



## Our Pulses for Innovations



The Kübler Group belongs today to the leading specialists worldwide in the fields of position and motion sensors, functional safety, counting and process technology and transmission technology.

Founded in the year 1960 by Fritz Kübler, the family business is now led by the next generation of Gebhard and Lothar Kübler.

Ten international group members and distributors in more than 50 countries offer local product know-how, service and advice throughout the world.

Innovative product and sector solutions, as well as solutions for functional safety and a high level of service, are the reasons behind our global success.

The strict focus on quality ensures the highest levels of reliability and a long service life for our products in the field.

Over 480 dedicated people worldwide make this success possible and ensure that customers can continue to place their trust in our company.





# Kübler Service for worldwide Planning Reliability



**24one**

## 24one delivery promise

Manufacturing in 24 hours. For orders placed on working days before 9 AM, the product will be ready for dispatch on that same day. 24one is limited to 20 pieces per delivery.

**10 by 10**

## 10 by 10

We will manufacture and deliver 10 encoders within 10 working days (365 days a year - with the exception of 24th Dec. until 2nd Jan.)

**48h**

## 48 h Express-Service

We can process your order within 48 hours; we can ship stock items the same day.



## Technical Support

Kübler' applications team is present on site all over the world for advice, analysis and support.

Kübler Germany / Austria ..... +49 7720 3903 952

Kübler France ..... +33 3 89 53 45 45

Kübler Italy ..... +39 026 423 345

Kübler Poland ..... +48 61 84 99 902



## Sample Service

We manufacture samples of special designs or according to customer specification within shortest time.



## Safety Services

- Adapted service packages
- Individual customer solutions



## Tailor-made Solutions – Kübler Design System (KDS) OEM Products and Systems (OPS)

We develop jointly with our customers product and engineering solutions for customer-specific products, integrated drive solutions, up to complete systems.

Kübler Turkey ..... +90 216 999 9791

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Kübler India ..... +91 8600 147 280

Kübler USA ..... +1 855 583 2537

## Our Product Portfolio



### Position and Motion Sensors

- Incremental and absolute encoders
- Fieldbus and Industrial Ethernet encoders
- Bearingless encoders
- Explosion protected encoders ATEX / IECEx
- Linear magnetic measuring systems
- Draw-wire encoders
- Inclometers
- Connection technology

### Transmission Technology

- Slip rings, modular system
- Slip rings, bearingless modular system
- Slip rings, contactless transmission
- Slip rings, compact and low-maintenance
- Slip rings, Ethernet transmission
- Optical fiber signal transmission modules
- Cables, connectors and pre-assembled cordsets

### Functional Safety

- Certified incremental and absolute encoders
- Certified explosion-protected encoders ATEX / IECEx
- Modules for safe drive monitoring
- Safe fieldbus gateways
- Safe speed monitors
- Adapted service packages
- Connection technology

### Counters and Process Devices

- Pulse counters and preset counters
- Hour meters and timers
- Frequency meters and tachometers
- Combination time and energy meters
- Position displays
- Process displays and controllers for temperature, analog signals and strain-gauge
- Setpoint adjuster

## We offer Solutions for the following Industries:



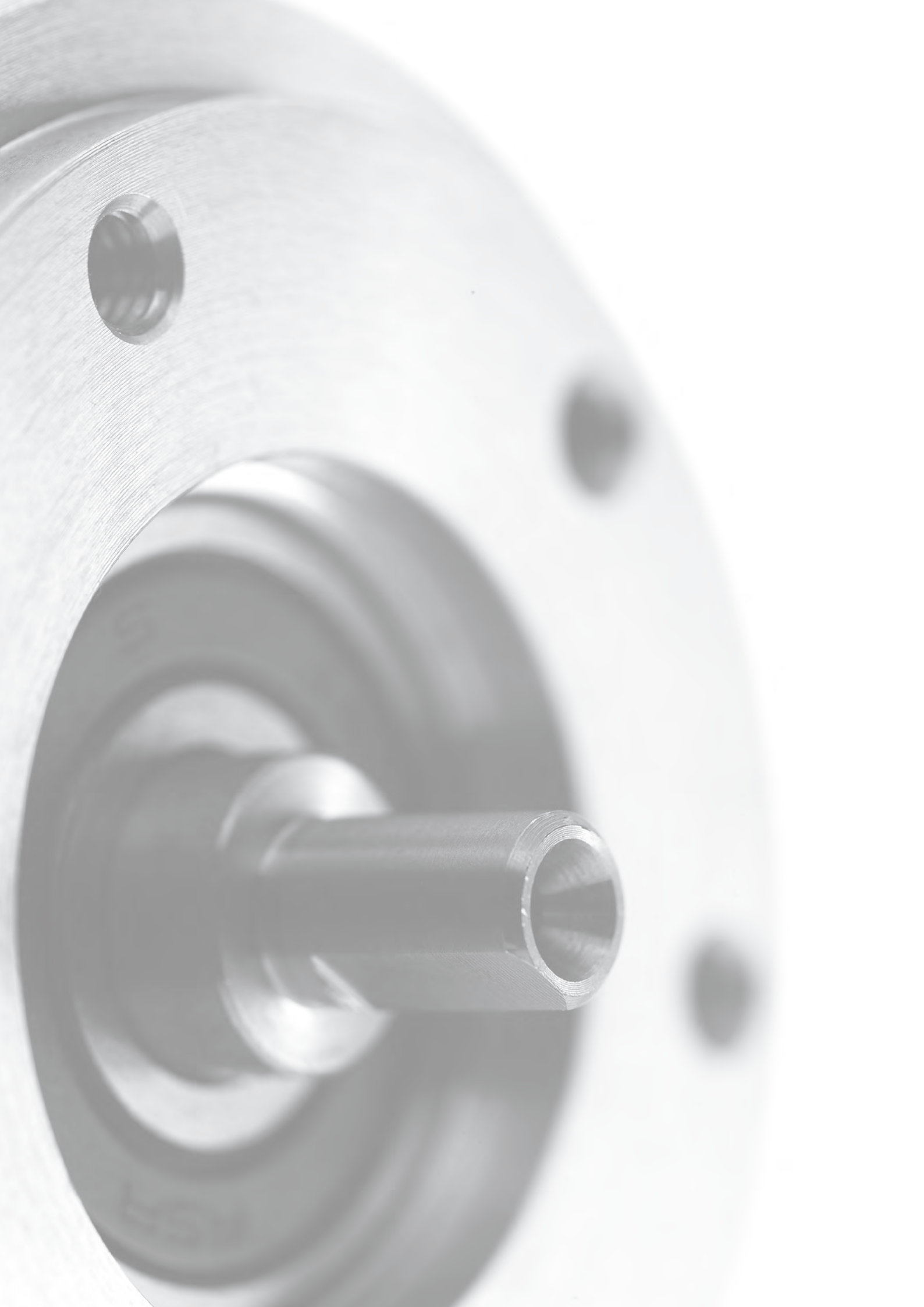
The high performance level and reliability of the Kübler products are based on our long experience in these demanding application sectors. Learn more about our application-specific solutions under:

[www.kuebler.com/industries](http://www.kuebler.com/industries)



# Position and Motion Sensors

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You will find comprehensive information about the basic technical knowledge relating to our products on our homepage, at the address [www.kuebler.com/basics](http://www.kuebler.com/basics)



# Product overview

## Incremental encoders

|  |  | Ø Dimensions in mm [inch] | Magnetic (Accuracy ± 1°) | Optical (Accuracy ± 0.015°) | Resolution max. in ppr | Push-pull | RS422 | SinCos | Open collector | Ø Hollow shaft max. in mm [inch] | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection                  | Power supply in V DC       | Pulse frequency max. in kHz | RoHS compliant | Approvals           | Page |
|--|--|---------------------------|--------------------------|-----------------------------|------------------------|-----------|-------|--------|----------------|----------------------------------|---------------------------------|-------------------------------|-----------------|-------------------------------------|----------------------------|-----------------------------|----------------|---------------------|------|
|  | Miniature, optical<br><b>2400</b> (shaft)<br><b>2420</b> (hollow shaft)  | 24<br>[0.94]              | -                        | •                           | 1.024                  | •         | -     | -      | -              | 6<br>[0.24]                      | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP64            | cable                               | 5 ... 24<br>8 ... 30       | 160                         | •              |                     | 50   |
|  | Miniature, magnetic<br><b>2430</b> (shaft)<br><b>2440</b> (hollow shaft)   | 24<br>[0.94]              | •                        | -                           | 256                    | -         | •     | -      | -              | 6<br>[0.24]                      | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP67            | cable                               | 5                          | 300                         | •              | -                   | 53   |
|  | Compact, optical<br><b>Sendix Base KIS40</b> (shaft)<br><b>Sendix Base KIH40</b> (hollow s.)                                 | 40<br>[1.57]              | -                        | •                           | 2.500                  | •         | •     | -      | •              | 8<br>[0.31]                      | 4.500                           | -20 ... +70<br>[-4 ... +158]  | IP64            | cable                               | 5<br>10 ... 30             | 250                         | •              |                     | 56   |
|  | Compact, optical<br><b>3610</b> (shaft)<br><b>3620</b> (hollow shaft)  | 36<br>[1.43]              | -                        | •                           | 2.500                  | •         | •     | -      | -              | 8<br>[0.31]                      | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP64            | cable<br>M12                        | 5<br>5 ... 18<br>8 ... 30  | 300                         | •              |                     | 59   |
|  | Compact, optical plastic housing<br><b>3700</b> (shaft)<br><b>3720</b> (hollow shaft)  | 37<br>[1.46]              | -                        | •                           | 1.024                  | •         | •     | -      | -              | 8<br>[0.31]                      | 6.000                           | -20 ... +70<br>[-4 ... +158]  | IP65            | cable                               | 5<br>5 ... 30<br>10 ... 30 | 250                         | •              |                     | 63   |
|  | Standard, optical<br><b>Sendix 5000</b> (shaft)<br><b>Sendix 5020</b> (hollow shaft)<br><b>24one</b> <sup>1)</sup>           | 58<br>[2.28]              | -                        | •                           | 5.000                  | •         | •     | -      | •              | 15<br>[0.59]<br>15.87<br>[5/8"]  | 12.000                          | -40 ... +85<br>[-40 ... +185] | IP67            | cable<br>M12<br>M23<br>MIL<br>Sub-D | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br>                | 67   |
|  | Standard, optical<br><b>Sendix Base KIS50</b> (shaft)<br><b>Sendix Base KIH50</b> (hollow s.)                                | 58<br>[2.28]              | -                        | •                           | 5.000                  | •         | •     | -      | •              | 15<br>[0.59]                     | 6.000                           | -20 ... +70<br>[-4 ... +158]  | IP65            | cable<br>M12<br>M23                 | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br>                | 79   |
|  | Standard, optical high temperature<br><b>5803</b> (shaft)<br><b>5823</b> (hollow shaft)                                      | 58<br>[2.28]              | -                        | •                           | 5.000                  | •         | •     | -      | -              | 12<br>[0.47]                     | 12.000                          | -20 ... +110<br>[-4 ... +230] | IP65            | cable<br>M23<br>MIL                 | 5<br>10 ... 30             | 300                         | •              |                     | 83   |
|  | Standard, optical sine wave output, with zero pulse<br><b>5804</b> (shaft)<br><b>5824</b> (hollow shaft)                     | 58<br>[2.28]              | -                        | •                           | 5.000                  | -         | -     | •      | -              | 12<br>[0.47]                     | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP65            | cable<br>M23                        | 5<br>10 ... 30             | 180                         | •              |                     | 88   |
|  | Standard, optical sine wave output, highly interpolable<br><b>Sendix 5814</b> (shaft)<br><b>Sendix 5834</b> (hollow shaft)   | 58<br>[2.28]              | -                        | •                           | 1.024 and 2.048        | -         | -     | •      | -              | 15<br>[0.59]                     | 12.000                          | -40 ... +90<br>[-40 ... +194] | IP67            | cable<br>M12                        | 5<br>10 ... 30             | 400                         | •              | <br>                | 92   |
|  | Standard, optical sine wave output, SIL2 / PLd<br><b>Sendix SIL 5814FS2</b> (shaft)<br><b>Sendix SIL 5834FS2</b> (hollow s.) | 58<br>[2.28]              | -                        | •                           | 1.024 and 2.048        | -         | -     | •      | -              | 14<br>[0.55]                     | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M12<br>M23                 | 5<br>10 ... 30             | 400                         | •              | <br><br>SIL2<br>PLd | 96   |
|  | Standard, optical sine wave output, SIL3 / PLd<br><b>Sendix SIL 5814FS3</b> (shaft)<br><b>Sendix SIL 5834FS3</b> (hollow s.) | 58<br>[2.28]              | -                        | •                           | 1.024 and 2.048        | -         | -     | •      | -              | 14<br>[0.55]                     | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M12<br>M23                 | 5<br>10 ... 30             | 400                         | •              | <br><br>SIL3<br>PLd | 102  |

1) We offer for all encoders configured with the underlined preferential options our free of charge 24one delivery promise. Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.



# Product overview

## Incremental encoders

|  |   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ±0.015°) | Resolution max. in ppr | Push-pull | RS422 | SinCos | Open collector | Ø Hollow shaft max. in mm [inch] | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]   | Protection max. | Type of connection                              | Power supply in V DC       | Pulse frequency max. in kHz | RoHS compliant | Approvals            | Page |
|--|---|---------------------------|-------------------------|----------------------------|------------------------|-----------|-------|--------|----------------|----------------------------------|---------------------------------|--------------------------------|-----------------|---|----------------------------|-----------------------------|----------------|----------------------|------|
|  | Standard, optical<br>high resolution<br><b>5805</b> (shaft)<br><b>5825</b> (hollow shaft)               | 58<br>[2.28]              | -                       | •                          | 36.000                 | •         | •     | -      | -              | 12<br>[0.47]                     | 12.000                          | -20 ... +105<br>[-4 ... +221]  | IP65            | cable<br>M23                                    | 5<br>10 ... 30             | 800                         | •              |                      | 108  |
|  | Standard, optical<br>stainless-steel<br><b>Sendix 5006</b> (shaft)<br><b>Sendix 5026</b> (hollow shaft) | 58<br>[2.28]              | -                       | •                          | 5.000                  | •         | •     | -      | -              | 15<br>[0.59]                     | 6.000                           | -40 ... +85<br>[-40 ... +185]  | IP67            | cable<br>M12                                    | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br>                 | 112  |
|  | Standard, optical<br>ATEX/IECEx – zone 1/21<br><b>7000</b> (shaft)<br><b>7020</b> (hollow shaft)        | 70<br>[2.76]              | -                       | •                          | 5.000                  | •         | •     | -      | -              | -                                | 6.000                           | -40 ... +60<br>[-40 ... +140]  | IP67            | cable   | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br>                 | 116  |
|  | Standard, optical<br>ATEX/IECEx – zone 1/21<br>SIL2/ PLd<br><b>Sendix SIL 7014FS2</b> (shaft)           | 70<br>[2.76]              | -                       | •                          | 1.024<br>and<br>2.048  | -         | -     | •      | -              | -                                | 6.000                           | -40 ... +60<br>[-40 ... +140]  | IP67            | cable   | 5<br>10 ... 30             | 400                         | •              | <br><br>SIL 2<br>PLd | 121  |
|  | Standard, optical<br>ATEX/IECEx – zone 1/21<br>SIL3/ PLe<br><b>Sendix SIL 7014FS3</b> (shaft)           | 70<br>[2.76]              | -                       | •                          | 1.024<br>and<br>2.048  | -         | -     | •      | -              | -                                | 6.000                           | -40 ... +60<br>[-40 ... +140]  | IP67            | cable   | 5<br>10 ... 30             | 400                         | •              | <br><br>SIL 3<br>PLe | 124  |
|  | Standard, optical<br>ATEX/IECEx – mining<br><b>7100</b> (shaft)<br><b>7120</b> (hollow shaft)           | 70<br>[2.76]              | -                       | •                          | 5.000                  | •         | •     | -      | -              | -                                | 6.000                           | -40 ... +60<br>[-40 ... +140]  | IP67            | cable   | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br>                 | 127  |
|  | Standard, optical<br>large hollow shaft<br><b>5821</b> (hollow shaft)                                   | 58<br>[2.28]              | -                       | •                          | 5.000                  | •         | •     | -      | -              | 28<br>[1.10]                     | 2.500                           | -20 ... +70<br>[-4 ... +158]   | IP64            | cable<br>M12                                    | 5<br>8 ... 30              | 300                         | •              | -                    | 132  |
|  | Large hollow shaft, optical<br><b>A020</b> (hollow shaft)   | 100<br>[3.94]             | -                       | •                          | 5.000                  | •         | •     | •      | -              | 42<br>[1.65]                     | 3.000                           | -40 ... +70<br>[-40 ... +140]  | IP65            | cable<br>M12<br>M23                             | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              |                      | 135  |
|  | Large hollow shaft, optical<br>robust<br><b>A02H</b> (hollow shaft)                                     | 100<br>[3.94]             | -                       | •                          | 5.000                  | •         | •     | •      | -              | 42<br>[1.65]                     | 6.000                           | -40 ... +80<br>[-40 ... +176]  | IP65            | cable<br>M12<br>M23<br>MIL                      | 5<br>5 ... 30<br>10 ... 30 | 300                         | •              | <br><br>             | 139  |
|  | Heavy Duty, optical<br><b>Sendix H100</b> (shaft)   | 115<br>[4.53]             | -                       | •                          | 3.600                  | •         | •     | -      | -              | -                                | 6.000                           | -40 ... +100<br>[-40 ... +212] | IP66            | cable <sup>1)</sup>                             | 5 ... 30<br>10 ... 30      | 300                         | •              |                      | 146  |
|  | Heavy Duty, optical<br><b>Sendix H120</b> (hollow shaft)  | 100<br>[3.94]             | -                       | •                          | 5.000                  | •         | •     | -      | -              | 28<br>[1.10]                     | 6.000                           | -40 ... +100<br>[-40 ... +212] | IP67            | cable <sup>1)</sup><br>M12<br>M23<br>opt. fiber | 5<br>10 ... 30             | 300                         | •              |                      | 151  |

1) With terminal box

# Product overview







## Absolute encoders Singleturn

|  |   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ±0.015°) | Resolution max. in bit | SSI interface | BISS interface | Analog/RS485 interface    | Parallel interface | Additional incremental track | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection  | Power supply in V DC             | RoHS compliant | Approvals                         | Page |
|--|---|---------------------------|-------------------------|----------------------------|------------------------|---------------|----------------|---------------------------|--------------------|------------------------------|---------------------------------|-------------------------------|-----------------|---------------------|----------------------------------|----------------|-----------------------------------|------|
|  | Miniature, magnetic<br><b>2450</b> (shaft)<br><b>2470</b> (hollow shaft)                                    | 24<br>[0.94]              | •                       | –                          | 12                     | •             | –              | –                         | –                  | –                            | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP67            | cable               | 5                                | •              | –                                 | 160  |
|  | Compact, magnetic analog<br><b>Sendix 3651</b> (shaft)<br><b>Sendix 3671</b> (hollow shaft)                 | 36<br>[1.43]              | •                       | –                          | 12                     | –             | –              | 4 ... 20 mA<br>0 ... 10 V | –                  | –                            | 6.000                           | -40 ... +85<br>[-40 ... +185] | IP69k           | cable<br>M12        | 10 ... 30<br>15 ... 30           | •              | e1<br>Ex 2/22                     | 163  |
|  | Compact, optical<br><b>Sendix F3653</b> (shaft)<br><b>Sendix F3673</b> (hollow shaft)                       | 36<br>[1.43]              | –                       | •                          | 17                     | •             | •              | –                         | –                  | Sin Cos<br>RS422             | 12.000                          | -40 ... +90<br>[-40 ... +194] | IP67            | cable<br>M12        | 5<br>10 ... 30                   | •              | c UL US                           | 178  |
|  | Standard, optical parallel/analog<br><b>5850</b> (shaft)<br><b>5870</b> (hollow shaft)                      | 58<br>[2.28]              | –                       | •                          | 13                     | –             | –              | 4 ... 20 mA               | •                  | –                            | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP66            | cable<br>M23        | 5<br>10 ... 30                   | •              | c UL US                           | 189  |
|  | Standard, optical parallel, highspeed<br><b>5852</b> (shaft)<br><b>5872</b> (hollow shaft)                  | 58<br>[2.28]              | –                       | •                          | 14                     | –             | –              | –                         | •                  | –                            | 12.000                          | -20 ... +85<br>[-4 ... +185]  | IP66            | cable<br>M23        | 5<br>10 ... 30                   | •              | c UL US                           | 194  |
|  | Standard, optical<br><b>Sendix 5853</b> (shaft)<br><b>Sendix 5873</b> (hollow shaft)                        | 58<br>[2.28]              | –                       | •                          | 21                     | •             | •              | –                         | –                  | Sin Cos<br>RS422             | 12.000                          | -40 ... +90<br>[-40 ... +194] | IP67            | cable<br>M12<br>M23 | 5<br>10 ... 30                   | •              | c UL US<br>Ex 2/22                | 198  |
|  | Standard, optical Motor-Line<br><b>Sendix 5873</b> (tapered shaft)  | 58<br>[2.28]              | –                       | •                          | 21                     | •             | •              | –                         | –                  | Sin Cos<br>RS422             | 9.000                           | -40 ... +90<br>[-40 ... +194] | IP65            | cable               | 5<br>10 ... 30<br>4,5 ...<br>5,5 | •              | c UL US                           | 206  |
|  | Standard, optical SIL2/PLd<br><b>Sendix SIL 5853FS2</b> (shaft)<br><b>Sendix SIL 5873FS2</b> (hollow s.)    | 58<br>[2.28]              | –                       | •                          | 17                     | •             | •              | –                         | –                  | Sin Cos                      | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M23        | 5<br>10 ... 30                   | •              | c UL US<br>Ex 2/22<br>SIL2<br>PLd | 210  |
|  | Standard, optical SIL3/PLe<br><b>Sendix SIL 5853FS3</b> (shaft)<br><b>Sendix SIL 5873FS3</b> (hollow s.)    | 58<br>[2.28]              | –                       | •                          | 17                     | •             | •              | –                         | –                  | Sin Cos                      | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M23        | 5<br>10 ... 30                   | •              | c UL US<br>Ex 2/22<br>SIL3<br>PLe | 217  |
|  | Standard, optical stainless-steel SSI/parallel<br><b>5876</b> (hollow shaft)                                | 58<br>[2.28]              | –                       | •                          | 14                     | •             | –              | –                         | •                  | –                            | 6.000                           | -20 ... +80<br>[-4 ... +176]  | IP67            | cable<br>M12        | 5<br>10 ... 30                   | •              | c UL US<br>Ex 2/22                | 252  |
|  | Standard, optical ATEX/IECEx – zone 1/21<br><b>Sendix 7053</b> (shaft)<br><b>Sendix 7073</b> (hollow shaft) | 70<br>[2.76]              | –                       | •                          | 17                     | •             | •              | –                         | –                  | –                            | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable               | 10 ... 30                        | •              | Ex<br>IECEx                       | 256  |















# Product overview

## Absolute encoders Singleturn





















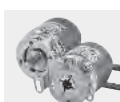


















|   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ≤ ±0.015°) | Resolution max. in bit | SSI interface | BiSS interface | Analog/RS485 interface | Parallel interface | Additional incremental track | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection | Power supply in V DC | RoHS compliant | Approvals   | Page |
|---|---------------------------|-------------------------|------------------------------|------------------------|---------------|----------------|------------------------|--------------------|------------------------------|---------------------------------|-------------------------------|-----------------|--------------------|----------------------|----------------|---|------|
|  Standard, optical<br>ATEX/IECEx – Zone 1/21<br>SIL2 / PLd<br><b>Sendix SIL 7053FS2</b> (shaft)              | 70<br>[2.76]              | -                       | •                            | 17                     | •             | •              | -                      | -                  | SinCos                       | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30            | •              |  | 261  |
|  Standard, optical<br>ATEX/IECEx – zone 1/21<br>SIL3 / PLe<br><b>Sendix SIL 7053FS3</b> (shaft)              | 70<br>[2.76]              | -                       | •                            | 17                     | •             | •              | -                      | -                  | SinCos                       | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30            | •              |  | 265  |
|  Standard, optical<br>ATEX/IECEx – mining<br><b>Sendix 7153</b> (shaft)<br><b>Sendix 7173</b> (hollow shaft) | 70<br>[2.76]              | -                       | •                            | 17                     | •             | •              | -                      | -                  | -                            | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30            | •              |  | 279  |

## Absolute encoders Singleturn Fieldbus

|   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ≤ ±0.015°) | CANopen | SAE J1939 | PROFIBUS DP | EtherCAT | PROFINET IO | EtherNet/IP | Resolution max. in bit | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection  | Power supply in V DC | RoHS compliant | Approvals   | Page |
|---|---------------------------|-------------------------|------------------------------|---------|-----------|-------------|----------|-------------|-------------|------------------------|---------------------------------|-------------------------------|-----------------|---------------------|----------------------|----------------|---|------|
|  Compact, magnetic<br><b>Sendix M3658</b> (shaft)<br><b>Sendix M3678</b> (hollow shaft)  | 36<br>[1.43]              | •                       | -                            | •       | •         | -           | -        | -           | -           | 14                     | 6.000                           | -40 ... +85<br>[-40 ... +185] | IP69k           | cable<br>M12        | 8 ... 30             | •              |  | 168  |
|  Compact, optical<br><b>Sendix F3658</b> (shaft)<br><b>Sendix F3678</b> (hollow shaft)   | 36<br>[1.43]              | -                       | •                            | •       | -         | -           | -        | -           | -           | 16                     | 12.000                          | -40 ... +85<br>[-40 ... +185] | IP67            | cable               | 10 ... 30            | •              |  | 184  |
|  Standard, optical<br><b>Sendix 5858</b> (shaft)<br><b>Sendix 5878</b> (hollow shaft)  | 58<br>[2.28]              | -                       | •                            | •       | -         | •           | •        | •           | -           | 16                     | 9.000                           | -40 ... +80<br>[-40 ... +176] | IP67            | cable<br>M12<br>M23 | 10 ... 30            | •              |  | 224  |
|  <b>new</b><br>Standard, optical<br>electronic singleturn<br><b>Sendix F5858</b> (shaft)<br><b>Sendix F5878</b> (hollow shaft) | 58<br>[2.28]              | -                       | •                            | -       | -         | -           | -        | -           | •           | 16                     | 8.000                           | -40 ... +80<br>[-40 ... +176] | IP65            | M12                 | 10 ... 30            | •              |  | 247  |
|  Standard, optical<br>ATEX/IECEx – zone 1/21<br><b>Sendix 7058</b> (shaft)<br><b>Sendix 7078</b> (hollow shaft)                | 70<br>[2.76]              | -                       | •                            | •       | -         | •           | -        | -           | -           | 16                     | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable               | 10 ... 30            | •              |  | 269  |
|  Standard, optical<br>ATEX/IECEx – mining<br><b>Sendix 7158</b> (shaft)<br><b>Sendix 7178</b> (hollow shaft)                   | 70<br>[2.76]              | -                       | •                            | •       | -         | •           | -        | -           | -           | 16                     | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable               | 10 ... 30            | •              |  | 284  |















# Product overview

## Absolute encoders Multiturn

|  |   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ±0.015°) | Resolution max. in bit S+T+MT | SSI interface | BiSS interface | Analog/RS485 interface                 | Additional incremental track | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection  | Power supply in V DC   | RoHS compliant | Approvals   | Page |
|--|---|---------------------------|-------------------------|----------------------------|-------------------------------|---------------|----------------|--|------------------------------|---------------------------------|-------------------------------|-----------------|---------------------|------------------------|----------------|---|------|
|       | Compact, magnetic electronic multiturn<br><b>Sendix M3661</b> (shaft)<br><b>Sendix M3681</b> (hollow shaft) | 36<br>[1.42]              | •                       | –                          | 12 + 16                       | –             | –              | 4 ... 20 mA<br>0 ... 10 V<br>0 ... 5 V | –                            | 6.000                           | -40 ... +85<br>[-40 ... +185] | IP67            | cable<br>M12        | 10 ... 30<br>15 ... 30 | •              | <br><br>       | 296  |
|       | Compact, magnetic electronic multiturn<br><b>Sendix M3663</b> (shaft)<br><b>Sendix M3683</b> (hollow shaft) | 36<br>[1.42]              | •                       | –                          | 14 + 24                       | •             | –              | –                                      | –                            | 6.000                           | -40 ... +85<br>[-40 ... +185] | IP67            | cable<br>M12        | 10 ... 30              | •              | <br><br>       | 302  |
|       | Compact, magnetic robust, electronic multiturn<br><b>Sendix M3661R</b> (shaft)                              | 36<br>[1.42]              | •                       | –                          | 12 + 16                       | –             | –              | 4 ... 20 mA<br>0 ... 10 V<br>0 ... 5 V | –                            | 4.000                           | -40 ... +85<br>[-40 ... +185] | IP69k           | cable<br>M12        | 10 ... 30<br>15 ... 30 | •              | <br><br>      | 312  |
|   | Compact, magnetic robust, electronic multiturn<br><b>Sendix M3663R</b> (shaft)                              | 36<br>[1.42]              | •                       | –                          | 14 + 24                       | •             | –              | –                                      | –                            | 4.000                           | -40 ... +85<br>[-40 ... +185] | IP69k           | cable<br>M12        | 10 ... 30              | •              | <br><br> | 316  |
|   | Compact, optical electronic multiturn<br><b>Sendix F3663</b> (shaft)<br><b>Sendix F3683</b> (hollow shaft)  | 36<br>[1.42]              | –                       | •                          | 17 + 24                       | •             | •              | –                                      | SinCos<br>RS422              | 12.000                          | -40 ... +90<br>[-40 ... +194] | IP67            | cable<br>M12        | 5<br>10 ... 30         | •              |    | 323  |
|   | Standard, magnetic electronic multiturn<br><b>Sendix M5861</b> (shaft)                                      | 58<br>[2.28]              | •                       | –                          | 12 + 16                       | –             | –              | 4 ... 20 mA<br>0 ... 10 V<br>0 ... 5 V | –                            | 4.000                           | -40 ... +85<br>[-40 ... +185] | IP65            | cable<br>M12        | 10 ... 30<br>15 ... 30 | •              | <br>  | 334  |
|   | Standard, magnetic electronic multiturn<br><b>Sendix M5863</b> (shaft)                                      | 58<br>[2.28]              | •                       | –                          | 14 + 24                       | •             | –              | –                                      | –                            | 4.000                           | -40 ... +85<br>[-40 ... +185] | IP65            | cable<br>M12        | 10 ... 30              | •              | <br>  | 338  |
|   | Standard, optical electronic multiturn<br><b>Sendix F5863</b> (shaft)<br><b>Sendix F5883</b> (hollow shaft) | 58<br>[2.28]              | –                       | •                          | 17 + 24                       | •             | •              | –                                      | SinCos<br>RS422              | 12.000                          | -40 ... +85<br>[-40 ... +185] | IP67            | cable<br>M12<br>M23 | 5<br>10 ... 30         | •              | <br>  | 345  |
|   | Standard, optical Motor-Line electronic multiturn<br><b>Sendix F5883M</b> (hollow shaft)                    | 58<br>[2.28]              | –                       | •                          | 17 + 24                       | •             | –              | –                                      | SinCos<br>RS422              | 9.000                           | -40 ... +85<br>[-40 ... +185] | IP65            | cable               | 5<br>10 ... 30         | •              |    | 352  |
|   | Standard, optical mechanical multiturn<br><b>Sendix 5863</b> (shaft)<br><b>Sendix 5883</b> (hollow shaft)   | 58<br>[2.28]              | –                       | •                          | 17 + 12                       | •             | •              | –                                      | SinCos<br>RS422              | 12.000                          | -40 ... +90<br>[-40 ... +194] | IP67            | cable<br>M12<br>M23 | 5<br>10 ... 30         | •              | <br>  | 356  |

# Product overview

## Absolute encoders Multiturn

|   | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ±0.015°) | Resolution max. in bit S+MT | SSI interface | BiSS interface | Analog/RS485 interface | Additional incremental track | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection | Power supply in V DC    | RoHS compliant | Approvals   | Page |
|---|---------------------------|-------------------------|----------------------------|-----------------------------|---------------|----------------|------------------------|------------------------------|---------------------------------|-------------------------------|-----------------|--------------------|-------------------------|----------------|---|------|
|  <p>Standard, optical mechanical multiturn<br/>SIL2 / PLd<br/><b>Sendix SIL 5863FS2</b> (shaft)<br/><b>Sendix SIL 5883FS2</b> (hollow s.)</p>  | 58<br>[2.28]              | -                       | •                          | 17 +12                      | •             | •              | -                      | SinCos                       | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M23       | 5<br>10 ... 30          | •              |    | 364  |
|  <p>Standard, optical mechanical multiturn<br/>SIL3 / PLe<br/><b>Sendix SIL 5863FS3</b> (shaft)<br/><b>Sendix SIL 5883FS3</b> (hollow s.)</p>  | 58<br>[2.28]              | -                       | •                          | 17 +12                      | •             | •              | -                      | SinCos                       | 9.000/<br>12.000                | -40 ... +90<br>[-40 ... +194] | IP65            | cable<br>M23       | 5<br>10 ... 30          | •              |    | 371  |
|  <p>Standard, optical mechanical multiturn<br/>ATEX/IECEX – zone 1/21<br/><b>Sendix 7063</b> (shaft)<br/><b>Sendix 7083</b> (hollow shaft)</p> | 70<br>[2.76]              |                         | •                          | 17 +12                      | •             | •              | -                      | -                            | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30               | •              |    | 420  |
|  <p>Standard, optical mechanical multiturn<br/>ATEX/IECEX – zone 1/21<br/>SIL2 / PLd<br/><b>Sendix SIL 7063FS2</b> (shaft)</p>                | 70<br>[2.76]              |                         | •                          | 17 +12                      | •             | •              | -                      | SinCos                       | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30               | •              |   | 425  |
|  <p>Standard, optical mechanical multiturn<br/>ATEX/IECEX – zone 1/21<br/>SIL3 / PLe<br/><b>Sendix SIL 7063FS3</b> (shaft)</p>               | 70<br>[2.76]              |                         | •                          | 17 +12                      | •             | •              | -                      | SinCos                       | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30               | •              |  | 429  |
|  <p>Standard, optical mechanical multiturn<br/>ATEX/IECEX – mining<br/><b>Sendix 7163</b> (shaft)<br/><b>Sendix 7183</b> (hollow shaft)</p>  | 70<br>[2.76]              |                         | •                          | 17 +12                      | •             | •              | -                      | -                            | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable              | 10 ... 30               | •              |  | 443  |
|  <p>Large hollow shaft, optical / magnetic, programmable<br/><b>9081</b> (large hollow shaft)</p>  | 90<br>[3.54]              |                         | •                          | 13 +12                      | •             | -              | -                      | -                            | 6.000                           | -20 ... +70<br>[-4 ... +158]  | IP65            | cable<br>M23       | 4.75 ... 30<br>5 ... 30 | •              |  | 465  |

# Product overview

## Absolute encoders Multiturn Fieldbus

new













Compact, magnetic electronic multiturn,  
**Sendix M3668** (shaft)  
**Sendix M3688** (hollow shaft)

|  | Ø Dimensions in mm [inch] | Magnetic (Accuracy ±1°) | Optical (Accuracy ≤ ±0.015°) | Resolution max. in bit S+T+MT | CANopen | CANopenlift | PROFIBUS DP | DeviceNet | MODBUS RTU | EtherCAT | PROFINET IO | EtherNet/IP | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]  | Protection max. | Type of connection    | Power supply in V DC | RoHS compliant | Approvals                                     | Page |
|--|---------------------------|-------------------------|------------------------------|-------------------------------|---------|-------------|-------------|-----------|------------|----------|-------------|-------------|---------------------------------|-------------------------------|-----------------|-----------------------|----------------------|----------------|---|------|
|  | 36<br>[1.42]              | •                       | –                            | 14 +24                        | •       | –           | –           | –         | –          | –        | –           | –           | 6.000                           | -40 ... +85<br>[-40...+185]   | IP67            | cable<br>M12          | 10 ... 30            | •              | e1<br>pending<br>cUL US<br>Ex 2/22            | 307  |
|  | 36<br>[1.42]              | •                       | –                            | 14 +24                        | •       | –           | –           | –         | –          | –        | –           | –           | 4.000                           | -40 ... +85<br>[-40...+185]   | IP69k           | cable<br>M12          | 10 ... 30            | •              | e1<br>pending<br>cUL US<br>Ex 2/22<br>pending | 319  |
|  | 36<br>[1.42]              | –                       | •                            | 14 +24                        | •       | –           | –           | –         | –          | –        | –           | –           | 12.000                          | -40 ... +85<br>[-40...+185]   | IP67            | cable                 | 10 ... 30            | •              | Ex 2/22                                       | 329  |
|  | 58<br>[2.28]              | •                       | –                            | 14 +24                        | •       | –           | –           | –         | –          | –        | –           | –           | 4.000                           | -40 ... +85<br>[-40...+185]   | IP65            | cable<br>M12          | 10 ... 30            | •              | cUL US<br>Ex 2/22                             | 341  |
|  | 58<br>[2.28]              | –                       | •                            | 16 +16                        | •       | –           | –           | •         | –          | –        | •           | –           | 12.000                          | -40 ... +80<br>[-40...+176]   | IP67            | cable<br>M12          | 10 ... 30            | •              | cUL US<br>Ex 2/22                             | 378  |
|  | 58<br>[2.28]              | –                       | •                            | 16 +12                        | •       | •           | •           | –         | –          | •        | •           | –           | 9.000                           | -40 ... +85<br>[-40...+185]   | IP67            | cable<br>M12<br>Sub-D | 10 ... 30            | •              | cUL US<br>Ex 2/22                             | 394  |
|  | 70<br>[2.76]              | –                       | •                            | 16 +12                        | •       | –           | •           | –         | –          | –        | –           | –           | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable                 | 10 ... 30            | •              | Ex<br>IECEx                                   | 433  |
|  | 70<br>[2.76]              | –                       | •                            | 16 +12                        | •       | –           | •           | –         | –          | –        | –           | –           | 6.000                           | -40 ... +60<br>[-40 ... +140] | IP67            | cable                 | 10 ... 30            | •              | Ex<br>IECEx                                   | 448  |
|  | 90<br>[3.54]              | –                       | •                            | 13 +12                        | •       | –           | •           | –         | –          | –        | –           | –           | 6.000                           | -10 ... +70<br>[-14 ... +158] | IP65            | cable<br>M12          | 10 ... 30            | •              | cUL US  | 458  |







# Product overview

## Bearingless encoders

|   |  | Hollow shaft max. in mm ["] | Magnetic (Accuracy ±1°) | With zero pulse | Resolution max. in ppr | Push-pull | RS422 | SinCos | Ø hollow shaft max. in mm | Speed max. in min <sup>-1</sup> | Temperature range in °C [°F]     | Protection max. | Type of connection | Power supply in V DC     | Pulse frequency max. in kHz | RoHS compliant | Approvals | Page       |
|---|--|-----------------------------|-------------------------|-----------------|------------------------|-----------|-------|--------|---------------------------|---------------------------------|----------------------------------|-----------------|--------------------|--------------------------|-----------------------------|----------------|-----------|------------|
|       | Incremental, Standard magnetic<br><b>RLI20</b> (hollow shaft)                        | 30<br>[1.18]                | •                       | -               | 3.600                  | •         | •     | -      | 30<br>[1.18]              | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>470</b> |
|       | Incremental, Standard zero pulse, magnetic<br><b>RLI50</b> (hollow shaft)            | 35<br>[1.38]                | •                       | •               | 3.600                  | •         | •     | -      | 30<br>[1.18]              | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>473</b> |
|    | Incremental, Standard magnetic<br><b>RI20/Limes LI20</b> (hollow shaft)              | 30<br>[1.18]                | •                       | -               | 3.600                  | •         | •     | -      | 30<br>[1.18]              | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>476</b> |
|   | Incremental, Standard zero pulse, magnetic<br><b>RI50/Limes LI50</b> (hollow shaft)  | 35<br>[1.38]                | •                       | •               | 3.600                  | •         | •     | -      | 30<br>[1.18]              | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>479</b> |
|   | Incremental, large hollow shaft magnetic<br><b>RLI200</b> (hollow shaft)             | 390<br>[15.35]              | •                       | -               | 16.000                 | •         | •     | -      | 180<br>[7.09]             | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>482</b> |
|   | Incremental, large hollow shaft zero pulse, magnetic<br><b>RLI500</b> (hollow shaft) | 350<br>[13.78]              | •                       | •               | 6.400                  | •         | •     | -      | 70<br>[2.76]              | 12.000                          | -20 ... +80<br>[-4°F ... +176°F] | IP69k           | cable              | 4.8 ... 26<br>4.8 ... 30 | 250                         | •              | -         | <b>485</b> |

## Product overview

### Linear measuring technology Magnetic measurement system

|  | Measuring max. in m | Accuracy max.                             | Resolution max. in µm | Dimensions in mm [inch]          | Incremental RS422/Push-Pull | Incremental SinCos | Absolute analog | Absolute SSI/BISS | Absolute field bus | Traverse speed max. in m/s | Temperature range in °C [°F]  | Protection max. | Type of connection | RoHS compliant | Page       |
|--|---------------------|---|-----------------------|----------------------------------|-----------------------------|--------------------|-----------------|-------------------|--------------------|----------------------------|-------------------------------|-----------------|--------------------|----------------|------------|
|  Incremental sensor head, magnetic band<br><b>Limes LI20/B1</b> | 50                  | dep. on meas. length<br>0.08 mm<br>for 1m | 10                    | 10x25x40<br>[0.39 x 0.98 x 1.57] | •                           | –                  | –               | –                 | –                  | 25                         | -20 ... +80<br>[-4 ... +176]  | IP69k           | cable              | •              | <b>490</b> |
|  Incremental sensor head, magnetic band<br><b>Limes LI50/B2</b> | 50                  | dep. on meas. length<br>0.1 mm<br>for 1m  | 5                     | 10x25x40<br>[0.39 x 0.98 x 1.57] | •                           | –                  | –               | –                 | –                  | 16                         | -20 ... +80<br>[-4 ... +176]  | IP69k           | cable              | •              | <b>493</b> |
|  Absolute sensor head, magnetic band<br><b>Limes LA10/BA1</b>   | 8                   | dep. on meas. length<br>0.03 mm<br>for 1m | 1                     | 16x30x70<br>[0.63 x 1.18 x 2.76] | –                           | •                  | –               | •                 | •                  | 10                         | -10 ... +70<br>[+14 ... +158] | IP64            | M12                | •              | <b>496</b> |
|  Absolute sensor head, magnetic band<br><b>Limes LA50/BA5</b>  | 20                  | dep. on meas. length<br>0.17 mm<br>for 1m | 10                    | 24x26x75<br>[0.94 x 1.02 x 2.95] | –                           | –                  | –               | •                 | •                  | 4                          | -10 ... +70<br>[+14 ... +158] | IP40            | cable              | •              | <b>500</b> |





# Product overview

## Linear measuring technology Draw wire mechanics

|  |   | Measuring max. in m | Accuracy max.                    | Resolution max. [mm] | Dimensions in mm [inch]                        | Incremental RS422/Push-Pull | Absolute analog                       | Absolute SSI/BISS | Absolute fieldbus | Traverse speed max. in m/s | Temperature range in °C [°F]  | Protection max. | Type of connection  | RoHS compliant | Page       |
|--|---|---------------------|----------------------------------|----------------------|--|-----------------------------|---------------------------------------|-------------------|-------------------|----------------------------|-------------------------------|-----------------|---------------------|----------------|------------|
|  | Draw wire encoder <b>A30</b><br>with analog sensor                | 0.6                 | ±0.1 %<br>of measuring<br>range  | 0.15                 | 32.45 x 40.7 x<br>28.6<br>[1.28 x 1.60 x 1.13] | –                           | 4 ... 20 mA<br>0 ... 10 V DC<br>10 kΩ | –                 | –                 | 0.8                        | -10 ... +80<br>[-4 ... +176]  | IP50            | cable               | •              | <b>504</b> |
|  | Draw wire encoder <b>A40</b><br>with analog sensor                | 1                   | ±0.1 %<br>of measuring<br>range  | 0.1                  | 40x40 x max. 72<br>[1.57 x 1.57 x 3.90]        | –                           | 4 ... 20 mA<br>0 ... 10 V<br>10 kΩ    | –                 | –                 | 0.8                        | -20 ... +90<br>[-4 ... +194]  | IP50<br>IP65    | cable               | •              | <b>506</b> |
|  | Draw wire encoder <b>A50</b><br>with encoder or<br>analog sensor  | 1.25                | ±0.05 %<br>of measuring<br>range | 0.05                 | 50x50 x max. 99<br>[1.97 x 1.97 x 3.90]        | •                           | 4 ... 20 mA<br>0 ... 10 V<br>1 kΩ     | •                 | •                 | 10                         | -20 ... +85<br>[-4 ... +185]  | IP67            | cable<br>M12        | •              | <b>508</b> |
|  | Draw wire encoder <b>A40</b><br>with incremental encoder          | 2                   | ±0.1 %<br>of measuring<br>range  | 0.15                 | 32.45 x 40.7 x<br>28.6<br>[1.28 x 1.60 x 1.13] | •                           | 4 ... 20 mA<br>0 ... 10 V DC<br>10 kΩ | –                 | –                 | 0.8                        | -10 ... +80<br>[-4 ... +176]  | IP45            | cable               | •              | <b>513</b> |
|  | Draw wire encoder <b>A41</b><br>with analog sensor                | 2                   | ±0.1 %<br>of measuring<br>range  | 0.1                  | 40x40 x max. 72<br>[1.57 x 1.57 x 2.83]        | •                           | 4 ... 20 mA<br>0 ... 10 V<br>10 kΩ    | –                 | –                 | 0.8                        | -20 ... +90<br>[-4 ... +194]  | IP50<br>IP65    | cable               | •              | <b>506</b> |
|  | Draw wire encoder <b>A41</b><br>with absolute encoder             | 2                   | ±0.35 %<br>of measuring<br>range | 0.15                 | 41x41 x max. 96.3<br>[1.61 x 1.61 x 3.79]      | –                           | 4 ... 20 mA<br>0 ... 10 V DC<br>10 kΩ | •                 | •                 | 1                          | -10 ... +80<br>[-4 ... +176]  | IP50            | cable               | •              | <b>515</b> |
|  | Draw wire encoder <b>B75</b><br>with encoder or<br>analog sensor  | 3                   | ±0.35 %<br>of measuring<br>range | 0.15                 | 75x75 x<br>max. 127.4<br>[2.95 x 2.95 x 5.02]  | –                           | 4 ... 20 mA<br>0 ... 10 V DC<br>10 kΩ | –                 | –                 | 0.8                        | -40 ... +80<br>[-40 ... +176] | IP65            | cable               | •              | <b>518</b> |
|  | Draw wire encoder <b>B80</b><br>with encoder or<br>analog sensor  | 3                   | ±0.05 %<br>of measuring<br>range | 0.05                 | 80x80 x max. 144<br>[3.15 x 3.15 x 5.67]       | •                           | 4 ... 20 mA<br>0 ... 10 V<br>1 kΩ     | •                 | •                 | 10                         | -20 ... +90<br>[-4 ... +194]  | IP67            | cable<br>M12<br>M23 | •              | <b>522</b> |
|  | Draw wire encoder <b>C105</b><br>with encoder                     | 6                   | ±0.1 %<br>of measuring<br>range  | 0.1                  | 105x85 x<br>max. 163<br>[4.13 x 3.35 x 6.42]   | •                           | –                                     | •                 | •                 | 3                          | -20 ... +80<br>[-4 ... +176]  | –               | cable               | •              | <b>528</b> |
|  | Draw wire encoder <b>C120</b><br>with encoder or<br>analog sensor | 6                   | ±0.05 %<br>of measuring<br>range | 0.08                 | 120x120 x<br>max. 136<br>[4.72 x 4.72 x 5.35]  | •                           | 4 ... 20 mA<br>0 ... 10 V<br>1 kΩ     | •                 | •                 | 10                         | -20 ... +90<br>[-4 ... +194]  | IP67            | cable<br>M12<br>M23 | •              | <b>531</b> |
|  | Draw wire encoder <b>D135</b><br>with encoder or<br>analog sensor | 42.5                | ±0.05 %<br>of measuring<br>range | 0.08                 | 135x135 x<br>max. 318<br>[5.32 x 5.32 x 12.52] | •                           | 4 ... 20 mA<br>0 ... 10 V<br>1 kΩ     | •                 | •                 | 10                         | -20 ... +90<br>[-4 ... +194]  | IP67            | cable<br>M12<br>M23 | •              | <b>537</b> |

## Product overview







### Linear measuring technology

|  |  | Measuring max. in m | Accuracy max. | Resolution min. in mm | Dimensions in mm [inch]              | Incremental RS422/Push-Pull | Incremental Sin Cos | Absolute analog | Absolute SSI/BISS | Absolute fieldbus | Traverse speed max.     | Temperature range in °C [°F] | Protection max. | Type of connection         | RoHS compliant | Page       |
|--|--|---------------------|---------------|-----------------------|--------------------------------------|-----------------------------|---------------------|-----------------|-------------------|-------------------|-------------------------|------------------------------|-----------------|----------------------------|----------------|------------|
|   | Lift measuring system for shaftcopying<br><b>LM3</b>   | 53                  | ±0.5 mm       | 0.1                   | dep. on type                         | •                           | •                   | –               | •                 | •                 | 6 m/s                   | -20 ... +85<br>[-4 ... +185] | IP67            | cable<br>M12<br>M23<br>MIL | •              | <b>544</b> |
|   | Length measuring kit, mini measuring wheel system, incremental incl. encoder                     | ∞                   | ±0.015°       | 0.1                   | 74 x 50 x 52<br>[2.91 x 1.97 x 2.05] | •                           | •                   | –               | –                 | –                 | 2.000 min <sup>-1</sup> | -20 ... +80<br>[-4 ... +176] | IP64            | cable                      | •              | <b>546</b> |
|   | Length measuring kit with rack and pinion incremental / absolute incl. encoder / preset counter  | ∞                   | 0.5 mm        | 0.1                   | dep. on rack                         | •                           | •                   | –               | •                 | –                 | 0.5 m/s                 | -20 ... +80<br>[-4 ... +176] | IP67            | cable<br>M12<br>M23<br>MIL | •              | <b>547</b> |
|  | Length measuring kit with measuring wheels incremental / absolute incl. encoder / preset counter | ∞                   | ±0.015°       | 0.1                   | dep. on the measuring wheel          | •                           | •                   | –               | •                 | –                 | 2.000 min <sup>-1</sup> | -20 ... +80<br>[-4 ... +176] | IP67            | cable<br>M12<br>M23<br>MIL | •              | <b>548</b> |



# Product overview

## Inclinometers







|   | Measuring angle max. | Accuracy max. | Resolution max. | Dimensions in mm [inch]                  | Absolute analog                              | CANopen | Reaction time in s | Temperature range in °C [°F]  | Protection max. | Type of connection connector | RoHS compliant | Approvals   | Page |
|---|----------------------|---------------|-----------------|--|--|---------|--------------------|-------------------------------|-----------------|------------------------------|----------------|---|------|
|    | 360°                 | ± 0.5°        | 0.15°           | 60 x 30 x 20<br>[2.36 x 1.18 x 0.79]     | 4 ... 20 mA<br>0.1 ... 4.9 V                 | –       | 0.1                | -30 ... +70<br>[-24 ... +158] | IP69k           | M12                          | •              | –   | 554  |
|    | ± 60°                | ± 0.5°        | 0.15°           | 60 x 30 x 20<br>[2.36 x 1.18 x 0.79]     | 4 ... 20 mA<br>0.1 ... 4.9 V<br>2 % ... 98 % | –       | 0.1                | -30 ... +70<br>[-24 ... +158] | IP69k           | M12                          | •              | –   | 556  |
|    | ± 85°<br>360°        | ± 0.4°        | 0,01°           | 80 x 60 x 23<br>[3.15 x 2.36 x 0.91]     | –  | •       | 0,1                | -40 ... +85                   | IP69k           | M12                          | •              |  | 558  |
|   | 360°                 | ± 0.5°        | 0.1°            | 68 x 42.5 x 42.5<br>[2.68 x 1.67 x 1.67] | –  | •       | 0.1                | -40 ... +80<br>[-40 ... +176] | IP69k           | M12                          | •              | –   | 561  |
|  | ± 60°                | ± 0.5°        | 0.1°            | 68 x 42.5 x 42.5<br>[2.68 x 1.67 x 1.67] | –  | •       | 0.1                | -40 ... +80<br>[-40 ... +176] | IP69k           | M12                          | •              | –   | 563  |

Product overview  
Basics

## Product overview




### Connection technology

Cable, unprepared, cut to length

|   |   | PVC cable | PUR cable | TPE cable | Cross section in mm <sup>2</sup>   | Cable diameter in mm  | for incremental encoders | for absolute encoders | Page |
|---|---|-----------|-----------|-----------|--|---|--------------------------|-----------------------|------|
|    | 5 core + shield   | •         | •         | –         | 5 x 0.14 [AWG25]<br>5 x 0.75 [AWG18]   | approx. 4.7<br>approx. 7.5  | •                        | –                     | 568  |
|    | 8 core + shield   | –         | •         | –         | 8 x 0,14 8 x 0.14 [AWG25]<br>3 x 2 x 0,14 [AWG25] + 2 x 0,5 [AWG20]  | ca. 5.5<br>ca. 7.4  | –                        | •                     | 568  |
|    | 10 core + shield  | –         | •         | –         | 4 x 2 x 0.25 [AWG23] + 2 x 1 [AWG17]   | approx. 7.9   | •                        | •                     | 568  |
|   | 12 core + shield  | •         | •         | •         | 10 x 0.14 [AWG25] + 2 x 0.5 [AWG20]<br>12 x 0.14 [AWG25]<br>6 x 2 x 0.14 [AWG25]<br>5 x 2 x 0.14 [AWG25] + 2 x 0.5 [AWG20]<br>6 x 2 x 0.14 [AWG25] | approx. 6.9<br>approx. 6.7<br>approx. 7.5<br>approx. 8.5<br>approx. 7.3 | •                        | •                     | 569  |
|  | 18 core + shield  | •         | –         | –         | 18 x 0.14 [AWG25]  | approx. 7.8   | –                        | •                     | 569  |
|  | PROFIBUS DP<br>DeviceNet<br>CANopen<br>EtherCAT, PROFINET IO, EtherNet/IP | •         | •         | –         | 2 x 0.34 [AWG25]<br>2 x 0.52 [AWG20] + 2 x 1.04 [AWG17]<br>3 x 2 x 0.25 [AWG23]<br>2 x 2 x 0.34 [AWG22]  | approx. 7.6<br>approx. 8.4<br>approx. 6.2<br>approx. 4.8                | •                        | •                     | 570  |





### Connection technology

Connectors, self-assembly



|   |     | N° of pins | Housing | Connection technology | Cable diameter Ø in mm | Straight connector | Right angle connector | Wall/panel lead-through | for fieldbus | Page |
|---|-----|------------|---------|-----------------------|------------------------|--------------------|-----------------------|-------------------------|--------------|------|
|  | M12 | 4/5/8/12   | Metal   | Screw terminals       | 6 - 8                  | •                  | •                     | •                       | •            | 571  |
|  | M23 | 12/17      | Metal   | Solder pins           | 5.5 - 10.5             | •                  | –                     | •                       | –            | 589  |
|  | MIL | 7/10       | Metal   | Solder pins           | 5 - 8                  | •                  | –                     | –                       | –            | 595  |

## Product overview

### Connection technology Cordsets, pre-assembled

|  | PVC cable | PUR cable | TPE cable | Optical fiber | Straight connector | Right angle connector | for incremental encoders | for SSI/ BiSS encoders | for fieldbus | for analog interfaces | Page |
|--|-----------|-----------|-----------|---------------|--------------------|-----------------------|--------------------------|------------------------|--------------|-----------------------|------|
|  with M12 connector                 | •         | •         | –         | –             | •                  | •                     | •                        | •                      | •            | •                     | 577  |
|  with M23 connector                 | •         | •         | •         | –             | •                  | –                     | •                        | •                      | –            | •                     | 591  |
|  with Sub-D connector               | –         | •         | –         | –             | –                  | •                     | –                        | –                      | •            | –                     | 596  |
|  Simplex patch cable optical fiber | –         | –         | –         | •             | •                  | –                     | •                        | •                      | –            | –                     | 604  |

### Optical fiber transmission modules (LWL)

|   | Interface | Transmission distance in m | Input frequency in kHz | Temperature range in °C [°F]  | Power / Current in VDC | Power consumption in W | Page |
|---|-----------|----------------------------|------------------------|-------------------------------|------------------------|------------------------|------|
|  Optical fiber module, incremental LWL | RS422 HTL | 2.000                      | 400                    | -10 ... +60<br>[-14 ... +140] | 5<br>10 ... 30         | 2                      | 604  |
|  Optical fiber module, absolute LWL.A  | SSI       | 2.000                      | 1.000                  | -10 ... +70<br>[-14 ... +158] | 5<br>10 ... 30         | 1                      | 606  |

# Basics

## Encoders

## Introduction

Encoders can be used in applications, where length, positions, speed or an angular position are measured. They transform mechanical movements into electrical signals and can be divided into incremental and absolute measuring systems.

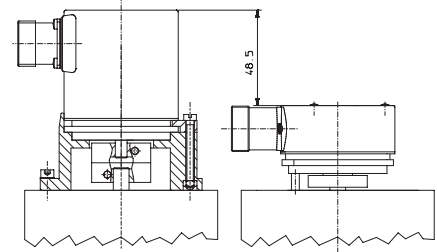
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position.

In absolute encoders, every position corresponds to a unique code pattern. No reference runs after starting-up are necessary as with incremental systems. Safety is increased and the time taken for reference runs is saved.

In principle we can supply all encoders, whether with a solid shaft or in a hollow shaft version.

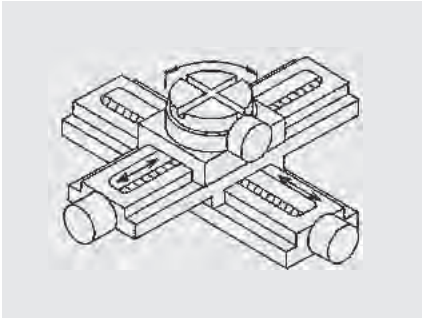
Using a hollow shaft encoder saves up to 30 % of costs and up to 50 % of the required space compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

To mount a hollow shaft encoder it just needs to be pushed onto the shaft, clamped, and in the simplest case prevented from rotating by using a cylinder pin. Moreover, in principle, hollow shaft encoders require less installation depth.

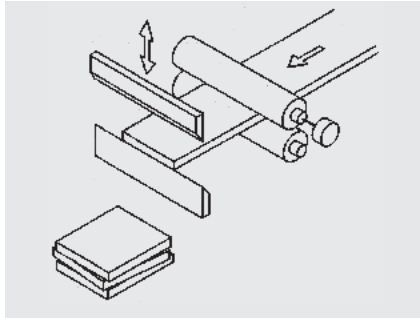


## Application examples

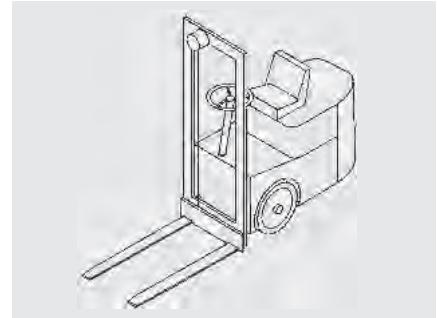
### Angular measurement



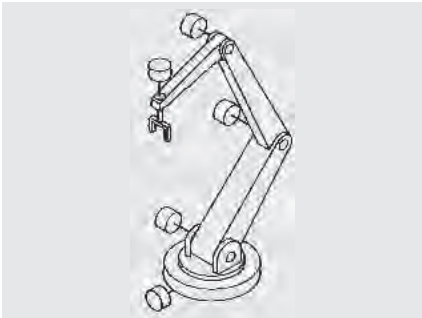
### Positioning



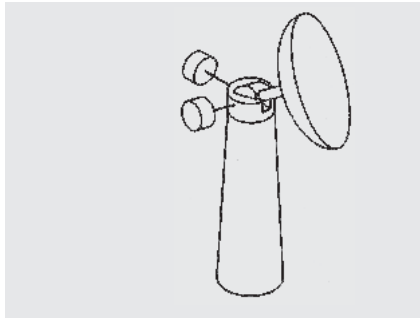
### Detecting of fork's position



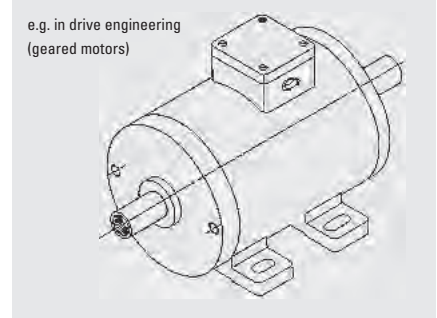
### Detecting of position



### Angular measurement



### Velocity measurement





## Encoders Functional principle

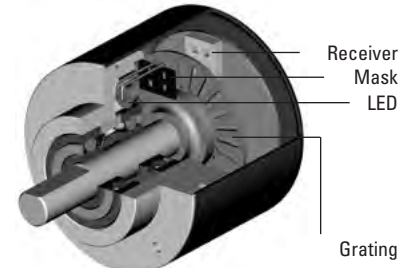
### Assembly and function

#### Optical scanning (incremental)

A disc fitted with a grating, having a code pattern of slits and bars, is mounted so that it can rotate between an LED and a receiver.

The light emitted by the LED is modulated by the mask and grating and then strikes the receiver, which produces a signal proportional to the luminosity.

When the disc rotates this signal has a shape that approximates to a sine wave.



Product overview  
Basics

#### Optical scanning (absolute)

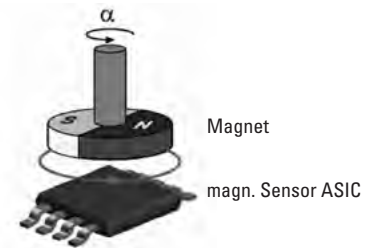
The light that is emitted by an LED is modulated by a code pattern, which is applied to a rotating disc; this is scanned by a special Kübler Opto ASIC. A unique bit pattern is assigned to each position and this is generally available as Gray Code.

The advantage, compared with incremental encoders, lies in the fact that any movement of the shaft whilst voltage is not applied is immediately detected when power is re-applied, ensuring the correct position is always available.

#### Magnetic scanning

The magnetic field created by a rotating permanent magnet is scanned by a sensor ASIC. Each angular position has underlying field vectors, which are converted by the ASIC into incremental signals.

Depending on the version, this signal will be emitted as an incremental signal or in absolute form as a SSI, 0 ... 10 V, 4 ... 20 mA signal or as a fieldbus signal.



### Limes rotary / Limes ring

The Limes rotary magnetic measuring systems are suitable for machines and plants where installation space is tight.

The bearingless and non-contact measuring principle allows error-free operation in environmental conditions that require a high IP protection level (up to IP69k) or high rotary speeds.



## Encoders

### Incremental encoders

#### Processing of the signals (optical, incremental encoders)

The sine wave signals are then processed in a specially designed electronic circuitry. Most controllers require square-wave signals on their input.

The signals are therefore pre-processed accordingly in the encoder and made available using various output circuits depending on the application.

#### Number of channels

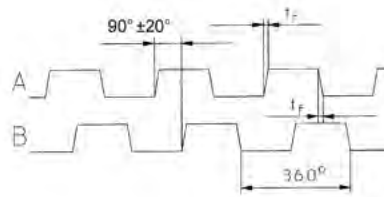
##### Encoders with one output channel:

Encoders with one output channel are used where no direction sensing is needed, e.g. speed control or length measuring.

##### Encoders with two output channels:

Applications, where the direction of rotation should be sensed, e.g. positioning, require encoders with two channels A and B being shifted  $90^\circ$  out of phase. By detecting the phase shift, the direction can be determined.

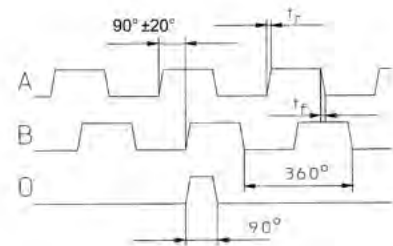
- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
  - Inverted signals available
- $t_r$  = rise time  
 $t_f$  = fall time



##### Encoders with three output channels:

In addition to the two channels A and B a zero pulse is available, which occurs once per revolution and is usually used for the reference run (zero point calibration) of a machine.

- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
  - Inverted signals available
  - 0 pulse is linked to AND with channel A and B
- $t_r$  = rise time  
 $t_f$  = fall time



## Encoders Incremental encoders

**Multiplication of pulses**      The resolution of a two channel encoder can be multiplied by two or four using special edge detection circuitry.      An encoder with physically 5000 pulses per revolution can generate 20000 pulses per revolution using this technique.

**Inverted signals**      When used in environments, with a lot of electrical noise and/or if very long cable distances are required, we recommend using encoders with inverted (complementary) signals.      These signals are always available with output circuits of the RS422 type and sine wave outputs or optionally with push-pull outputs.

**Resolution**      The required angular or linear resolution of an application determines the number of pulses per revolution. Linear movements must first be converted into rotary, for example by means of a spindle.

**Example:**  
An encoder is equipped with a measuring wheel. Every revolution corresponds to a distance of 200 mm (circumference). The accuracy should be 0.1 mm. What is the required resolution (ppr)?

given:      • Circumference of the measuring wheel = 200 mm  
              • Accuracy of the system = 0.1 mm  
wanted:     • Resolution of the encoder [ppr] <sup>1)</sup>

$$\text{Resolution} = \frac{\text{Circumference}}{\text{Accuracy}}$$

The required resolution would be 2000 ppr <sup>1)</sup>.

**Pulse frequency**      The required pulse frequency can be calculated as a result of the number of pulses per revolution (ppr) and the maximum speed (rpm). The maximum pulse frequency is shown in the data sheet specifications for each encoder.

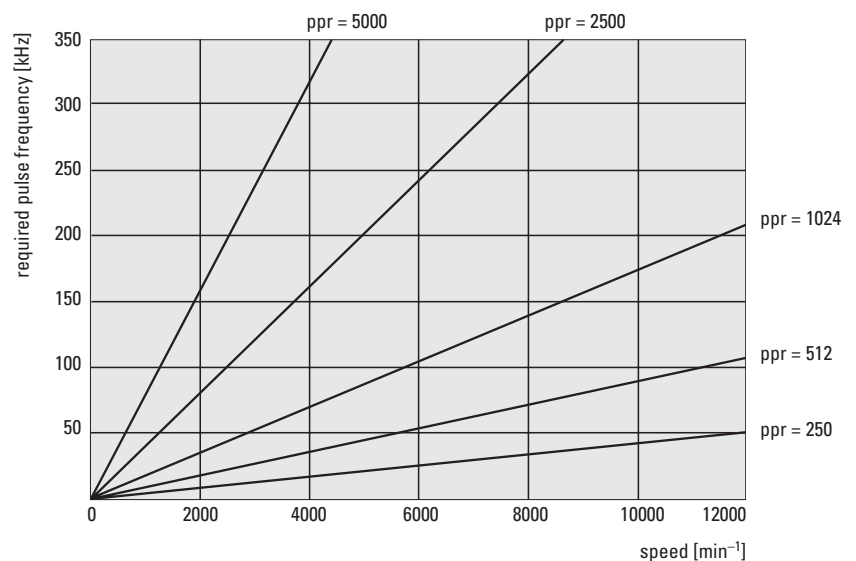
Generally this is 300 KHz, but can be up to 800 KHz with high-resolution encoders.

**Example:**  
given:      • Speed = 3000 min<sup>-1</sup>  
              • Resolution of the encoder= 1000 ppr <sup>1)</sup>  
wanted:     • Required pulse frequency of the encoder

$$\text{Pulse frequency} = \frac{\text{Speed} \times \text{Resolution}}{60}$$

The required pulse frequency is thus 50 KHz. This can now be compared with the maximum possible pulse frequency of the desired encoder.

This diagram can be used to estimate the required pulse frequency



1) ppr = Pulses per revolution

# Basics

## Encoders

### Incremental encoders

#### Sensor outputs

With long cable runs, the inherent resistance of the cables can lead to a situation where insufficient supply voltage is available to the encoder.

Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.

#### Digital outputs

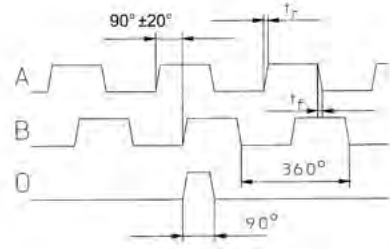
The sine wave signal from the optical system is first digitized to have square wave signals available.

- Shaft turning clockwise, top view of shaft
- Inverted signals are available
- 0 pulse is linked to AND with channel A and B

To transmit the signals there are two possible outputs available. RS422 (TTL compatible) or push-pull.

When choosing the suitable output for the application the following points have to be considered:

- The corresponding unit / controller the encoder will be connected to
- The required cable length
- The sensitivity against electrical noise or other interference



#### Push-pull outputs (HTL)

Push-pull outputs are suitable for count interface cards, electronic counters or PLC inputs. They are available in two versions:

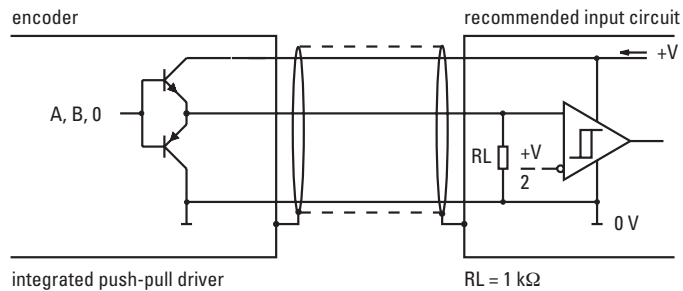
##### Push-pull:

- Push-pull with integrated wave impedance adjustment, recommended cable impedance 40 ... 150  $\Omega$
- Recommended for long cable lengths, high pulse frequencies and output voltages to 30 V
- With or without inverted (complementary) signals

##### Push-pull (7272):

- Universal line driver 5 ... 30 V with low-level (max 0.5 V)
- Recommended for cable lengths up to 30 m
- With inverted signals

#### Output circuit and recommended input circuit push-pull without inverted signals (HTL)

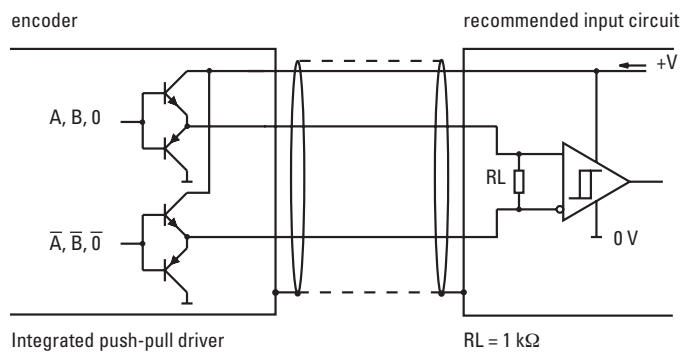




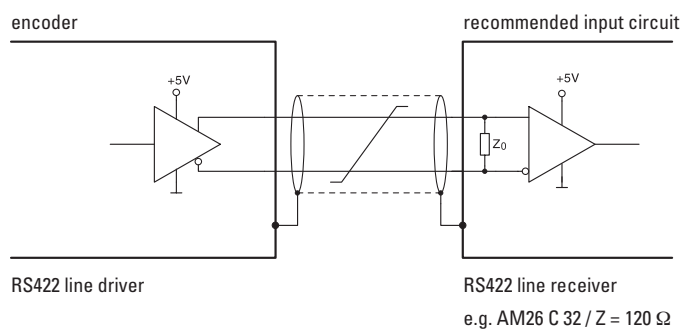
## Encoders

### Incremental encoders

**Output circuit and recommended input circuit push-pull with inverted signals (HTL)**



**RS422 Output circuit and recommended input circuit (TTL)**

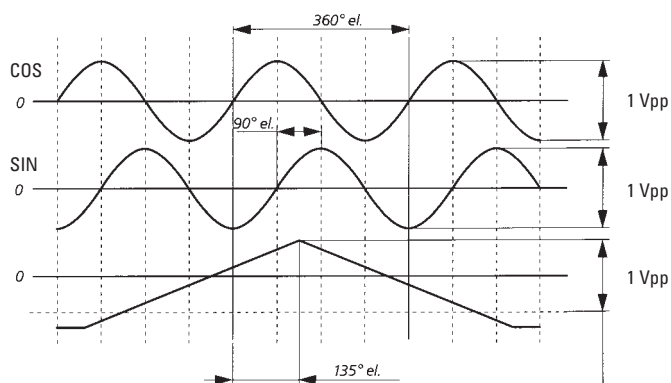


### Sine wave outputs

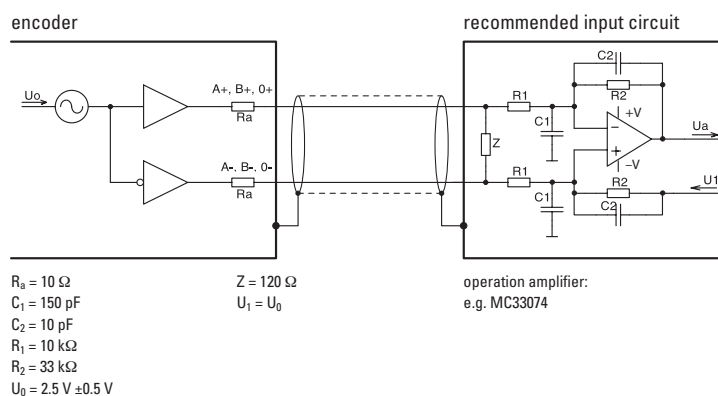
The sine wave signals are available as voltage signals. They can be further processed in the evaluation electronics. Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

Further they are very suitable for digital drives with a very slow movement, e.g. for grinding machines or lifts and elevators.

- Shaft turning clockwise, top view of shaft
- 0 pulse is generated once per turn (only with 5804 / 5824)



**Output circuit and recommended input circuit for sine wave voltage signals**



#### Cable lengths for incremental encoders

Depending on the output circuit and the electrical noise the following cable lengths are recommended:

| Output circuit                         | max. cable length                          | Encoder connected to e.g. |
|--|--|---------------------------|
| Push-pull without inverted signals     | 100 m <sup>1)</sup>                        | Kübler counter/SPS        |
| Push-pull with inverted signals        | 250 m <sup>1)</sup>                        | SPS/IPC <sup>2)</sup>     |
| Push-Pull with inverted signals (7272) | 30 m                                       |                           |
| RS422 with inverted signals            | up to 1000 m<br>(> 50 m dep. on frequency) | SPS/IPC <sup>2)</sup>     |
| Voltage sine with inverted signals     | 50 m                                       | SPS/IPC <sup>2)</sup>     |
| Sine wave 1 Vpp                        | 50 m                                       | 10 ... 30 V DC            |

#### Annotations:

- Depending on the application the recommended cable length can be shorter, especially in areas with a high level of electrical noise.
- Always use shielded cables - the shield should be connected at both the encoder and controller ends!
- The core diameter of the signal cores should be > 0.14 mm<sup>2</sup>
- The core diameter of the voltage supply cores should be large enough depending on the cable length, that the voltage supply of the encoder is high enough and the signals do not go below the minimum levels!

1) Depends on frequency

2) IPC = industrial PC

## Encoders Absolute encoders

### Versions

#### Singleturn encoders

Depending on the number of divisions they generate unique positions per revolution. After one complete revolution the process re-commences at the start position.

They are suitable for angular measurement over a maximum of one turn of the shaft (=360°), for example in robotics, with cam controllers and in other controlled rotary motion.

#### Multiturn encoders

Up to 17 bit unique angular positions per revolution are provided. In addition the number of revolutions is detected. Up to 4096 (12 bit) unique revolutions can be made available on the output.

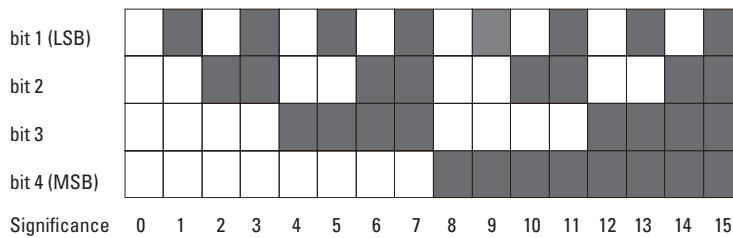
Multiturn encoders are suitable for angular measurement over more than one turn of a shaft, for example with longer traverse paths, such as high rack storage areas, cranes or machine tools.

### Code types

#### Binary code

The Binary code can be processed very easily by computer systems. When using optical read-out, errors may occur, because the change from one bit to another on the different concentric tracks

(LSB, LSB+1...) is not exactly synchronized. Due to this, without any correction of the code, the position information could be wrong.



#### Gray code

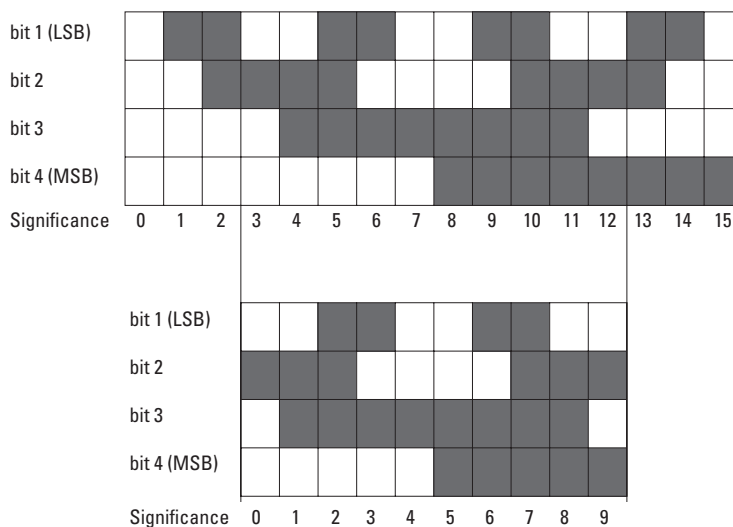
The Gray Code is a single-step code, which guarantees that from one position to the next only 1 bit changes.

This leads to reliable scanning of the code and consequently of the positions.

#### Symmetrically capped Gray code (Gray-Excess):

If a particular section of the complete Gray Code is extracted, this results in the so-called Gray Excess Code

This permits even-numbered divisions, such as 360, 720, 1000, and 1440.



#### Reversion of the Gray code

The code values increase when the shaft is turning clockwise.

The Gray code is reversible, i.e. if the most significant bit (MSB) is inverted, the code values decrease when the shaft is turning clockwise.

## Encoders

### Absolute encoders

#### The mechanical Sendix multiturn stage with gear



- Multiturn gear with purely optical scanning technology. Completely resistant to magnetic fields.
- First stage with double bearing layer.
- Special materials ensure temperature stability and long service life.
- Through hollow shaft diameter up to 14 mm  
- up to 15 mm as blind hollow shaft.
- Specially developed gear teeth allow for very high rotational speeds and eliminate wear.



#### The patented electronic Sendix multiturn stage with Intelligent Scan Technology™



Firstly all the single and multiturn functions of the encoder are integrated on an Opto ASIC. With multiturn versions the optical sensor technology can achieve a resolution of up to 41 bits. Furthermore, the new Intelligent Scan Technology ensures 100% magnetic insensitivity.

#### Mechanical or electronic gears?

Absolute singleturn and multiturn encoders have established themselves as the standard method for measuring linear displacement or angular position. With absolute encoders a reference trip is no longer needed after system start-up or a power-down. Multiturn encoders in particular are now being employed, where previously incremental encoders had predominated, for example with geared motors or in lifts.

Today all manner of multiturn encoders are available in a variety of designs.

As a rule the manufacturers offer either mechanical gears for 'counting turns', or swear by electronic counters with electronic data storage. They are critical of any other technology.

The fact is however: it is not a case of which is better or worse; each technology has its advantages and drawbacks.

Only the actual application can decide.

#### Intelligent Sensing Technology

A new operating principle, based on a non-contact multiturn stage, eliminates the system drawbacks linked with the encoders with mechanical gear or with the usual electronic gear technology.

#### Advantages

- High operational safety
- Compensation of high EMC disturbances thanks to logical filters and a novel operating principle of the system
- Free of wear

### Outputs

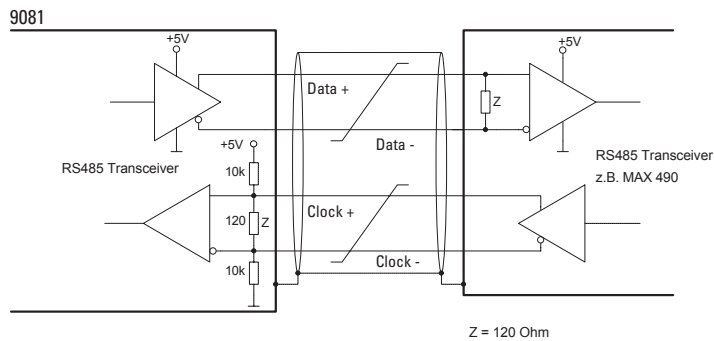
To transfer the position data to a controller, different interfaces are available.

### Synchronous serial interface (SSI)

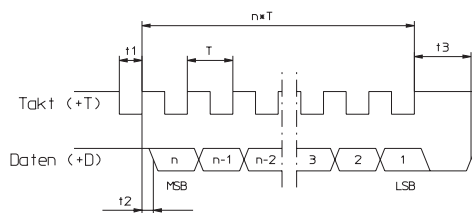
Compared to the parallel interface, the SSI interface needs less components and the EMC characteristics are much better.

In addition less lines are needed for transmission and the possible cable length is much longer.

#### Output circuit and recommended input circuit



#### Data transmission SSI



- $t_1 = T / 2$
- $t_2 < 1 / (4 \times f_{max})$
- $t_3 = \text{Monoflop time (see below)}$
- $n = \text{Resolution in bit}$
- $1 / f_{max} \leq T \leq 1 / f_{min}$
- $f_{min} = \text{min. clock rate (see data sheet)}$
- $f_{max} = \text{max. clock rate (see data sheet)}$

At rest, the clock and data lines are at a high level. With the first falling clock-pulse edge, the current encoder data are stored in the buffer ready to be sent. With the next rising clock-pulse edge, the data are transmitted bit by bit, starting with the MSB. The transfer of a complete data word requires  $n+1$  rising clock-pulse edges ( $n$ =resolution in bit), e.g. 14 clock signals for a complete readout of a 13 bit encoder.

After the last positive-going clock-pulse edge the data line will remain for the duration of the monoflop time  $t_3$  at a low level, until the encoder is ready for a new data word. The clock line must stay high for at least as long, and then can begin a new read-out sequence again with the next falling edge.

#### Please note!

Only for type 5850, 5870 and 9081:

The updating of the data occurs synchronously with the read-out cycle. So, the data are as up-to-date as the interval time between two read-outs.

A periodic read-out of the encoder in the application is therefore recommended, using appropriately short cycle times, so that current position values are constantly maintained. It is not possible to read out the same data word several times.

Monoflop time of the encoder:  $t_3 = \text{max. } 40\mu\text{s}$

Only for the new Sendix absolute encoders:

The updating of the data occurs immediately with the first falling edge of the clock signal. The data are thus always up-to-date. If a repeated read-out of the same data word is desired, then a new clock sequence must be started within the time interval  $t_3$ . If the clock sequence is terminated before the necessary number of clock pulses, needed for a complete readout of the data word, has been transmitted, then after a further time interval  $t_3$  the data line will go high again and signal that the last read-out sequence has been aborted. It will also indicate that it is ready for a new data word to be sent. Monoflop time of the encoder:  $t_3 = \text{see data sheet}$ .



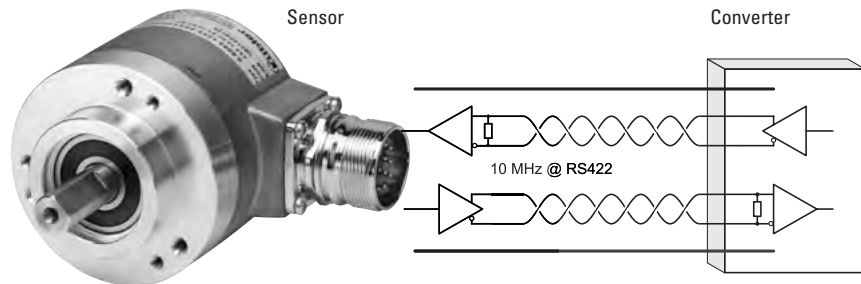
#### BiSS interface

##### Point-to-point communication

- Bidirectional isochronous connection between drive, converter and sensor.
- Purely digital link for maximum performance, reliability and safety in transmission.
- Reduction of hardware, installation and maintenance work.

##### Advantages at a glance

- Flexible.
- Fast and safe.
- Cost-effective and non proprietary / Open source.
- Fully digital and bidirectional.
- Suitable for motor feedback systems.
- Plug and Play.



##### Extended possibilities with BiSS

- Motor data and maintenance information can be stored and read out easily in the encoder.
- Condition monitoring through register communication.

##### Easy supplementing of the BiSS master function

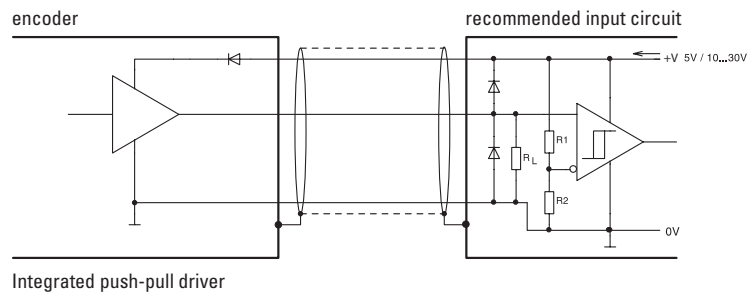
- The existing standard control hardware can mostly be used also for BiSS.
- Extension by firmware update is in most cases possible.
- BiSS as a real alternative to existing, RS422 or RS485-based interfaces.
- Fast and simple BiSS master implementation with free-of-charge BiSS IPs on processors and FPGAs.

Details about our BiSS interface can be found on our website at: [www.kuebler.com/service/biss\\_en.pdf](http://www.kuebler.com/service/biss_en.pdf).

#### Parallel output

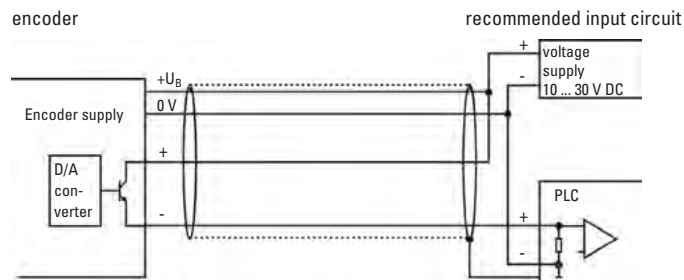
This type of transfer is very fast. All bits of a position are transferred simultaneously each via a separate line.

##### Output circuit and recommended input circuit



#### Analog output 4 ... 20 mA

##### Output circuit and recommended input circuit



#### Cable lengths

The following maximum cable lengths are recommended, depending on the output circuitry and any noise sources present

| Interface and output circuit | max. cable length          | Connected to            |
|------------------------------|----------------------------|-------------------------|
| Parallel CMOS / TTL          | 2 m                        | SPS / IPC <sup>1)</sup> |
| Parallel push-pull (HTL)     | 100 m                      | SPS / IPC <sup>1)</sup> |
| SSI                          | up to 1000 m <sup>2)</sup> | SPS / IPC <sup>1)</sup> |
| RS422 / RS485                | 1000 m                     | SPS / IPC <sup>1)</sup> |
| Analog 4 ... 20 mA           | 200 m                      |                         |

##### Annotations:

- Depending on the application the max. allowed cable length can be shorter, especially in areas with strong electrical noise
- Always use shielded cables; the cable shield should be connected at both the encoder and controller ends.
- The core diameter of the signal cores should be  $\geq 0.14 \text{ mm}^2$
- The core diameter of the voltage supply cores should be large enough depending on the cable length, that the voltage supply of the encoder is high enough and the signals do not go below the minimum levels!

1) IPC = Industrial PC

2) Depends on clock frequency:  
at 100 kHz  $L_{\text{max}}$  approx. 250 m; at  $f = 250 \text{ kHz}$   $L_{\text{max}}$  approx. 50 m

Encoders shafts and in turn their bearings are subjected to loads for a variety of reasons:

- Installation tolerances when mounting the encoders (radial and angular displacement)
- Thermal changes, e.g. linear expansion of the drive shaft
- Effects of wear, e.g. radial runout of the drive shaft or vibrations

These load factors have a direct effect on the life expectancy of the shaft bearings and on the quality of the signal.

Facilities must therefore be provided during installation to compensate for these forces. For encoders having a solid shaft this is generally done by using shaft couplings between the drive shaft and the encoder shaft. The solution with hollow shaft encoders is to use stator couplings, fixing brackets or torque stops between the encoder flange and the mounting surface.

Not making use of a coupling but instead rigidly mounting the shaft and the encoder housing generally leads to unacceptably high loads on the bearings; the ensuing wear will cause the encoder to fail prematurely.

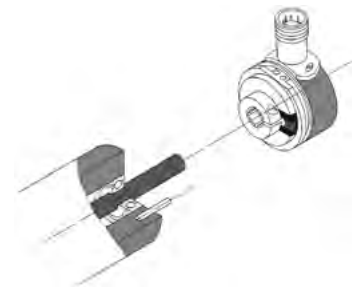
In order to avoid permanent damage of the encoder, certain bearing loads should not be exceeded. If hollow shaft encoders are correctly installed and the torque stops or stator couplings that are available from Kübler are used, then no problems should occur. For solid shaft encoders the maximum permitted axial and radial loads are shown in the appropriate technical data.

#### Mounting options for hollow shaft encoders

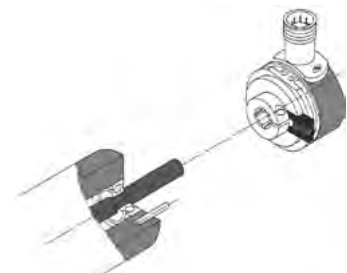
##### Hollow shaft encoder with torque stop and pin

(easiest and fastest mounting)

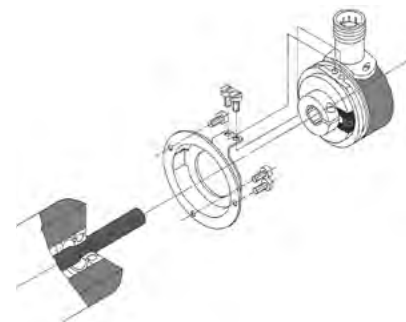
Standard hollow shaft encoders are equipped with the torque stop (cylindrical pin not supplied).



##### Extended torque stop and long pin



##### Stator coupling

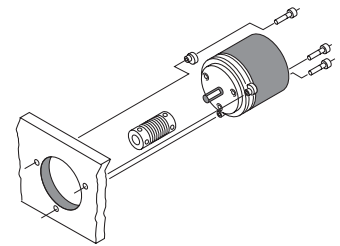


## Encoders

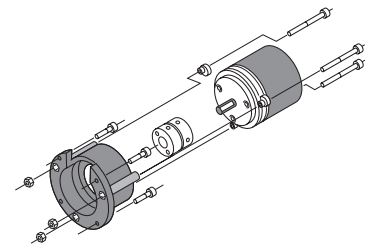
## Installing encoders

**Mounting examples for shaft encoders with synchronous flange**

**Fastening eccentrics + coupling**  
(to reduce shaft overload)

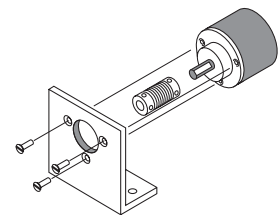


**Assembly bell, fastening eccentrics + coupling**  
(to prevent shaft overload and to isolate the encoder thermally and electrically)

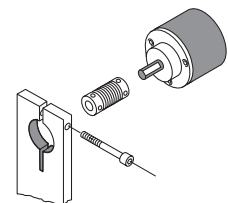


**Mounting examples for shaft encoders with clamping bracket**

**Angular bracket + coupling**  
(to reduce shaft overload)



**Clamping device + coupling**  
(to reduce shaft overload)



## Encoders

## Installing encoders

### Loading of encoder shaft bearings using coupling forces

With all spring couplings (shaft coupling, stator coupling, fixing bracket), alignment and axial errors are converted to a force that corresponds to the spring constant of the coupling.

This force has to be absorbed by the encoder shaft bearings. When installing an encoder, this should be done with as little force as possible, i.e. without any unnecessary initial tension on the coupling. If this is adhered to, then with all Kübler couplings adequate tolerance compensation is guaranteed for the whole service life of the encoder bearings.

This force does not occur with torque stops for hollow shaft encoders, where the encoder is prevented from turning also by means of a pin or rod.

Although the encoder is prevented from rotating due to a rigid interlock, the encoder is still free to move in any other direction. This is of course dependent on it being mounted in such a way that it has freedom to move radially and especially axially (thermal linear expansion of the drive shaft!).

### Possible errors in accuracy due to couplings

#### 1. Deviations in accuracy caused by torsion of a spring coupling (in particular shaft couplings)

This deviation in accuracy is defined by the torque to be transmitted (bearing friction and mass moment of inertia) and by the torsional spring constant of the torque stop.

The following applies:

$$\text{Max. error (degree)} = \frac{\text{max. torque [Ncm]}}{\text{torsional spring constant [Ncm/Grad]}}$$

The following table serves to estimate the ratio between such an error and the smallest increment of an encoder:

Relationship between the resolution of an encoder in bit and the smallest increment in angular degrees:

| Resolution | binary          | 10 bit  | 11 bit  | 12 bit  | 13 bit  | 14 bit  | 17 bit  |
|------------|-----------------|---------|---------|---------|---------|---------|---------|
|            | ppr             |         | 1024    | 2048    | 4096    | 8192    | 16384   |
| Increment  | degrees         | 0.352   | 0.176   | 0.088   | 0.044   | 0.022   | 0.0028  |
|            | degrees:min:sec | 0:21:06 | 0:10:33 | 0:05:16 | 0:02:38 | 0:01:19 | 0:00:10 |
|            | sec             | 1266    | 633     | 316     | 158     | 79      | 10      |

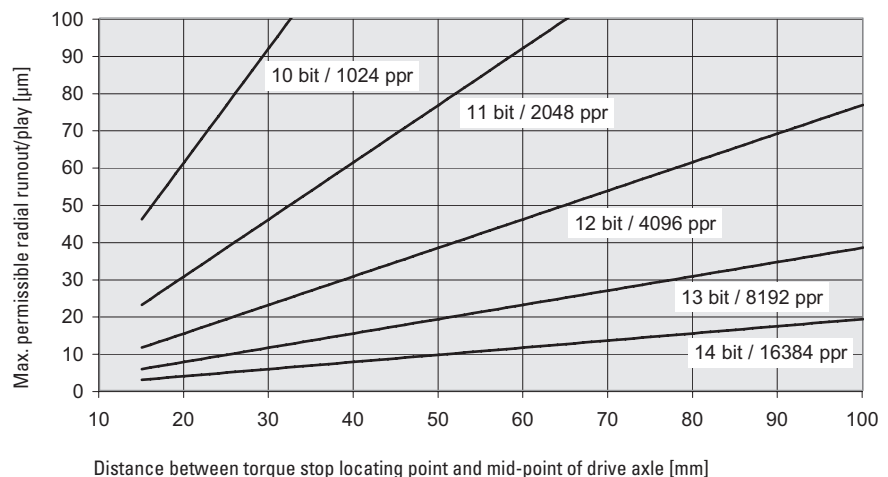
#### 2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

Here one has to differentiate between couplings that are mounted in an axially symmetrical manner round the shaft (all shaft couplings, many stator couplings) and asymmetrical couplings (many stator couplings, all mounting brackets and pin-based torque stops).

With asymmetrical couplings deviations in accuracy can arise due to radial movements of the drive shaft (radial runout/play); this is determined by the system. These deviations are dependent on the amount of the radial play and the distance of the torque stop locating point from the drive shaft.

The relationship is shown in the following diagram:

Maximum permissible radial runout to achieve an accuracy >1/2 LSB when using an asymmetrical 1 point torque stop





|                 |                            |  |
|-----------------|----------------------------|--|
| <b>Encoders</b> | <b>Installing encoders</b> |  |
|-----------------|----------------------------|--|

**Particular shaft loading due to toothed-wheels, gear-pulleys and similar elements**

Measuring wheels, toothed wheels or gear pulleys, which are mounted directly on the encoder shaft, exert radial forces on the latter, dependent on prestressing and angular acceleration. Kübler encoders are designed so that they can absorb these forces to a great extent. The maximum permissible load capacity of the shaft is shown in the technical data for the encoder.

If these load values may be exceeded in a particular application, then the encoder shaft must be isolated from the radial load by interposing an appropriate shaft with its own bearings that can absorb the forces.

Kübler offers suitable bearing blocks and bearing boxes for this purpose (please refer to the „Accessories“ section in the catalog).

Product overview  
Basics

**Isolation insert**

Thermal and electrical isolation of the encoders. Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled threephase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.



## Encoders

## Functional Safety

### Incremental and absolute encoders for Functional Safety

Further information about Functional Safety can be found in our catalog "Functional Safety" or at:

[www.kuebler.com/safety](http://www.kuebler.com/safety)



#### Safe incremental encoder function

In order to achieve safe incremental information with the encoder, the controller must monitor the validity of the analog, 90° phase-shifted sine/cosine signals with the help of the function:  
 $\sin^2 + \cos^2 = 1$

#### Safe absolute encoder function

In order to obtain safe information with the encoder regarding the absolute position, the controller counts the incremental pulses and compares the result with the absolute positions also provided by the encoder.

#### Safe mechanical connection

A 100% reliable mechanical connection is required for a safe function in the applications. Suitably sturdy fixing elements can help eliminate the risk of faults.

#### Compliance with Safety standards

According to EN ISO 13849-1, EN ISO 13849-2 and EN 61800-5-2 up to SIL3/PLe/Cat.4 the following safety functions can be implemented with the encoder:

| Acronym    | Designation                 | Function   |
|------------|-----------------------------|--|
| <b>SSX</b> | Safe Stop 1 or 2            | Monitoring of the braking ramp and switch-off of the motor after standstill (SS1) or monitoring of the braking ramp and SOS after standstill (SS2). Corresponds to Stop Category 1 or 2 acc. DIN EN 60204-1. |
| <b>SOS</b> | Safe Operating Stop         | Monitoring of the standstill of the active motor.  |
| <b>SLA</b> | Safely Limited Acceleration | Monitoring of the exceeding of an acceleration limit value.  |
| <b>SLS</b> | Safely Limited Speed        | Monitoring of a speed limit value.   |
| <b>SLT</b> | Safely Limited Torque       | Monitoring of a torque / force limit value.  |
| <b>SLP</b> | Safely Limited Position     | The exceeding of a position limit value is monitored.  |
| <b>SEL</b> | Safe Emergency Limit        | Safe monitoring of the minimum and maximum position or of the allowed position range. Optional monitoring of the speed / position limit curve for minimizing the worst-case overtravel.                      |
| <b>SLI</b> | Safely Limited Increment    | The respect of a specific step value during the movements is monitored.  |
| <b>SDI</b> | Safe Direction              | Monitoring of the unintended direction of movement of the motor.   |
| <b>SBC</b> | Safe Brake Control          | Safe control and monitoring of an external brake.  |
| <b>SCA</b> | Safe Cam                    | A safe output signal is generated when the motor position is in a specified range.   |
| <b>SSM</b> | Safe Speed Monitor          | A safe output signal is generated when the motor speed is lower than a specified value.  |
| <b>SAR</b> | Safe Acceleration Range     | Monitoring of the respect of the acceleration of the motor within specified limit values.  |
| <b>ECS</b> | Encoder Status              | Error status of the speed / position sensor.   |
| <b>PDM</b> | Position Deviation Muting   | Muting of the deviation monitoring in 2-sensor operation.  |

## Linear measuring systems Technology

### Magnetic measuring system (incremental)

up to 70 m measuring length  
(other length on request)  
up to 0.005 mm resolution

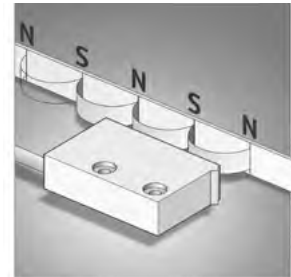


#### The idea:

A magnetic sensor is guided across a magnetic band without coming into contact with it. The changes in polarity on the magnetic band are counted and intermediate values are interpolated. Our engineers have fine-tuned the system to such a degree that resolutions up to 0.005 mm are possible.

The system is not affected by dust, shavings or humidity and is resistant to many liquids and to oil.

Assembly is easy - the magnetic band just has to be glued into place. There are no problems for calibration.



The distance between the sensor and the magnetic band can be up to 2 mm.

Repeat accuracy is very high.

#### Where is our Limes system used?

The measuring system offers an economical alternative to optical systems in applications where the high accuracy of the glass rules is not absolutely necessary but where up till now no other suitable alternative has been available.

Because of its rugged construction the measuring system can now be used even in tough industrial environments.

The system is not affected by vibration nor is it damaged if subjected to high shock loads.

Our flexible magnetic band offers a further interesting area of application, due to the fact that it can be fitted round very large shafts.

The maximum length of the magnetic band is 70 m!



## Linear measuring systems

## Technology

### Magnetic measuring system Limes (absolute)

up to 8 m measuring length, up to 0.001 mm resolution  
up to 20 m measuring length, up to 0.01 mm resolution

The LA series are absolute length measuring systems. Sensor and translator and interpolation unit are together in one housing. The magnetic tape of the BA series is paste up to a plain area. The sensor can be mounted with a max. of 0.2 / 1.5 mm distance to the magnetic tape with reduced measuring accuracy.

Different interfaces are available (SSI, CANopen (DS406)).

Typical applications are handling systems, conveyor and storage technology, hydraulic presses, stamping machines, casting machines, linear slides, linear drives and pick and place systems.

Overview of features:

- No reference necessary.
- Direct contact free measurement.
- Distance between sensor and magnetic tape can be between 0.1... 0.2 / 1.5 mm  
→ Distance not OK = LED glow red.
- Up to 8 / 20 m measuring length.
- High resolution 1 / 10  $\mu\text{m}$ .
- Repeat accuracy +/- 1  $\mu\text{m}$ .
- Inured against dirt.



### Functional principle

A hall sensor and a magneto-resistive impedance measuring bridge are guided over a two-track magnetic tape with a fine-interpolation trace and an absolute trace.

Together with the sensor line the absolute track provides an absolute value and the fine-interpolation trace provides together with the interpolation electronic the measuring systems high resolution.

Figure 1

Shows two magnetic traces, with north pole and south pole magnetization.

The fine interpolation trace encloses alternately north and south pole traces with a distance of 1 / 5 mm, these are scanned with resistance bridges and provide a resolution of 0.001 / 0.01 mm. The absolute value provides the sensor line with 16 single Hall sensors, these sensors are scanning the code sections of the north and south poles. The absolute value on the magnetic tape recurs every 8 / 20 m.



Fig. 1: Coding



## Linear measuring systems Technology

### Draw wire systems

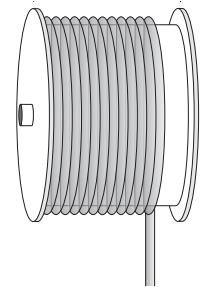
Measuring length up to 40 m,  
Resolution up to 0.1 mm



#### The idea:

At the core of a draw wire encoder is a drum mounted on bearings, onto which a wire is wound. The winding takes place via a spring-loaded device. The number of revolutions is measured by means of an encoder. If the circumference of the drum is known, then the length can be calculated from it.

- Specially for demanding applications
- With analog sensors (0 ... 10 V, 4 ... 20 mA, potentiometer) or encoders (incremental, absolute, fieldbus)
- Measuring lengths from 250 mm up to 40000 mm
- High travelling speed
- High acceleration
- Dynamic spring traction by means of a constant force spring, long service life
- Simple wire fixing using clip
- Quick mounting
- Diamond-polished ceramic guide
- Titanium anodized aluminum housing



### Length measuring kits

We have taken our expertise from the fields of sensor and counting technology and applied this to length measuring kits.

We will supply you the measuring wheel, the encoder and the counter – all from one source. Plug in and go – saves you time and effort – no need to assemble the component parts. We supply the complete kits.

## Inclinometers

## Technology

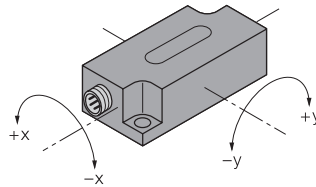
### Inclinometers

The 1 and 2-dimensional inclinometers are used for measuring inclinations in the ranges of  $\pm 10^\circ$ ,  $\pm 45^\circ$ ,  $\pm 60^\circ$  and 0-360°.

To ensure high accuracy, the zero point and the limit values of the measuring range are factory-calibrated at a temperature of 25°C.

These inclinometers are based on the MEMS technology (Micro Electro-Mechanical Systems). They can be used for a wide range of different applications such as:

- Machines and automats
- Vehicles and planes
- Harvesting, agricultural and construction machinery
- Transport equipment





## Connection technology Introduction / Cables and connectors

### The idea behind our connection technology system



#### Connection technology from Kübler = system safety!

All the products in the connection technology section have been tested and approved with the relevant compatible Kübler sensors.

They ensure the full functionality and high signal quality of our sensors.

#### Your benefit:

- Elimination of connection errors – no laborious fault finding
- Optimal shielding – avoids EMC problems
- Shorter installation times – saves time, cuts costs
- No time-consuming search for the right connector or cable – saves time, eliminates errors



Product overview Basics

### Material information - cables

#### PVC

- Suitable for average mechanical stresses in the area of packaging machines and assembly and production lines.
- Good resistance against acids and alkalis and thus predestined for use in the food and beverage industry.
- Limited friction resistance and partial resistance to oils and chemicals.

#### PUR

- Flexible, PVC, silicone and halogen-free control cable with PUR cable jacket and polypropylene wire insulation.
- The cable is oil-resistant and non-flammable according to VDE 0472, and it is resistant to chemicals, hydrolysis and microbes.
- Temperature resistance from -30°C to + 90°C.
- Use is possible in trailing cable carriers with a bending radius equal at least to 10 x D.
- Thanks to its resistance to welding sparks, this cable is very well adapted for flexible use in the area of robotics, machine tools and metal cutting production.

### Material information - connectors

Two material groups are used for the connectors described in the catalog:

#### Metals for contacts and housings

- Contacts: metal, CuZn, gilded
- Connecting nut /compression screw: metal, CuZn, nickel-plated

#### Plastics for insulator and housing

- Contact carrier: plastic, TPU, black
- Body: plastic, TPU, black
- Seal: plastic, fluorine rubber (FKM/FPM) FPM/FKM or nitrile-butadiene rubber (NBR)

## Connection technology

## Introduction / Cables and connectors

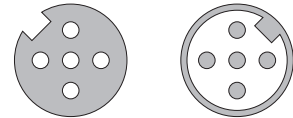
### Coding of the M12 x 1 connectors

The connectors are coded to guarantee protection against polarity reversal. This coding is achieved by means of a peg or a notch in the contact carrier.

Kübler connectors make a distinction between A, B or D coding.

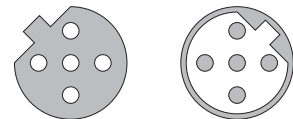
#### A-coding

Female connector with coupling nut: Coding notch  
 Male connector with external thread: Coding peg  
 Use: CANopen and 8-pin connector



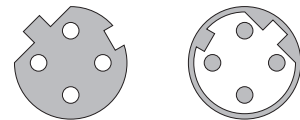
#### B-coding

Female connector with coupling nut: Coding peg  
 Male connector with external thread: Coding notch  
 Use: Profibus



#### D-coding

Female connector with coupling nut: Coding peg and Coding notch  
 Male connector with external thread: Coding peg and Coding notch  
 Use: Profinet and EtherCAT



### Shielding

With round connectors, care must be taken to connect carefully the shielding braid of the cable to the shield connection of the connector.

An all-round contact (360°) is optimal. Good (in practice often sufficient) shielding values are also reached by connecting the shielding braid firmly to the electrically conductive housing. Connectors purely out of plastic, without metal sleeve, providing no contact for the shielding braid, are not sufficient.

Furthermore, a proper contact with the mating connector is also important, as well as a good contact of the mating connector with the chassis of the equipment.

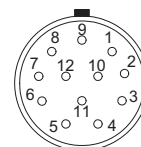


"Allround" shielding with Kübler cordsets

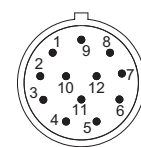
### Counting direction cw/ccw

The counting direction of the connectors is indicated by cw for a clockwise arrangement and ccw for a counter-clockwise arrangement. The connector is always viewed from the mating side.

Top view of mating side



Counting direction cw (e.g. female connector)



Counting direction ccw (e.g. male connector)

| Optical fiber signal transmission                         | General information  |   |
|---|--|---|
| <p><b>Description</b></p>                                 | <p>The system is made up of an optical fiber transmitter and an optical fiber receiver.</p> <p>The optical fiber transmitter converts the electrical signals of an encoder into optical fiber signals. A simple glass fiber allows reliable transmission up to distances of 2000 m.</p> <p>The receiver module converts the optical signals back into electrical signals.</p> <p>The modules are available in various level and power supply voltage variants.</p> | <p>Main advantages of an optical fiber transmission:</p> <ul style="list-style-type: none"> <li>• Insensitivity to electromagnetic interferences and to leakage effects between lines routed parallel</li> <li>• Significantly higher transmission speeds</li> <li>• The optical fiber cable can be routed through explosive atmospheres</li> <li>• Cost and weight savings thanks to reduced cabling work, especially for important cable lengths</li> </ul> |
| <p><b>Mounting of optical fiber modules</b></p>           | <p>The optical fiber modules can be mounted directly on a TS35 DIN rail (top-hat rail) according to EN 50022.</p> <p>The installation width for every module is only 19 mm.</p>  |   |
| <p><b>Laying and connection of glass fiber cables</b></p> | <p>Laying the cable is generally easy.</p> <p>Care must nevertheless be taken to make sure that the bending radius does not become smaller than 30 mm for static laying and 60 mm for dynamic laying.</p>  | <p>When connecting the cable, make sure that the bayonet catch is locked and remove the dust protection caps only just before connecting the cable.</p>   |
| <p><b>Glass fiber cables</b></p>                          | <p>The modules can be connected together using 50/125 µm or 62.5/125 µm multimode glass fiber cables with ST/PC type connectors with bayonet catch. Single-mode Simplex patch cables are not suitable.</p>   | <p>Kübler offers finished confectioned patch cables adapted to the optical fiber modules as accessories. They ensure the full functionality and high signal quality of our sensors.</p>   |

| Encoders | Technologies |  |
|----------|--------------|--|
|----------|--------------|--|

### Safety-Lock™



All Kübler encoders are equipped with the Safety-Lock™ bearing structure.

#### Safety-Lock™

Interlocked bearings, large bearing span and extra strong outer bearings ensure stability when subjected to vibration and tolerance of installation errors. Machine downtime and repairs are eliminated.

#### Safety-Lockplus™

The proven Safety-Lock™ construction with additional mechanically protected shaft seal.

### HD-Safety-Lock™ = Safety-Lock™ + additional engineering

Floating bearing on the cover-side eliminates internal stress <sup>1)</sup>

- Mechanically decoupled sensor unit ensures constant signal quality with large temperature fluctuations and other adverse environmental influences <sup>1)</sup>
- Dual seals on the shaft-side – friction seal against humidity, labyrinth seal against dust and water jet ingress
- Very large, highly-robust flange bearings
- Even greater bearing clearance
- Extremely robust flange mounting due to screw-on housing
- Bearing design incorporates integrated isolation (isolating inserts not required), tested up to 2.5 kV for high running accuracy; metal to metal connection for slip free mounting. <sup>2)</sup>

#### Benefits:

The resistance against adverse environmental conditions is greatly increased – especially against high bearing loads and high temperatures.

<sup>1)</sup> for Sendix H100    <sup>2)</sup> for Sendix H120

|  | Safety-Lock™ | HD-Safety-Lock™ |
|--|--------------|-----------------|
| Stability with vibration                           | +            | ++              |
| Robustness against installation errors             | ++           | ++              |
| Radial load  | 80 N         | 400 N           |
| Axial load   | 40 N         | 300 N           |
| Elimination of internal stresses                   | 0            | ++              |
| Constant signal quality with extended temperatures | +            | ++              |
| Mechanical protection of the seal                  | 0            | ++              |

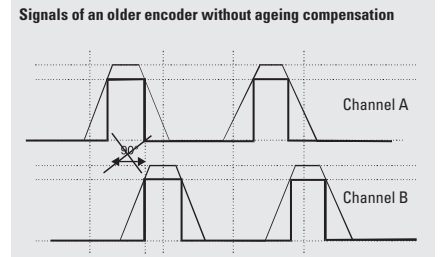
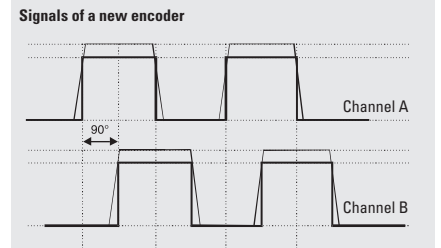
## Encoders Technologies

### Ageing compensation (optical encoders)

Every LED loses some of its luminosity over time. Without ageing compensation the excellent quality of the output signals would suffer. The phase shift of 90° necessary to detect the direction of rotation would be lost. This effect however is prevented by means of special electronic circuitry.

**Benefit:**

The ageing compensation circuit ensures the same signal, even after many years of operating time. The downtime of machines will be reduced dramatically and the reliability is increased.



Product overview Basics

### Temperature compensation

This circuit ensures that the signal will remain the same over the whole working temperature range.

**Benefit:**

The positioning accuracy of a machine will not be affected by temperature changes.

### Current consumption

The typical values for current consumption given in the catalog apply for ambient temperature (23°C). Because of the temperature compensation, the current consumption of the encoder rises with the temperature.

This increase in current is taken into consideration when giving the figure for maximum current consumption. The output currents are dependent on the user's input circuit and are therefore not included in the figures given; these should therefore be calculated and added in.

### Short-circuit protection

The outputs of all the encoders are short-circuit protected, provided that the supply voltage is correctly wired. If an output is connected by mistake to 0 V or +U<sub>B</sub> or with another output, the device will not be damaged. As soon as the error is corrected, the encoder is ready for use again.

**Benefit:**

Wiring circuit errors during installation that often occur in the hectic of day-to-day industrial environments do not lead to the encoder being permanently damaged.

### Environmental conditions



The environmental conditions in which the encoder operates can have a significant influence on its service life, for example

- The ambient temperature
- The expected shaft load
- Soiling and humidity
- Noise interference

Thanks especially to the high-quality technology employed in our encoders, they are particularly suitable for use in harsh environments.

Numerous references from our customers, including Bosch, Siemens, Bombardier and from suppliers to the automotive industry, are proof of this.

### Bearing life

All Kübler encoders are designed to ensure that their bearings give a long service life. This is subject of course to correct installation and to the load limits for the shaft (shaft encoders) being complied with or, in the case of hollow shaft encoders, being mounted with the appropriate stator couplings or torque stops.

The following diagrams show the expected service life of the shaft encoder bearings depending on the bearing load. The calculations are based on a mixed load, where the axial force components are always half of the radial shaft load.

The use of the torque stops and stator couplings that are offered ensure that the shaft load with the hollow shaft encoders as supplied from the factory is kept very small.

|                 |                 |
|-----------------|-----------------|
| <b>Encoders</b> | <b>Glossary</b> |
|-----------------|-----------------|

|                                |  |
|--------------------------------|--|
| <b>Bit (Binary Digit)</b>      | Smallest discrete piece of information. A bit can be allocated to the value 0 or 1.  |
| <b>ccw (counter clockwise)</b> | Turning the encoder shaft in counterclockwise direction (in view of the shaft side of the encoder).                                |
| <b>cw (clockwise)</b>          | Turning the encoder shaft in clockwise direction (in view of the shaft side of the encoder).                                       |
| <b>Zero signal</b>             | The zero signal is emitted once per revolution, it can be used e.g. as a reference signal during the first revolution after power. |

|                    |  |   |
|--------------------|--|---|
| <b>Temperature</b> | <p><i>Working temperature:</i></p> <p>Is defined as the environmental temperature, in which the encoder will produce the signals defined in the data sheets.</p> | <p><i>Operating temperature:</i></p> <p>Is defined as the environmental temperature, in which the encoder can be operated without incurring damage.</p> |
|--------------------|--|---|

**Soiling and humidity**

The IP classification according to EN 60529 describes how the encoder is protected against particles and water. It is described as an abbreviation "IP" followed by two numbers.

**Protection against particles (first digit)**

The higher the number the smaller the particles.

|          |  |
|----------|--|
| <b>0</b> | Not protected                                  |
| <b>1</b> | protected against particles 50 mm and larger   |
| <b>2</b> | protected against particles 12.5 mm and larger |
| <b>3</b> | protected against particles 2.5 mm and larger  |
| <b>4</b> | protected against particles 1.0 mm and larger  |
| <b>5</b> | protected against dust                         |
| <b>6</b> | dust proof                                     |

**Our encoders have a protection up to IP69k.**

These two tables summarize the most used IP ratings.

**Protection against water (second digit)**

The higher the number, the higher the water pressure can be.

|          |  |
|----------|--|
| <b>0</b> | Not protected  |
| <b>1</b> | Protected against vertically falling drops of water                                    |
| <b>2</b> | Protected against vertically falling drops of water when enclosure is tilted up to 15° |
| <b>3</b> | Protected against spraying water   |
| <b>4</b> | Protected against splashing water  |
| <b>5</b> | Protected against water jets   |
| <b>6</b> | Protected against powerful water jets  |
| <b>7</b> | Protected against the effects of temporary immersion in water                          |
| <b>8</b> | Protected against the effects of continuous immersion in water                         |

|           |   |
|-----------|---|
| <b>9K</b> | acc. to DIN 40050 / Part 9: protected against high-pressure water/ steam jet cleaning |
|-----------|---|



**Encoders**      **Glossary**

**Designation of colors to DIN IEC 757**

| Abbreviation | Color     |
|--------------|-----------|
| BK           | black     |
| BN           | brown     |
| RD           | red       |
| OG           | orange    |
| YE           | yellow    |
| GN           | green     |
| BU           | blue      |
| VT           | violet    |
| GY           | grey      |
| WH           | white     |
| PK           | pink      |
| GD           | gold      |
| TQ           | turquoise |
| SR           | silver    |

Product overview  
Basics






**Kubler**  
Fritz Kubler GmbH  
Made in Germany  
www.kubler.com

Type: 8.5020.D85H.1024  
10-30 VDC 100 mA  
S-Nr: 0929502BD4

CE

0V : 1  
+ UB : 2  
↑

# Incremental encoders

| Series   | Type   | Output circuit                            | Page              |
|--|--|---|-------------------|
| <b>Miniature, optical</b>                      | 2400 / 2420 (shaft / hollow shaft)   | Push-pull                                 | <b>50</b>         |
| <b>Miniature, magnetic</b>                     | 2430 / 2440 (shaft / hollow shaft)   | RS422                                     | <b>53</b>         |
| <b>Compact, optical</b>                        |  Sendix Base KIS40 / KIH40 (shaft / hollow s.)    | Push-pull / RS422 open collector          | <b>56</b>         |
|  | 3610 / 3620 (shaft / hollow shaft)   | Push-pull / RS422                         | <b>59</b>         |
|  | Plastic housing<br>3700 / 3720 (shaft / hollow shaft)  | Push-pull / RS422                         | <b>63</b>         |
| <b>Standard, optical</b>                       |  <sup>1)</sup> 5000 / 5020 (shaft / hollow shaft) | Push-pull / RS422 open collector          | <b>67</b>         |
|  |  Sendix Base KIS50 / KIH50 (shaft / hollow s.)    | Push-pull / RS422 open collector          | <b>79</b>         |
|  | High temperature<br>5803 / 5823 (shaft / hollow shaft)   | Push-pull / RS422                         | <b>83</b>         |
|  | Sine wave output, with zero pulse<br>5804 / 5824 (shaft / hollow shaft)  | SinCos                                    | <b>88</b>         |
|  | Sine wave output, highly interpolable<br>Sendix 5814 / 5834 (shaft / hollow shaft)   | SinCos                                    | <b>92</b>         |
|  | Sine wave output, SIL2 / PLd<br>Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow s.)   | SinCos                                    | <b>96</b>         |
|  | Sine wave output, SIL3 / PLe<br>Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow s.)   | SinCos                                    | <b>102</b>        |
|  | High resolution<br>5805 / 5825 (shaft / hollow shaft)  | Push-pull / RS422                         | <b>108</b>        |
|  | Stainless steel<br>Sendix 5006 / 5026 (shaft / hollow shaft)   | Push-pull / RS422                         | <b>112</b>        |
|  | <b>Standard, optical ATEX / IECEx – zone 1/21</b>  | Sendix 7000 / 7020 (shaft / hollow shaft) | Push-pull / RS422 |
| SIL2 / PLd                                     | Sendix SIL 7014FS2 (shaft)   | SinCos                                    | <b>121</b>        |
| SIL3 / PLe                                     | Sendix SIL 7014FS3 (shaft)   | SinCos                                    | <b>124</b>        |
| <b>Standard, optical ATEX / IECEx – mining</b> | Sendix 7100 / 7120 (shaft / hollow shaft)  | Push-pull / RS422                         | <b>127</b>        |
| <b>Large hollow shaft, optical</b>             | 5821 (hollow shaft)  | Push-pull / RS422                         | <b>132</b>        |
|  | A020 (hollow shaft)  | Push-pull / RS422 / SinCos                | <b>135</b>        |
|  | Robust<br>A02H (hollow shaft)  | Push-pull / RS422 / SinCos                | <b>139</b>        |
| <b>Heavy Duty, optical</b>                     | Shaft<br>Sendix Heavy Duty H100 (shaft)  | Push-pull / RS422 / speed switch          | <b>146</b>        |
|  | Hollow shaft<br>Sendix Heavy Duty H120 (hollow shaft)  | Push-pull / RS422 / optical fiber         | <b>151</b>        |

1) We offer for all encoders configured with the underlined preferential options our free of charge 24one delivery promise. Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

# Incremental encoders

**Miniature optical**

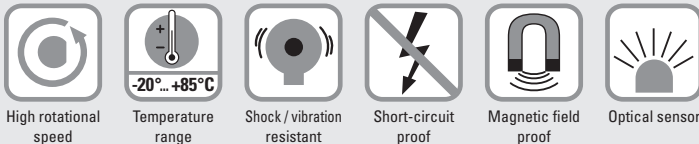
**2400 / 2420 (shaft / hollow shaft)**

**Push-pull**



The incremental miniature encoders type 2400 / 2420 with their optical sensor technology offer a resolution of up to 1024 pulses per revolution.

With a diameter of just 24 mm this encoder is ideal for use where space is tight.



## Reliable

- Robust bearing construction.
- Cable outlet boasts high degree of strain relief thanks to multiple clamping.
- Short-circuit proof outputs.

## Versatile

- Ideally suited for use in small devices.
- Meets the certification requirements of railways standard EN 50121.

## Order code Shaft version

**05.2400** . **XXXX** . **XXXX**  
Type                    **a** **b** **c** **d**                    **e**

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### **a** Flange

- 1 = ø 24 mm [0.94"]**
- 3 = ø 28 mm [1.10"]
- 2 = ø 30 mm [1.18"]

### **b** Shaft (ø x L)

- 1 = ø 4 x 10 mm [0.16 x 0.39"]**
- 3 = ø 5 x 10 mm [0.20 x 0.39"], with flat
- 2 = ø 6 x 10 mm [0.24 x 0.39"]
- 4 = ø 1/4" x 10 mm [1/4" x 0.39"], with flat <sup>1)</sup>
- 6 = ø 6 x 10 mm [0.24 x 0.39"], with flat <sup>1)</sup>

### **c** Output circuit / power supply

- 1 = push-pull (without inverted signal) / 5 ... 24 V DC
- 2 = push-pull (with inverted signal) / 5 ... 24 V DC
- 3 = push-pull (without inverted signal) / 8 ... 30 V DC
- 4 = push-pull (with inverted signal) / 8 ... 30 V DC**

### **d** Type of connection

- 1 = axial cable, 2 m [6.56'] PVC**
- A = axial cable, special length PVC \*)
- 2 = radial cable, 2 m [6.56'] PVC
- B = radial cable, special length PVC \*)
- \*) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 05.2400.122A.1024.0030 (for cable length 3 m)

### **e** Pulse rate

- 4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, **100**, 120, 125, 180, 200, 250, 300, **360**, 400, 500, **512**, **1000**, **1024** (e.g. 360 pulses => 0360)

### Stock types

- 05.2400.1122.0050
- 05.2400.1122.0360
- 05.2400.1122.0500
- 05.2400.1122.1000
- 05.2400.1122.1024

Optional on request  
- other pulse rates

1) US version.

# Incremental encoders

|                          |   |                  |
|--------------------------|---|------------------|
| <b>Miniature optical</b> | <b>2400 / 2420 (shaft / hollow shaft)</b> | <b>Push-pull</b> |
|--------------------------|---|------------------|

|   |  |   |  |  |
|---|--|---|--|--|
| <b>Order code</b><br><b>Hollow shaft</b>      | <b>05.2420</b><br>Type   | <b>1</b> <b>X</b> <b>X</b> <b>X</b> <b>X</b> <b>X</b><br>a b c d e  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>a Flange</b><br><u>1 = ø 24 mm [0.94"]</u> | <b>b Blind hollow shaft</b><br>(insertion depth max. 14 mm [0.55"])<br><u>1 = ø 4 mm [0.16"]</u><br>2 = ø 6 mm [0.24"]<br><br>4 = ø 1/4" <sup>1)</sup> | <b>c Output circuit / power supply</b><br>1 = push-pull (without inverted signal) / 5 ... 24 V DC<br>2 = push-pull (with inverted signal) / 5 ... 24 V DC<br>3 = push-pull (without inverted signal) / 8 ... 30 V DC<br><u>4 = push-pull (with inverted signal) / 8 ... 30 V DC</u>   | <b>e Pulse rate</b><br>4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, <u>100</u> , 120, 125, 180, 200, 250, 300, <u>360</u> , 400, 500, <u>512</u> , <u>1000</u> , <u>1024</u><br>(e.g. 360 pulses => 0360)  | <b>Stock types</b><br>05.2420.1212.0500<br>05.2420.1222.0500<br>05.2420.1222.1000<br>05.2420.1222.1024 |
|   |  | <b>d Type of connection</b><br><u>1 = axial cable, 2 m [6.56'] PVC</u><br>A = axial cable, special length PVC *)<br>2 = radial cable, 2 m [6.56'] PVC<br>B = radial cable, special length PVC *)<br><br>*) Available special lengths (connection types A, B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 05.2420.122A.1024.0030 (for cable length 3 m) | <b>Optional on request</b><br>- other pulse rates  |  |

Incremental encoders

|  |   |                         |
|--|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b> |   | Order no.               |
| <b>Coupling</b>                              | bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"] | <b>8.0000.1202.0404</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   |
|--|---|
| <b>Maximum speed</b>                             | 12000 min <sup>-1</sup>                                 |
| <b>Mass moment of inertia</b>                    | approx. 0.1 x 10 <sup>-6</sup> kgm <sup>2</sup>         |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial 10 N<br>axial 20 N                               |
| <b>Weight</b>                                    | approx. 0.06 kg [2.12 oz]                               |
| <b>Protection acc. to EN 60529</b>               | housing side IP65<br>flange side IP50 (IP64 on request) |
| <b>Working temperature range</b>                 | -20°C ... +85°C [-4°F ... +185°F]                       |
| <b>Materials</b>                                 | shaft stainless steel<br>blind hollow shaft brass       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms                            |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                   |

| Electrical characteristics             |   |   |
|--|---|---|
| <b>Output circuit</b>                  | <b>Push-pull <sup>2)</sup></b><br>(7272 compatible)   | <b>Push-pull <sup>2)</sup></b><br>(7272 compatible) |
| <b>Power supply</b>                    | 5 ... 24 V DC <sup>3)</sup>                           | 8 ... 30 V DC                                       |
| <b>Power consumption (no load)</b>     | max. 50 mA  | max. 50 mA  |
| <b>Permissible load / channel</b>      | max. +/- 50 mA  | max. +/- 50 mA                                      |
| <b>Pulse frequency</b>                 | max. 160 kHz  | max. 160 kHz  |
| <b>Signal level</b>                    | HIGH min. +V - 2.5 V<br>LOW max. 0.5 V                | min. +V - 3.0 V<br>max. 0.5 V                       |
| <b>Rising edge time t<sub>r</sub></b>  | max. 1 µs   | max. 1 µs   |
| <b>Falling edge time t<sub>f</sub></b> | max. 1 µs   | max. 1 µs   |
| <b>Short circuit proof outputs</b>     | yes   | yes   |
| <b>UL approval</b>                     | file 224618   |   |
| <b>CE compliant acc. to</b>            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |   |

An independent test laboratory (TTI-P-G115/96-01) approved by the German Accreditation Council (DAR) certified the compliance with the Railways Standard, according to EN 50121. This means our encoder is compatible with higher electromagnetic noise standards than standard industrial encoders.

You will have a higher quality encoder even in applications with higher EMC noise levels. We will gladly send you a copy of the test report on request. When ordering an encoder to the railway standard, please ensure you state this explicitly on the order.



1) US version.  
 2) Max. recommended cable length 30 m [98.4'].  
 3) With 24 V DC there is no tolerance above 24 V DC. Please use output circuit 8 ... 30 V DC.

# Incremental encoders

|                          |   |                  |
|--------------------------|---|------------------|
| <b>Miniature optical</b> | <b>2400 / 2420 (shaft / hollow shaft)</b> | <b>Push-pull</b> |
|--------------------------|---|------------------|

### Terminal assignment

| Output circuit              | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |
|-----------------------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|
| 1, 3<br>without inv. signal | 1, 2, A, B         | Signal:   | 0 V | +V | A  | B         | 0  |           |    |           |
|                             |                    | Cable color:  | WH  | BN | GN | YE        | GY |           |    |           |
| Output circuit              | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |
| 2, 4<br>with inv. signal    | 1, 2, A, B         | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ |
|                             |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

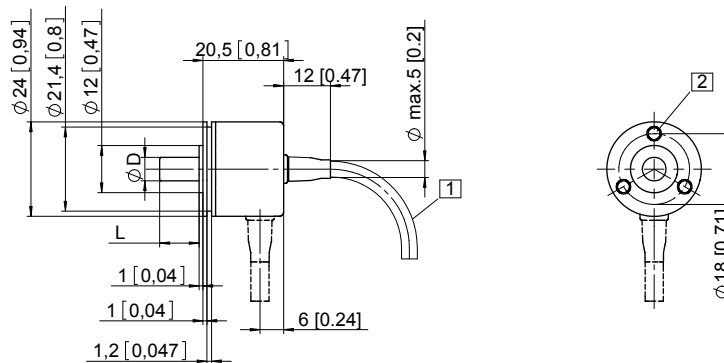
### Dimensions shaft version

Dimensions in mm [inch]

#### Flange type 1, $\varnothing$ 24 [0.94]

- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |
| 1/4"     | f7  | 10 [0.39] |

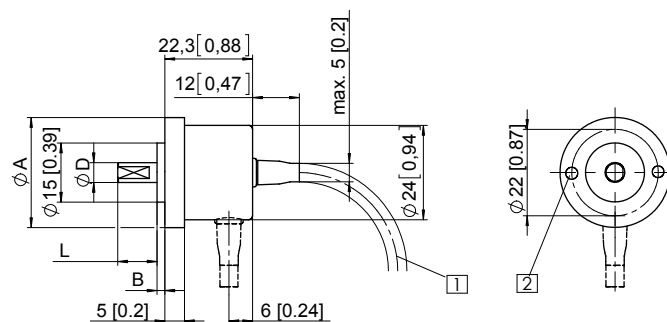


#### Flange type 2, $\varnothing$ 30 [1.18]

#### Flange type 3, $\varnothing$ 28 [1.10]

- 1 min R50 [1.97]
- 2 2 x M3, 4 [0.16] deep

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |
| 1/4"     | f7  | 10 [0.39] |



| Flange type | A                       | B        |
|-------------|-------------------------|----------|
| 2           | $\varnothing$ 30 [1.18] | 3 [0.12] |
| 3           | $\varnothing$ 28 [1.10] | 2 [0.08] |

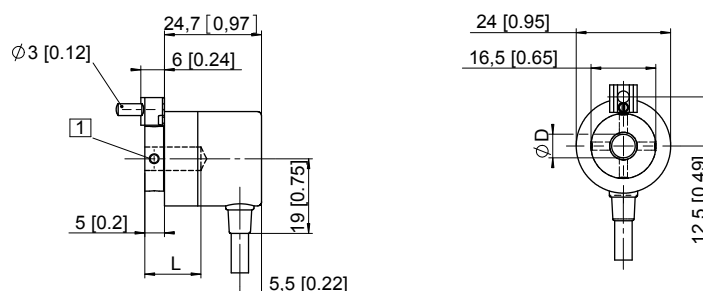
### Dimensions hollow shaft version

Dimensions in mm [inch]

#### Flange type 1, $\varnothing$ 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | H7  | 14 [0.55] |
| 6 [0.24] | H7  | 14 [0.55] |
| 1/4"     | H7  | 14 [0.55] |



L = insertion depth max. blind hollow shaft

# Incremental encoders

|                           |   |              |
|---------------------------|---|--------------|
| <b>Miniature magnetic</b> | <b>2430 / 2440 (shaft / hollow shaft)</b> | <b>RS422</b> |
|---------------------------|---|--------------|



Thanks to their non-contact magnetic scanning technology the miniature-format encoders 2430 and 2440 guarantee exceptional ruggedness – and this with a resolution of up to 256 pulses per revolution.

As a result of their compact outer diameter of only 24 mm, they are ideal for use where installation space is restricted.



Incremental encoders

|                       |                   |                             |                     |                             |                            |
|-----------------------|-------------------|-----------------------------|---------------------|-----------------------------|----------------------------|
|                       |                   |                             |                     |                             |                            |
| High rotational speed | Temperature range | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor technology |

### Magnetically robust

- The non-contact magnetic technology prevents wear and guarantees a long service life.
- Multiple clamping affords high strain relief to the cable outlet, ensuring longer life.
- Wide temperature range from -20°C up to +85°C.
- Flexible connection possibilities: can be supplied with radial or axial cable outlet.

### Compact power

- Resolution up to 256 pulses per revolution.
- Shaft and hollow shaft version.

|  |               |   |   |  |          |          |          |
|--|---------------|---|---|--|----------|----------|----------|
| <b>Order code</b>  | <b>8.2430</b> | <b>. X X 6 X . XXXX</b>   | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |          |          |          |
| <b>Shaft version</b>   | Type          | <table border="1" style="font-size: x-small; border-collapse: collapse;"> <tr> <td style="text-align: center;"><u>a</u></td> <td style="text-align: center;"><u>b</u></td> <td style="text-align: center;"><u>c</u></td> <td style="text-align: center;"><u>d</u></td> <td style="text-align: center;"><u>e</u></td> </tr> </table> |   |  | <u>a</u> | <u>b</u> | <u>c</u> |
| <u>a</u>   | <u>b</u>      | <u>c</u>  | <u>d</u>  | <u>e</u>   |          |          |          |
| <b>a Flange</b><br><u>1 = ø 24 mm [0.94"]</u><br>3 = ø 28 mm [1.10"]<br>2 = ø 30 mm [1.18"]  |               | <b>d Type of connection</b><br>1 = axial cable, 2 m [5.56'] PVC<br>A = axial cable, special length PVC *)<br><u>2 = radial cable, 2 m [5.56'] PVC</u><br>B = radial cable, special length PVC *)  |   | <b>e Pulse rate</b><br>1 ... 128 (factory programmable)<br><u>256</u><br>(e.g. 128 pulses => 0128) |          |          |          |
| <b>b Shaft (ø x L)</b><br>1 = ø 4 x 10 mm [0.16 x 0.39"]<br>3 = ø 5 x 10 mm [0.20 x 0.39"], with flat<br><u>2 = ø 6 x 10 mm [0.24 x 0.39"]</u> |               | *) Available special lengths (connection types A, B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.2430.126A.0256.0030 (for cable length 3 m)  |   |  |          |          |          |
| <b>c Output circuit / power supply</b><br><u>6 = RS422 (with inverted signal) / 5 V DC</u>   |               | Optional on request<br>- other pulse rates  |   |  |          |          |          |

|  |               |   |   |  |          |          |          |
|--|---------------|---|---|--|----------|----------|----------|
| <b>Order code</b>  | <b>8.2440</b> | <b>. 1 X 6 X . XXXX</b>   | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |          |          |          |
| <b>Hollow shaft</b>  | Type          | <table border="1" style="font-size: x-small; border-collapse: collapse;"> <tr> <td style="text-align: center;"><u>a</u></td> <td style="text-align: center;"><u>b</u></td> <td style="text-align: center;"><u>c</u></td> <td style="text-align: center;"><u>d</u></td> <td style="text-align: center;"><u>e</u></td> </tr> </table> |   |  | <u>a</u> | <u>b</u> | <u>c</u> |
| <u>a</u>   | <u>b</u>      | <u>c</u>  | <u>d</u>  | <u>e</u>   |          |          |          |
| <b>a Flange</b><br><u>1 = ø 24 mm [0.94"]</u>  |               | <b>d Type of connection</b><br>1 = axial cable, 2 m [5.56'] PVC<br>A = axial cable, special length PVC *)<br><u>2 = radial cable, 2 m [5.56'] PVC</u><br>B = radial cable, special length PVC *)  |   | <b>e Pulse rate</b><br>1 ... 128 (factory programmable)<br><u>256</u><br>(e.g. 128 pulses => 0128) |          |          |          |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 14 mm [0.55"])<br>1 = ø 4 mm [0.16"]<br><u>2 = ø 6 mm [0.24"]</u> |               | *) Available special lengths (connection types A, B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.2440.126A.0256.0030 (for cable length 3 m)  |   |  |          |          |          |
| <b>c Output circuit / power supply</b><br><u>6 = RS422 (with inverted signal) / 5 V DC</u>                             |               | Optional on request<br>- other pulse rates  |   |  |          |          |          |



# Incremental encoders

|                           |   |              |
|---------------------------|---|--------------|
| <b>Miniature magnetic</b> | <b>2430 / 2440 (shaft / hollow shaft)</b> | <b>RS422</b> |
|---------------------------|---|--------------|

|  |   |                         |
|--|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b> |   | Order no.               |
| <b>Coupling</b>                              | bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"] | <b>8.0000.1202.0404</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   |
|--|---|
| <b>Maximum speed</b>                             | 12000 min <sup>-1</sup>   |
| <b>Mass moment of inertia</b>                    | approx. 0.1 x 10 <sup>-6</sup> kgm <sup>2</sup>                           |
| <b>Starting torque - at 20°C [68°F]</b>          | < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial 10 N<br>axial 20 N   |
| <b>Weight</b>                                    | approx. 0.06 kg [2.11 oz]   |
| <b>Protection acc. to EN 60529</b>               | housing side IP65 (IP67 on request)<br>flange side IP50 (IP67 on request) |
| <b>Working temperature range</b>                 | -20°C ... +85°C [-4°F ... +185°F]   |
| <b>Materials</b>                                 | shaft / hollow shaft stainless steel<br>clamping flange MS58              |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                                     |

| Electrical characteristics                              |   |
|---|---|
| <b>Output circuit</b>                                   | RS422 (TTL compatible)                                |
| <b>Power supply</b>                                     | 5 V DC (±5 %)   |
| <b>Power consumption with inverted signal (no load)</b> | typ. 40 mA<br>max. 90 mA                              |
| <b>Permissible load / channel</b>                       | max. +/- 20 mA  |
| <b>Pulse frequency</b>                                  | max. 300 kHz  |
| <b>Signal level</b>                                     | HIGH min. 2.5 V<br>LOW max. 0.5 V                     |
| <b>Rising edge time t<sub>r</sub></b>                   | max. 200 ns   |
| <b>Falling edge time t<sub>f</sub></b>                  | max. 200 ns   |
| <b>Min. pulse edge interval</b>                         | 0.5 µs <sup>1)</sup>                                  |
| <b>Short circuit proof outputs<sup>2)</sup></b>         | yes <sup>3)</sup>                                     |
| <b>Reverse polarity protection of the power supply</b>  | no  |
| <b>CE compliant acc. to</b>                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

## Terminal assignment

| Output circuit        | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |  |
|-----------------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|--|
| 6<br>with inv. signal | 1, 2, A, B         | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ |  |
|                       |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

1) For max. speed use a counter with input frequency of min. 500 kHz.  
 2) If power supply correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 If +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.

# Incremental encoders

|                           |   |              |
|---------------------------|---|--------------|
| <b>Miniature magnetic</b> | <b>2430 / 2440 (shaft / hollow shaft)</b> | <b>RS422</b> |
|---------------------------|---|--------------|

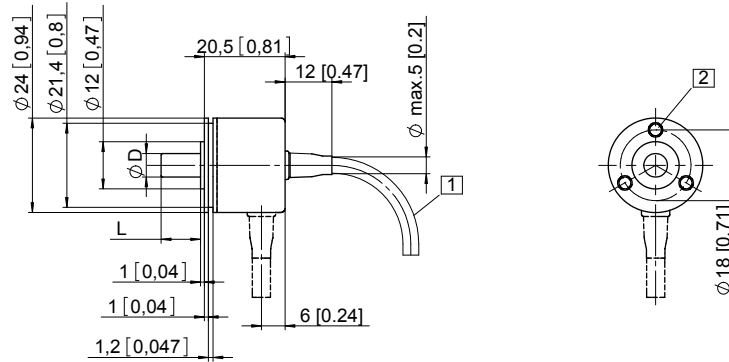
## Dimensions shaft version

Dimensions in mm [inch]

### Flange type 1, $\varnothing$ 24 [0.94]

- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |



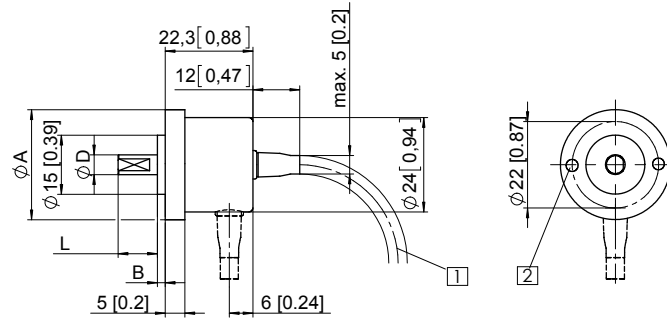
### Flange type 2, $\varnothing$ 30 [1.18]

### Flange type 3, $\varnothing$ 28 [1.10]

- 1 min R50 [1.97]
- 2 2 x M3, 4 [0.16] deep

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |

| Flange type | A                       | B        |
|-------------|-------------------------|----------|
| 2           | $\varnothing$ 30 [1.18] | 3 [0.12] |
| 3           | $\varnothing$ 28 [1.10] | 2 [0.08] |



## Dimensions hollow shaft version

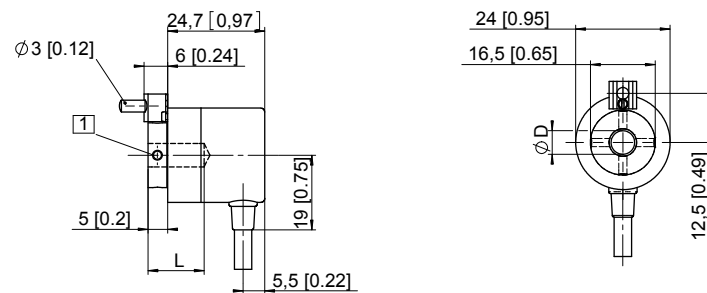
Dimensions in mm [inch]

### Flange type 1, $\varnothing$ 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5

| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | H7  | 14 [0.55] |
| 6 [0.24] | H7  | 14 [0.55] |
| 1/4"     | H7  | 14 [0.55] |

L = insertion depth max. blind hollow shaft





# Incremental encoders

|                        |   |   |
|------------------------|---|---|
| <b>Compact optical</b> | <b>Sendix Base KIS40 / KIH40 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|------------------------|---|---|

| Mounting accessory for shaft encoders      |   | Order no.               |
|--|---|-------------------------|
| <b>Coupling</b>                            | bellows coupling $\varnothing$ 15 mm [0.59"] for shaft 6 mm [0.24"] | <b>8.0000.1202.0606</b> |
| Connection technology                      |   | Order no.               |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                       | <b>05.CMBS 8181-0</b>   |

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 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics              |   | Working temperature range                        |                                       |
|---|---|--|---------------------------------------|
| <b>Maximum speed</b>                    | 4500 min <sup>-1</sup>                          | -20°C ... +70° [-4°F ... +158°F]                 |                                       |
| <b>Mass moment of inertia</b>           | approx. 0.2 x 10 <sup>-6</sup> kgm <sup>2</sup> | <b>Materials</b>                                 |                                       |
| <b>Starting torque – at 20°C [68°F]</b> | < 0.05 Nm                                       | shaft  | stainless steel                       |
| <b>Shaft load capacity</b>              | radial 40 N<br>axial 20 N                       | flange   | aluminum                              |
|   |   | housing  | aluminum                              |
| <b>Weight</b>                           | ca. 0.17 kg [6.00 oz]                           | cable  | PVC                                   |
| <b>Protection acc. to EN 60529</b>      | IP64  | <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms          |
|   |   | <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz |

| Electrical characteristics                              |   |   |                           |
|---|---|---|---------------------------|
| Output circuit  | RS422<br>(TTL comp.)                                  | Push-pull <sup>1)</sup><br>(7272 comp.) | Open collector<br>(7273)  |
| <b>Power supply</b>                                     | 5 V DC ( $\pm$ 5 %)                                   | 10 ... 30 V DC                          | 10 ... 30 V DC            |
| <b>Power consumption with inverted signal (no load)</b> | typ. 40 mA<br>max. 90 mA                              | typ. 50 mA<br>max. 100 mA               | 100 mA                    |
| <b>Permissible load / channel</b>                       | max. +/- 20 mA  | max. +/- 20 mA                          | +/- 20 mA sink at 30 V DC |
| <b>Pulse frequency</b>                                  | max. 250 kHz  | max. 250 kHz                            | max. 250 kHz              |
| <b>Signal level</b>                                     | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V - 2.0 V<br>max. 0.5 V           |                           |
| <b>Rising edge time t<sub>r</sub></b>                   | max. 200 ns   | max. 1 $\mu$ s                          |                           |
| <b>Falling edge time t<sub>f</sub></b>                  | max. 200 ns   | max. 1 $\mu$ s                          |                           |
| <b>Short circuit proof outputs <sup>2)</sup></b>        | yes <sup>3)</sup>                                     | yes                                     | yes                       |
| <b>Reverse polarity protection of the power supply</b>  | no  | yes                                     | yes                       |
| <b>UL approval</b>                                      | file 224618   |   |                           |
| <b>CE compliant acc. to</b>                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |   |                           |

## Terminal assignment

| Output circuit              | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |  |
|-----------------------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|--|
| 3, 4, 6<br>with inv. signal | 1, 2               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ |  |
|                             |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

1) Max. recommended cable length 30 m [98.43'].  
 2) If power supply correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
 at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

# Incremental encoders

## Compact optical

Sendix Base KIS40 / KIH40 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

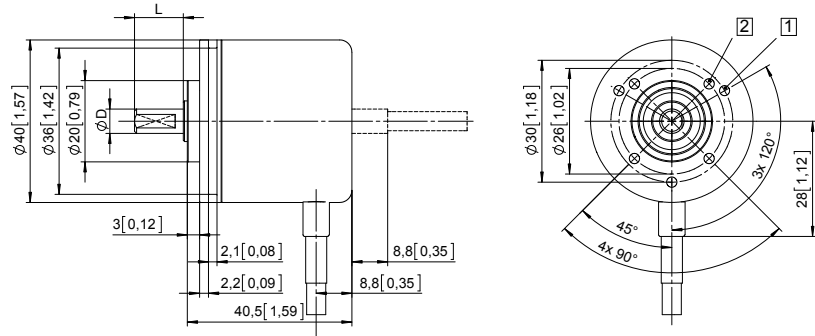
### Dimensions shaft version

Dimensions in mm [inch]

#### Clamping-synchro flange, $\varnothing$ 40 [1.57]

##### Flange type 1

- 1 3 x M3, 4 [0.16] deep
- 2 4 x M3, 4 [0.16] deep



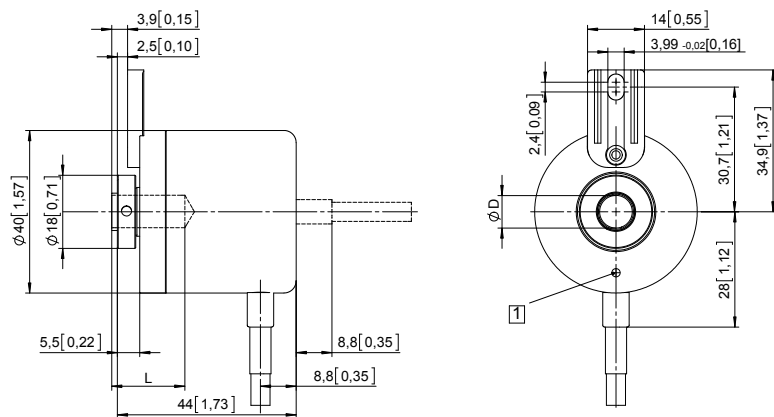
| D        | Fit | L         |
|----------|-----|-----------|
| 6 [0.24] | h7  | 12 [0.47] |
| 1/4"     | h7  | 12 [0.47] |

### Dimensions hollow shaft version

Dimensions in mm [inch]

#### Flange with spring element, long

##### Flange type 2



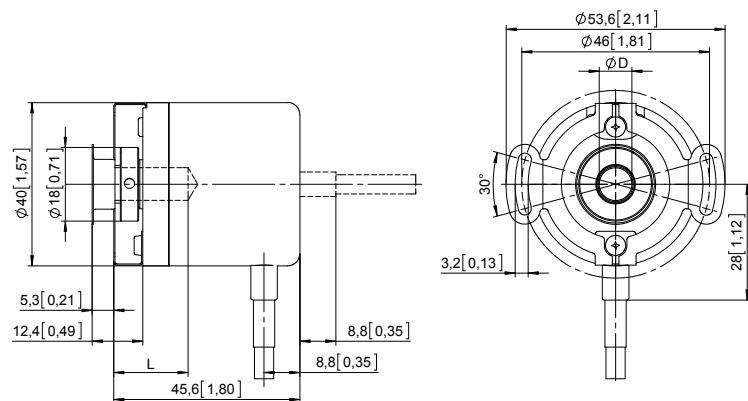
1 M2.5, 4 [0.16] tief

| D        | Fit | L         |
|----------|-----|-----------|
| 8 [0.32] | H7  | 18 [0.71] |
| 1/4"     | H7  | 18 [0.71] |

L = insertion depth max. blind hollow shaft

#### Flange with stator coupling, $\varnothing$ 46 [1.81]

##### Flange type 5



| D        | Fit | L         |
|----------|-----|-----------|
| 8 [0.32] | H7  | 18 [0.71] |
| 1/4"     | H7  | 18 [0.71] |

L = insertion depth max. blind hollow shaft  
insertion depth min. = 1.5 x D

# Incremental encoders

|                        |   |                          |
|------------------------|---|--------------------------|
| <b>Compact optical</b> | <b>3610 / 3620 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|------------------------|---|--------------------------|



The compact incremental encoders type 3610 / 3620 with optical sensor technology are available with a resolution of up to 2500 pulses per revolution.

The versions with hollow shaft are designed for diameters up to 8 mm.



|                       |                   |                             |                     |                             |                      |                |
|-----------------------|-------------------|-----------------------------|---------------------|-----------------------------|----------------------|----------------|
|                       |                   |                             |                     |                             |                      |                |
| High rotational speed | Temperature range | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic field proof | Optical sensor |

### Compact

- Only 36 mm outer diameter.
- Through hollow shaft up to 8 mm.
- Ideally suited for use where space is tight.

### Versatile

- Available with cable outlet or M12 connector.
- Maximum resolution of 2500 pulses per revolution.
- Power supply 5 ... 18 V DC or 8 ... 30 V DC.

|   |                      |   |                 |   |  |
|---|----------------------|---|-----------------|---|--|
| <b>Order code</b>   | <b>Shaft version</b> | <b>8.3610</b>   | <b>. XXXX .</b> | <b>XXXX</b>   | <p>If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |
|   |                      | Type  | a b c d         | e   |  |
| <b>a Flange</b><br>2 = synchro flange, $\varnothing$ 36.5 mm [1.44"]<br><u>3 = clamping flange, <math>\varnothing</math> 36.5 mm [1.44"]</u>  |                      | <b>b Shaft (<math>\varnothing \times L</math>)</b><br>1 = $\varnothing$ 4 x 10 mm [0.16 x 0.39"]<br>2 = $\varnothing$ 5 x 10 mm [0.20 x 0.39"]<br><u>3 = <math>\varnothing</math> 6 x 12.5 mm [0.24 x 0.49"], with flat</u><br>5 = $\varnothing$ 1/4" x 12.5 mm [1/4" x 0.49"], with flat |                 | <b>c Output circuit / power supply</b><br>2 = push-pull (with inverted signal) / 5 ... 18 V DC<br><u>4 = push-pull (with inverted signal) / 8 ... 30 V DC</u><br>3 = push-pull (without inverted signal) / 8 ... 30 V DC<br>6 = RS422 (with inverted signal) / 5 V DC<br>5 = RS422 (with inverted signal) / 8 ... 30 V DC |  |
| <b>d Type of connection</b><br>1 = axial cable, 2 m [5.56'] PVC<br>A = axial cable, special length PVC *)<br><u>2 = radial cable, 2 m [5.56'] PVC</u><br>B = radial cable, special length PVC *)<br>3 = axial M12 connector, 8-pin<br>4 = radial M12 connector, 8-pin<br>*) Available special lengths (connection types A, B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.3610.334A.1024.0030 (for cable length 3 m) |                      | <b>e Pulse rate</b><br>25, 100, <u>200</u> , 360, <u>500</u> , 512, 600, 1000,<br><u>1024</u> , 1500, 2000, <u>2048</u> , <u>2500</u><br>(e.g. 500 pulses => 0500)<br><br><i>Optional on request</i><br>- other pulse rates   |                 |   |  |

# Incremental encoders

|                        |   |                          |
|------------------------|---|--------------------------|
| <b>Compact optical</b> | <b>3610 / 3620 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|------------------------|---|--------------------------|

|  |   |  |  |  |   |                     |   |
|--|---|--|--|--|---|---------------------|---|
| <b>Order code</b>                      | <b>8.3620</b>   | <b>.XXXX</b>   | <b>.XXXX</b>   | <p>If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |   |                     |   |
| <b>Hollow shaft</b>                    | Type  | a  | b  | c  | d   | e                   |   |
| <b>a Flange</b>                        | 1 = with spring element, short<br><u>2 = with spring element, long</u><br>5 = with stator coupling, ø 46 mm [1.81"]   | <b>d Type of connection</b>  | <u>E = radial cable, 2 m [5.56'] PVC</u><br>B = radial cable, special length PVC *)<br>4 = radial M12 connector, 8-pin |  |   | <b>e Pulse rate</b> | 25, 100, <u>200</u> , 360, <u>500</u> , 512, 600, 1000,<br><u>1024</u> , 1500, 2000, <u>2048</u> , <u>2500</u><br>(e.g. 500 pulses => 0500) |
| <b>b Through hollow shaft</b>          | <u>2 = ø 6 mm [0.24"]</u><br>4 = ø 8 mm [0.32"]<br>3 = ø 1/4"   | *) Available special lengths (connection type B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.3620.224B.1024.0030 (for cable length 3 m) |  |  | <b>Optional on request</b><br>- other pulse rates |                     |   |
| <b>c Output circuit / power supply</b> | 2 = push-pull (with inverted signal) / 5 ... 18 V DC<br><u>4 = push-pull (with inverted signal) / 8 ... 30 V DC</u><br>3 = push-pull (without inverted signal) / 8 ... 30 V DC<br>6 = RS422 (with inverted signal) / 5 V DC<br>5 = RS422 (with inverted signal) / 8 ... 30 V DC |  |  |  |   |                     |   |

| Mounting accessory for shaft encoders      |  | Order no.                   |
|--|--|-----------------------------|
| <b>Coupling</b>                            | bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]                | <b>8.0000.1202.0606</b>     |
| Connection technology                      |  | Order no.                   |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable | <b>05.00.6041.8211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                          | <b>05.CMB 8181-0</b>        |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |   |   |                                |                 |
|---|---|---|--------------------------------|-----------------|
| Mechanical characteristics                              |   |   |                                |                 |
| <b>Maximum speed</b>                                    | shaft version   | 12000 min <sup>-1</sup>                         |                                |                 |
|   | hollow shaft version                                  | 6000 min <sup>-1</sup>                          |                                |                 |
| <b>Mass moment of inertia</b>                           |   | approx. 0.2 x 10 <sup>-6</sup> kgm <sup>2</sup> |                                |                 |
| <b>Starting torque - at 20°C [68°F]</b>                 |   | < 0.05 Nm                                       |                                |                 |
| <b>Shaft load capacity</b>                              | radial  | 40 N  |                                |                 |
|   | axial   | 20 N  |                                |                 |
| <b>Weight</b>   |   | approx. 0.08 kg [2.82 oz]                       |                                |                 |
| <b>Protection acc. to EN 60529</b>                      | housing side  | IP65  |                                |                 |
|   | flange side   | IP50 (IP64 on request)                          |                                |                 |
| <b>Working temperature range</b>                        |   | -20°C ... +85°C [-4°F ... +185°F]               |                                |                 |
| <b>Materials</b>  | shaft   | stainless steel                                 |                                |                 |
|   | hollow shaft  | brass   |                                |                 |
|   | housing   | aluminum  |                                |                 |
|   | cable   | PVC   |                                |                 |
| <b>Shock resistance acc. to EN 60068-2-27</b>           |   | 1000 m/s <sup>2</sup> , 6 ms                    |                                |                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b>        |   | 100 m/s <sup>2</sup> , 55 ... 2000 Hz           |                                |                 |
| Electrical characteristics                              |   |   |                                |                 |
| <b>Output circuit</b>                                   | <b>RS422</b>  | <b>Push-pull <sup>1)</sup></b>                  | <b>Push-pull <sup>1)</sup></b> |                 |
|   |   | (7272 comp.)                                    | (7272 comp.)                   |                 |
| <b>Power supply</b>                                     | 5 V DC (±5 %) or 8 ... 30 V DC                        | 5 ... 18 V DC                                   | 8 ... 30 V DC                  |                 |
| <b>Power consumption with inverted signal (no load)</b> | typ. 40 mA / max. 90 mA                               | max. 40 mA                                      | max. 40 mA                     |                 |
| <b>Permissible load / channel</b>                       | max. +/- 20 mA  | max. +/- 20 mA                                  | max. +/- 20 mA                 |                 |
| <b>Pulse frequency</b>                                  | max. 300 kHz  | max. 200 kHz                                    | max. 200 kHz                   |                 |
| <b>Signal level</b>                                     | HIGH  | min. 2.5 V                                      | min. +V - 2.5 V                | min. +V - 3.0 V |
|   | LOW   | max. 0.5 V                                      | max. 0.5 V                     | max. 0.5 V      |
| <b>Rising edge time t<sub>r</sub></b>                   |   | max. 200 ns                                     | max. 1 µs                      | max. 1 µs       |
| <b>Falling edge time t<sub>f</sub></b>                  |   | max. 200 ns                                     | max. 1 µs                      | max. 1 µs       |
| <b>Short circuit proof outputs <sup>2)</sup></b>        | yes   | yes   | yes                            | yes             |
| <b>Reverse polarity protection of the power supply</b>  | yes   | yes   | yes                            | yes             |
| <b>UL approval</b>                                      | file 224618   |   |                                |                 |
| <b>CE compliant acc. to</b>                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |   |                                |                 |

1) Max. recommended cable length 30 m [98.43'].  
2) If power supply correctly applied.



# Incremental encoders

|                        |   |                          |
|------------------------|---|--------------------------|
| <b>Compact optical</b> | <b>3610 / 3620 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|------------------------|---|--------------------------|

## Terminal assignment

| Output circuit                 | Type of connection | Cable (isolate unused wires individually before initial start-up) |
|--------------------------------|--------------------|---|
| 2, 4, 5, 6<br>with inv. signal | 1, 2, A, B, E      | Signal: 0 V +V A $\bar{A}$ B $\bar{B}$ 0 $\bar{0}$                |
|                                |                    | Cable color: WH BN GN YE GY PK BU RD                              |
| 3<br>without inv. signal       | 1, 2, A, B, E      | Signal: 0 V +V A $\bar{A}$ B $\bar{B}$ 0 $\bar{0}$                |
|                                |                    | Cable color: WH BN GN - YE - GY -                                 |
| 2, 4, 5, 6<br>with inv. signal | 3, 4               | M12 connector, 8-pin  |
|                                |                    | Signal: 0 V +V A $\bar{A}$ B $\bar{B}$ 0 $\bar{0}$                |
| 3<br>without inv. signal       | 3, 4               | M12 connector, 8-pin  |
|                                |                    | Signal: 0 V +V A $\bar{A}$ B $\bar{B}$ 0 $\bar{0}$                |
|                                |                    | Pin: 1 2 3 4 5 6 7 8  |
|                                |                    | Pin: 1 2 3 - 5 - 7 -  |

Top view of mating side, male contact base



M12 connector, 8-pin

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

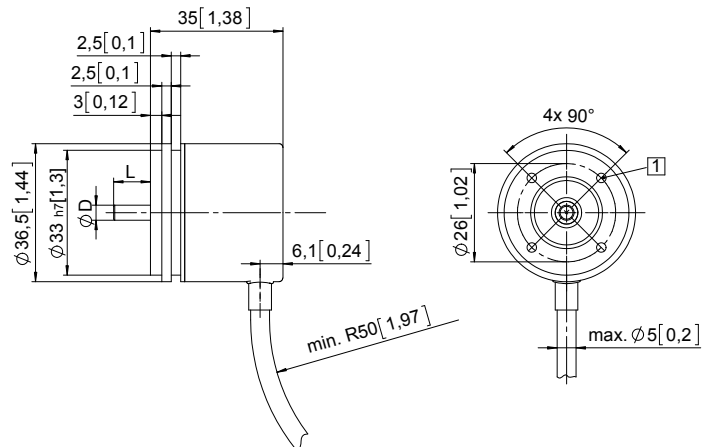
## Dimensions shaft version

Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 36.5 [1.44]

#### Flange type 2

- 1 4 x M3, 5 [0.20] deep

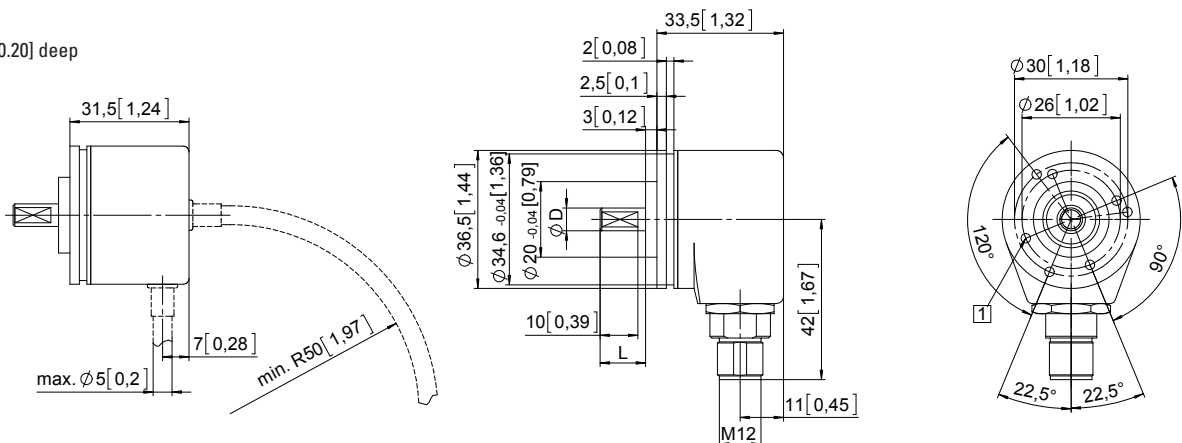


| D        | Fit | L           |
|----------|-----|-------------|
| 4 [0.16] | f7  | 10 [0.39]   |
| 5 [0.20] | f7  | 10 [0.39]   |
| 6 [0.24] | f7  | 12.5 [0.49] |
| 1/4"     | f7  | 12.5 [0.49] |

### Clamping flange, $\varnothing$ 36.5 [1.44]

#### Flange type 3

- 1 4 x M3, 5 [0.20] deep



| D        | Fit | L           |
|----------|-----|-------------|
| 4 [0.16] | f7  | 10 [0.39]   |
| 5 [0.20] | f7  | 10 [0.39]   |
| 6 [0.24] | f7  | 12.5 [0.49] |
| 1/4"     | f7  | 12.5 [0.49] |

# Incremental encoders

**Compact optical**

**3610 / 3620 (shaft / hollow shaft)**

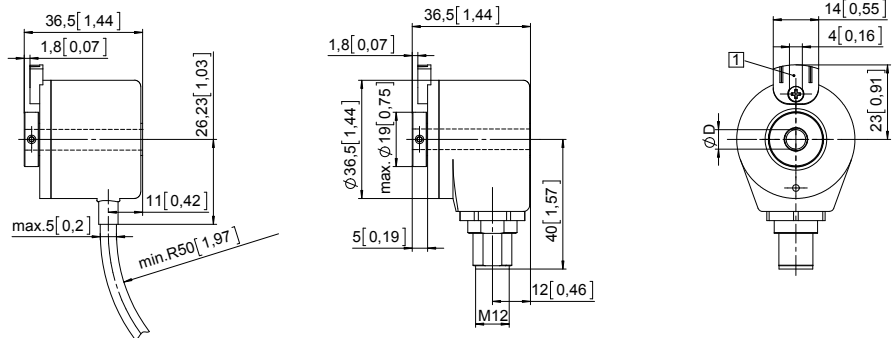
**Push-pull / RS422**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

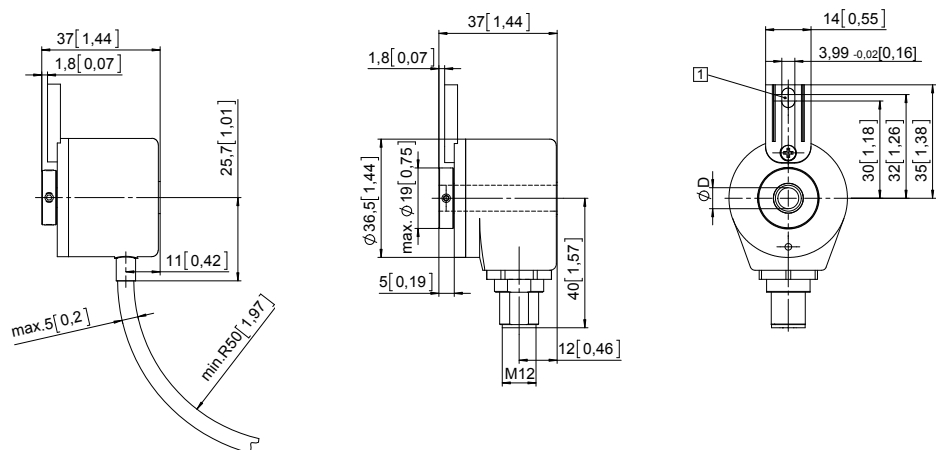
- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]



| D        | Fit |
|----------|-----|
| 6 [0.24] | H7  |
| 8 [0.32] | H7  |
| 1/4"     | H7  |

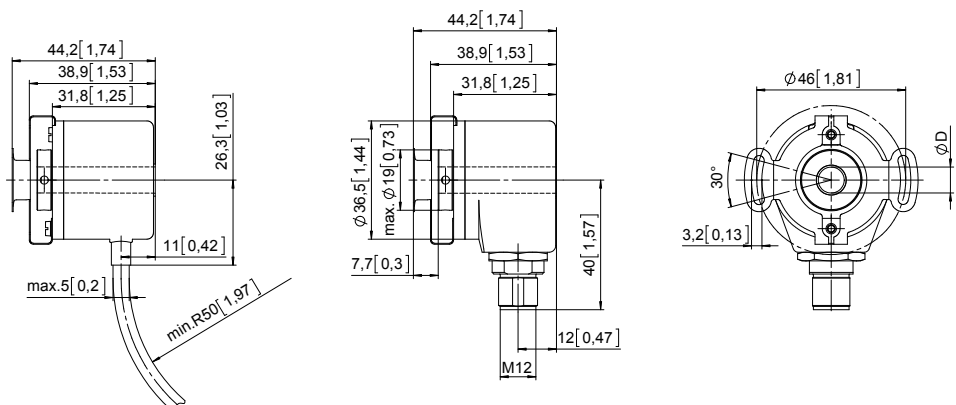
### Flange with spring element, long Flange type 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]



| D        | Fit |
|----------|-----|
| 6 [0.24] | H7  |
| 8 [0.32] | H7  |
| 1/4"     | H7  |

### Flange with stator coupling, $\varnothing 46$ [1.81] Flange type 5



| D        | Fit |
|----------|-----|
| 6 [0.24] | H7  |
| 8 [0.32] | H7  |
| 1/4"     | H7  |

# Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Compact plastic housing, optical</b> | <b>3700 / 3720 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|



The incremental economy encoders type 3700 / 3720 with optical sensor technology are a particularly compact and economical solution.

The carbon-fiber reinforced plastic housing of these incremental encoders is, nevertheless, extremely robust and resistant.



Incremental encoders

|                      |                             |                     |                       |                |
|----------------------|-----------------------------|---------------------|-----------------------|----------------|
|                      |                             |                     |                       |                |
| Magnetic field proof | Reverse polarity protection | Short-circuit proof | High protection level | Optical sensor |

## Reliable

- Tube Tech® cable outlet with extremely high strain relief.
- Ideal for outdoor use thanks to high IP protection.

## Versatile

- Through hollow shaft up to 8 mm.
- Compact size of only 37 mm.
- Up to 1024 pulses per revolution.

|                      |               |                       |
|----------------------|---------------|-----------------------|
| <b>Order code</b>    | <b>8.3700</b> | <b>. XXXXX . XXXX</b> |
| <b>Shaft version</b> | Type          | a b c d e             |

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



|   |   |  |
|---|---|--|
| <p><b>a Flange</b></p> <p><u>1 = clamping-synchro flange, ø 36.8 mm [1.45"]</u><br/>A = flange adapter, mounted, ø 40 mm [1.57"]<sup>2)</sup></p> <p><b>b Shaft with flat, ø x L<sup>2)</sup></b></p> <p>1 = ø 4 x 12.5 mm [0.16 x 0.49"]<br/>2 = ø 5 x 12.5 mm [0.20 x 0.49"]<br/><u>3 = ø 6 x 12.5 mm [0.24 x 0.49"]</u><br/>6 = ø 8 x 12.5 mm [0.32 x 0.49"]<br/>4 = ø 1/4" x 12.5 mm [1/4" x 0.49"]</p> | <p><b>c Output circuit / power supply</b></p> <p>1 = RS422 / 5 V DC (±5 %)</p> <p><u>3 = push-pull (with inverted signal) / 5 ... 30 V DC</u><br/>4 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <p><b>d Type of connection<sup>1)</sup></b></p> <p>1 = axial cable, 1 m [3.28'] PVC<br/><u>2 = radial cable, 1 m [3.28'] PVC</u><br/>3 = axial cable, 2 m [6.56'] PVC<br/>4 = radial cable, 2 m [6.56'] PVC<br/>5 = axial cable, 3 m [9.84'] PVC<br/>6 = radial cable, 3 m [9.84'] PVC<br/>7 = axial cable, 5 m [16.40'] PVC<br/>8 = radial cable, 5 m [16.40'] PVC</p> | <p><b>e Pulse rate</b></p> <p>10, 25, 50, 60, 100, 200, 250, 300, <u>360</u>, 400, <u>500</u>, <u>512</u>, 600, <u>1000</u>, <u>1024</u><br/>(e.g. 360 pulses =&gt; 0360)</p> <p><b>Stock types</b></p> <p>8.3700.1332.0360<br/>8.3700.1332.0500<br/>8.3700.1332.1000<br/>8.3700.1332.1024</p> <p><i>Optional on request</i><br/>- other pulse rates</p> |
|---|---|--|

|                     |               |                       |
|---------------------|---------------|-----------------------|
| <b>Order code</b>   | <b>8.3720</b> | <b>. XXXXX . XXXX</b> |
| <b>Hollow shaft</b> | Type          | a b c d e             |

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



|   |  |  |
|---|--|--|
| <p><b>a Flange</b></p> <p>1 = with spring element, short<br/>2 = with spring element, long<br/><u>5 = with stator coupling, ø 46 mm [1.81"]</u></p> <p><b>b Through hollow shaft</b></p> <p>1 = ø 4 mm [0.16"]<br/>2 = ø 5 mm [0.20"]<br/>3 = ø 6 mm [0.24"]<br/><u>6 = ø 8 mm [0.32"]</u><br/>4 = ø 1/4"</p> | <p><b>c Output circuit / power supply</b></p> <p>1 = RS422 / 5 V DC (±5 %)</p> <p><u>3 = push-pull (with inverted signal) / 5 ... 30 V DC</u><br/>4 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <p><b>d Type of connection<sup>1)</sup></b></p> <p>1 = radial cable, 1 m [3.28'] PVC<br/><u>2 = radial cable, 2 m [6.56'] PVC</u><br/>3 = radial cable, 3 m [9.84'] PVC<br/>4 = radial cable, 5 m [16.40'] PVC</p> | <p><b>e Pulse rate</b></p> <p>10, 25, 50, 60, 100, 200, 250, 300, <u>360</u>, 400, <u>500</u>, <u>512</u>, 600, <u>1000</u>, <u>1024</u><br/>(e.g. 360 pulses =&gt; 0360)</p> <p><b>Stock types</b></p> <p>8.3720.5631.0360<br/>8.3720.5611.1024</p> <p><i>Optional on request</i><br/>- other pulse rates</p> |
|---|--|--|

1) "Tube Tech®" cable outlet guarantees 10 x higher strain relief than traditional cabling methods plus higher IP protection.  
2) With flange adapter L = 8.9 mm [0.35"].

# Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Compact plastic housing, optical</b> | <b>3700 / 3720 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

|  |   |                         |
|--|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b> |   | Order no.               |
| <b>Coupling</b>                              | bellows coupling $\varnothing$ 15 mm [0.59"] for shaft 6 mm [0.24"] | <b>8.0000.1202.0606</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   | Electrical characteristics                              |   |  |  |
|--|---|---|---|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup>  | <b>Output circuit</b>                                   | <b>RS422</b><br>(TTL compatible)                      | <b>Push-pull</b><br>(7272 comp.) <sup>4)</sup> | <b>Push-pull</b><br>(7272 comp.) <sup>4)</sup> |
| <b>Mass moment of inertia</b>                    | shaft version approx. $0.4 \times 10^{-6}$ kgm <sup>2</sup><br>hollow shaft version $1.4 \times 10^{-6}$ kgm <sup>2</sup> | <b>Power supply</b>                                     | 5 V DC ( $\pm 5$ %)                                   | 5 ... 30 V DC                                  | 10 ... 30 V DC                                 |
| <b>Starting torque - at 20°C [68°F]</b>          | shaft version < 0.007 Nm<br>hollow shaft version < 0.01 Nm  | <b>Power consumption with inverted signal (no load)</b> | typ. 40 mA<br>max. 90 mA                              | typ. 50 mA<br>max. 100 mA                      | typ. 50 mA<br>max. 100 mA                      |
| <b>Shaft load capacity</b>                       | radial 20 N<br>axial 10 N   | <b>Permissible load / channel</b>                       | max. +/- 20 mA  | max. +/- 20 mA                                 | max. +/- 20 mA                                 |
| <b>Weight</b>                                    | approx. 0.1 kg [35.27 oz]   | <b>Pulse frequency</b>                                  | max. 250 kHz  | max. 250 kHz                                   | max. 250 kHz                                   |
| <b>Protection acc. to EN 60529</b>               | bearings, shaft IP65<br>cable outlet IP67   | <b>Signal level</b>                                     | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V - 2.0 V<br>max. 0.5 V                  | min. +V - 2.0 V<br>max. 0.5 V                  |
| <b>Working temperature range</b>                 | -20°C ... +70°C [-4°F ... 158°F] <sup>1)</sup>  | <b>Rising edge time t<sub>r</sub></b>                   | max. 200 ns   | max. 1 $\mu$ s                                 | max. 1 $\mu$ s                                 |
| <b>Materials</b>                                 | shaft / hollow shaft stainless steel<br>housing, flange plastic PPA, 40 % CF (carbon fiber)<br>cable PVC                  | <b>Falling edge time t<sub>f</sub></b>                  | max. 200 ns   | max. 1 $\mu$ s                                 | max. 1 $\mu$ s                                 |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms  | <b>Short circuit proof outputs<sup>2)</sup></b>         | yes <sup>3)</sup>                                     | yes  | yes  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz   | <b>Reverse polarity protection of the power supply</b>  | no  | no   | yes  |
|  |   | <b>UL approval</b>                                      | file 224618   |  |  |
|  |   | <b>CE compliant acc. to</b>                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |  |  |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|
| 1, 3, 4        | 1 ... 8            | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

1) For versions with push-pull output and power supply >15 V DC: max. 55°C [+131°F].  
 2) If power supply correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 if +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.  
 if +V = 5 ... 30 V DC short circuit to channel or 0 V is permitted.  
 4) Max. recommended cable length 30 m [98.43'].

# Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Compact plastic housing, optical</b> | <b>3700 / 3720 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

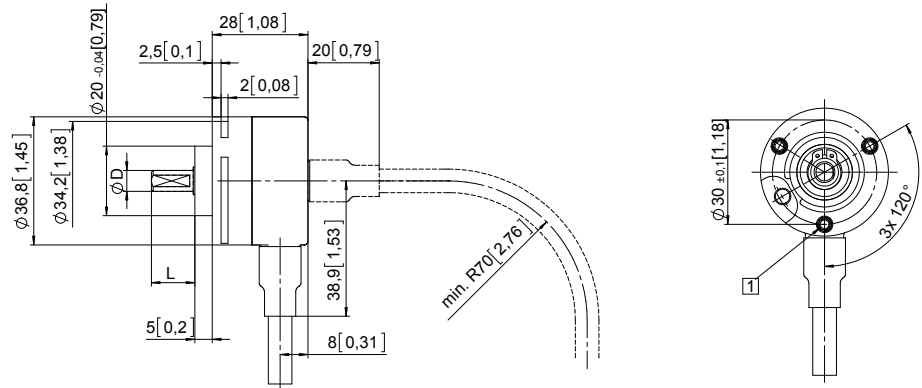
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping-synchro flange, $\varnothing$ 36.8 [1.45]

#### Flange type 1

1 3 x M3, 6 [0.24] deep

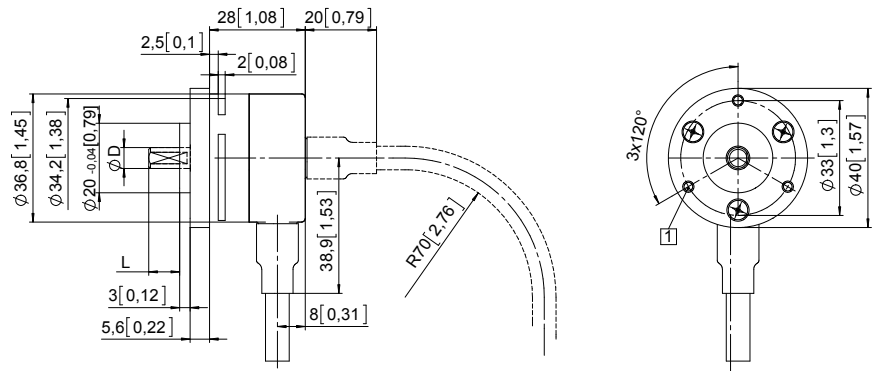


| D        | Fit | L           |
|----------|-----|-------------|
| 4 [0.16] | h7  | 12.5 [0.49] |
| 5 [0.20] | h7  | 12.5 [0.49] |
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

### Flange adapter, $\varnothing$ 40 [1.57]

#### Flange type A

1 3 x M3, 6 [0.24] deep



| D        | Fit | L           |
|----------|-----|-------------|
| 4 [0.16] | h7  | 12.5 [0.49] |
| 5 [0.20] | h7  | 12.5 [0.49] |
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

# Incremental encoders

**Compact plastic housing, optical**

**3700 / 3720 (shaft / hollow shaft)**

**Push-pull / RS422**

## Dimensions hollow shaft version

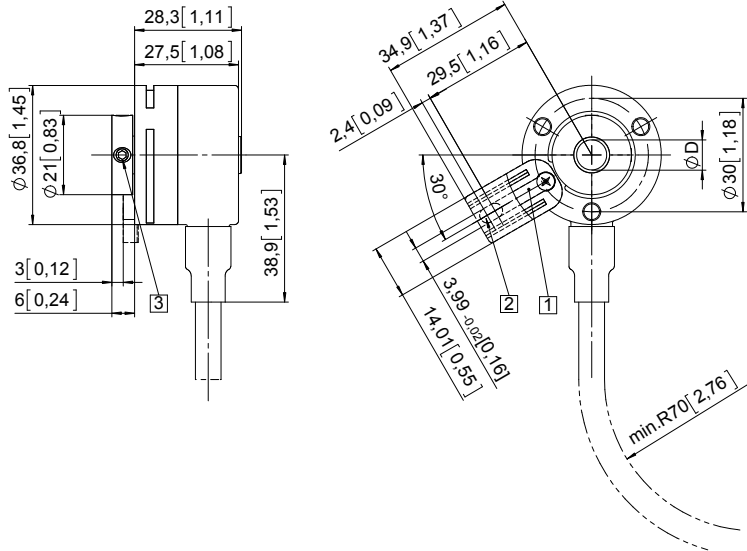
Dimensions in mm [inch]

### Flange with spring element, short

(long spring element version is shown dashed)

#### Flange type 1 (2)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\phi$  4 [0.16]
- 2 Spring element, long
- 3 Recommended torque for the clamping ring 1.0 Nm

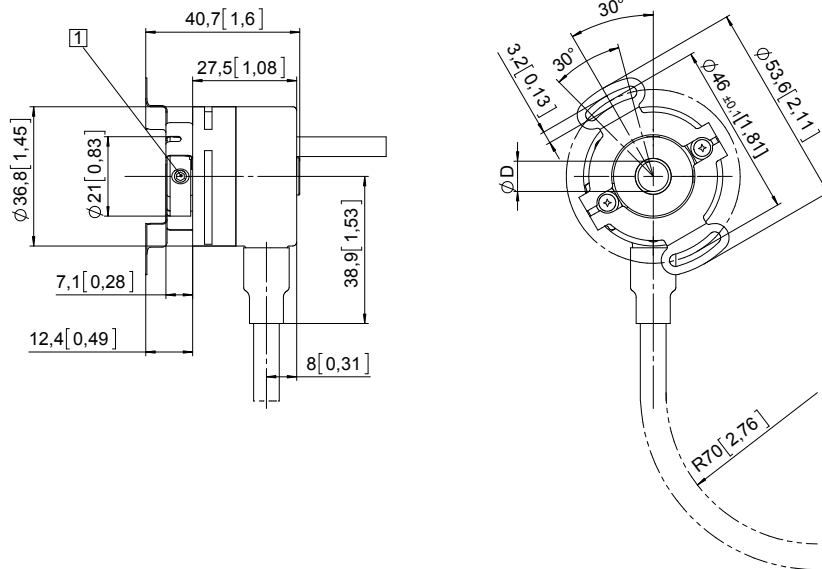


| D        | Fit |
|----------|-----|
| 4 [0.16] | H7  |
| 5 [0.20] | H7  |
| 6 [0.24] | H7  |
| 8 [0.32] | H7  |
| 1/4"     | H7  |

### Flange with stator coupling, $\phi$ 46 [1.81]

#### Flange type 5

- 1 Recommended torque for the clamping ring 1.0 Nm



| D        | Fit |
|----------|-----|
| 4 [0.16] | H7  |
| 5 [0.20] | H7  |
| 6 [0.24] | H7  |
| 8 [0.32] | H7  |
| 1/4"     | H7  |

# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|



Due to their sturdy bearing construction in Safety-Lock™ Design, the Sendix 5000 and 5020 offer high resistance against vibration and installation errors.

The rugged housing, high protection level of up to IP67, as well as the wide temperature range of -40°C up to +85°C, make this product range the perfect encoder for all applications.

**NEW: 24one delivery promise**



Incremental encoders

|              |                       |                   |                       |                          |                             |                      |                     |                             |                |   |
|--------------|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|---|
|              |                       |                   |                       |                          |                             |                      |                     |                             |                |   |
| Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional |

## Robust performance

- Increased resistance against vibrations and tolerance of installation errors, elimination of machine downtime and repairs thanks to sturdy bearing construction in "Safety-Lock™ Design".
- Ensures highest safety against field breakdowns and is thus suitable also for outside use thanks to its resistant die-cast housing and protection up to IP67.
- Undetachable clamping ring on hollow shaft encoders.
- Wide temperature range, -40°C ... +85°C.

### NEW:

- Higher shock resistance.
- Higher vibration resistance.
- IP66 and IP67 protection level in one version.

## Many variants

- Suitable connection variant for every specific case: cable connection, M12, M23, MIL and Sub-D connector.
- Reliable mounting in a wide variety of installation situations: comprehensive and proven fixing possibilities.
- Compatible with all US and European standards.
- Max. 5000 pulses per revolution.

### NEW:

- Double number of standard pulse numbers.
- Variants with connector fitted in the cable – for error-free electrical connection to your control.
- Additional connector variants (M12 / 5-pin, Sub-D).
- Additional standard cable lengths.

## Technology in detail

|  |                                     |  |                                |
|--|-------------------------------------|--|--------------------------------|
| <b>Robust Safety-Lock™ bearing structure</b> | <b>Cables with fitted connector</b> | <b>Undetachable clamping ring</b><br>Slotted clamping ring + slotted shaft | <b>Tangential cable outlet</b> |
|  |                                     |  |                                |

# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

|                      |               |   |   |   |   |   |   |  |
|----------------------|---------------|---|---|---|---|---|---|--|
| <b>Order code</b>    | <b>8.5000</b> | . <b>XXXX</b> . <b>XXXX</b>   |   |   |   |   |   |  |
| <b>Shaft version</b> | Type          | <table border="1" style="font-size: 8px; border-collapse: collapse; width: 100%;"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> </tr> </table> | a | b | c | d | e |  |
| a                    | b             | c   | d | e |   |   |   |  |

We offer for all encoders configured with the underlined preferential options our free of charge 24one delivery promise.

Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

24one

**a Flange**

- 5 = synchro flange, IP66/IP67     $\varnothing$  50.8 mm [2"]
  - 6 = synchro flange, IP65         $\varnothing$  50.8 mm [2"]
  - 7 = clamping flange, IP66/IP67     $\varnothing$  58 mm [2.28"]
  - 8 = clamping flange, IP65         $\varnothing$  58 mm [2.28"]
  - A = synchro flange, IP66/IP67     $\varnothing$  58 mm [2.28"]<sup>1)</sup>
  - B = synchro flange, IP65         $\varnothing$  58 mm [2.28"]<sup>1)</sup>
  - C = square flange, IP66/IP67     $\square$  63.5 mm [2.5"]
  - D = square flange, IP65         $\square$  63.5 mm [2.5"]
  - G = Euroflansch, IP66/IP67     $\varnothing$  115 mm [4.53"]<sup>2)</sup>
- 
- 1 = servo flange, IP66/IP67     $\varnothing$  50.8 mm [2"]<sup>3)</sup>
  - 2 = servo flange, IP65         $\varnothing$  50.8 mm [2"]<sup>3)</sup>
  - 3 = square flange, IP66/IP67     $\square$  52.3 mm [2.06"]<sup>3)</sup>
  - 4 = square flange, IP65         $\square$  52.3 mm [2.06"]<sup>3)</sup>
  - E = servo flange, IP66/IP67     $\varnothing$  63.5 mm [2.5"]<sup>3)</sup>
  - F = servo flange, IP65         $\varnothing$  63.5 mm [2.5"]<sup>3)</sup>

**b Shaft ( $\varnothing \times L$ ), with flat**

- 1 =  $\varnothing$  6 x 10 mm [0.24 x 0.39"]
  - 2 =  $\varnothing$  1/4 x 5/8" (6.35 x 15.875 mm)
  - 6 =  $\varnothing$  8 x 15 mm [0.32 x 0.59"]
  - 3 =  $\varnothing$  10 x 20 mm [0.39 x 0.79"]
  - 4 =  $\varnothing$  3/8 x 5/8" (9.5 x 15.875 mm)
  - B =  $\varnothing$  11 x 33 mm [0.43 x 1.30"], with feather key shaft slot<sup>4)</sup>
  - 5 =  $\varnothing$  12 x 20 mm [0.47 x 0.79"]
- 
- 7 =  $\varnothing$  1/4 x 7/8"<sup>3)</sup>
  - 8 =  $\varnothing$  3/8 x 7/8"<sup>3)</sup>

**c Output circuit / power supply**

- 4 = RS422 (with inverted signal) / 5 V DC
  - 1 = RS422 (with inverted signal) / 5 ... 30 V DC
  - 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
  - 5 = push-pull (with inverted signal) / 10 ... 30 V DC
  - 7 = push-pull (without inverted signal) / 10 ... 30 V DC<sup>5)</sup>
- 
- 3 = open collector (with inverted signal) / 5 ... 30 V DC<sup>3)</sup>
  - 8 = push-pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC<sup>1) 3) 6)</sup>

**d Type of connection – cable**

- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC \*)
- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC \*)

*Type of connection – connector*

- P = axial M12 connector, 5-pin<sup>7)</sup>
  - R = radial M12 connector, 5-pin<sup>7)</sup>
  - 3 = axial M12 connector, 8-pin
  - 4 = radial M12 connector, 8-pin
  - 7 = axial M23 connector, 12-pin
  - 8 = radial M23 connector, 12-pin
  - Y = radial MIL connector, 10-pin
  - W = radial MIL connector, 7-pin
- 
- 9 = radial MIL connector, 6-pin<sup>3)</sup>

*Type of connection – connector with cable*

- L = radial cable with M12 connector, 8-pin, special length PVC \*)
- M = radial cable with M23 connector, 12-pin, special length PVC \*)
- N = radial cable with Sub-D connector, 9-pin, special length PVC \*)

\*) Available special lengths (connection types A, B, L, M, N):  
 0.3, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20 m [0.98, 1.64, 3.28, 6.56, 9.84, 13.12, 16.40, 19.69, 26.25, 32.80, 39.37, 49.21, 65.62']  
 order code expansion .XXXX = length in dm  
 ex.: 8.5000.814A.1024.0030 (for cable length 3 m)

**e Pulse rate**

- 1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
- (e.g. 100 pulses => 0100)

*Optional on request*

- other pulse rates
- Ex 2/22<sup>8)</sup>
- surface protection salt spray

| Mounting accessory for shaft encoders |  | Order no.               |
|---------------------------------------|--|-------------------------|
| <b>Coupling</b>                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

1) 24one type only in conjunction with shaft type 1.  
 2) Only in conjunction with shaft type B.  
 3) US version.  
 4) Only in conjunction with flange type G.

5) Only in conjunction with type of connection P or R.  
 6) Attention: no CE types!  
 7) Only in conjunction with output circuit 7.  
 8) For the cable connection type, cable material PUR.



# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

**Order code** **8.5020** . **XXXX** . **XXXX** . **XXXX**

**Hollow shaft** Type **a** **b** **c** **d** **e**

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Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

**24one**

**a Flange**

**1** = with spring element, long, IP66/IP67  
**2** = with spring element, long, IP65  
**3** = with torque stop, long, IP66/IP67  
**4** = with torque stop, long, IP65  
**7** = with stator coupling, IP66/IP67 ø 65 mm [2.56"]  
**8** = with stator coupling, IP65 ø 65 mm [2.56"]  
**C** = with stator coupling, IP66/IP67 ø 63 mm [2.48"]  
**D** = with stator coupling, IP65 ø 63 mm [2.48"]

5 = with stator coupling, IP66/IP67 ø 57.2 mm [2.25"]<sup>1)</sup>  
 6 = with stator coupling, IP65 ø 57.2 mm [2.25"]<sup>1)</sup>

**b Through hollow shaft**

1 = ø 6 mm [0.24"]  
 2 = ø 1/4"  
**9** = ø 8 mm [0.32"]  
 4 = ø 3/8"  
**3** = ø 10 mm [0.39"]  
**5** = ø 12 mm [0.47"]  
 6 = ø 1/2"  
 A = ø 14 mm [0.55"]  
**8** = ø 15 mm [0.59"]  
 7 = ø 5/8"

**c Output circuit / power supply**

**4** = RS422 (with inverted signal) / 5 V DC  
**1** = RS422 (with inverted signal) / 5 ... 30 V DC  
**2** = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC  
**5** = push-pull (with inverted signal) / 10 ... 30 V DC  
 7 = push-pull (without inverted signal) / 10 ... 30 V DC<sup>3)</sup>

**3** = open collector (with inverted signal) / 5 ... 30 V DC<sup>1)</sup>  
 8 = push-pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC<sup>1)2)</sup>

**d Type of connection – cable**

**1** = radial cable, 1 m [3.28'] PVC  
 A = radial cable, special length PVC \*)  
**E** = tangential cable, 1 m [3.28'] PVC  
 F = tangential cable, special length PVC \*)

*Type of connection – connector*

R = radial M12 connector, 5-pin<sup>4)</sup>  
**2** = radial M12 connector, 8-pin  
**4** = radial M23 connector, 12-pin  
 6 = radial MIL connector, 7-pin  
**7** = radial MIL connector, 10-pin

*Type of connection – connector with cable*

H = tangential cable, 0.3 m [0.98'] PVC, incl. M12 connector, 8-pin for central fastening  
 L = tangential cable with M12 connector, 8-pin, special length PVC \*)  
 M = tangential cable with M23 connector, 12-pin, special length PVC \*)  
 N = tangential cable with Sub-D connector, 9-pin, special length PVC \*)

\*) Available special lengths (connection types A, F, L, M, N):  
 0.3, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20 m [0.98, 1.64, 3.28, 6.56, 9.84, 13.12, 16.40, 19.69, 26.25, 32.80, 39.37, 49.21, 65.62']  
 order code expansion .XXXX = length in dm  
 ex.: 8.5020.234A.1024.0030 (for cable length 3 m)

**e Pulse rate**

**1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000**  
 (e.g. 100 pulses => 0100)

*Optional on request*

- other pulse rates
- Ex 2/22 (not for type of connection E, F, H, L, M, N)<sup>5)</sup>
- surface protection salt spray tested

Incremental encoders

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

**Cylindrical pin, long**

for flange with spring element  
 (flange type 1 + 2)

with fixing thread

**8.0010.4700.0000**

**Isolation / adapter inserts for hollow shaft encoders order code 8.5020.X8XX.XXXX**

**Thermal and electrical isolation of the encoders**  
 (Temperature range -40 ... +115°C [-40°F ... +239°F])

Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.

| Dimensions    | Order no.               |
|---------------|-------------------------|
| 6 mm [0.24"]  | <b>8.0010.4021.0000</b> |
| 8 mm [0.32"]  | <b>8.0010.4020.0000</b> |
| 10 mm [0.39"] | <b>8.0010.4023.0000</b> |
| 12 mm [0.47"] | <b>8.0010.4025.0000</b> |
| 1/4"          | <b>8.0010.4022.0000</b> |
| 3/8"          | <b>8.0010.4024.0000</b> |
| 1/2"          | <b>8.0010.4026.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

1) US version.  
 2) Attention: no CE types!  
 3) Only in conjunction with type of connection R.  
 4) Only in conjunction with output circuit 7.  
 5) For the cable connection type, cable material PUR.

# Incremental encoders

| Standard optical                           | Sendix 5000 / 5020 (shaft / hollow shaft)                               | Push-pull / RS422 / Open collector |
|--|---|------------------------------------|
| <b>Connection technology</b>               |   | Order no.                          |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable  | <b>05.00.6041.8211.002M</b>        |
|  | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6901.0002</b>            |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                           | <b>05.CMB 8181-0</b>               |
|  | M23 female connector with coupling nut, 12-pin                          | <b>8.0000.5012.0000</b>            |
|  | MIL female connector with coupling nut, 10-pin                          | <b>8.0000.5062.0000</b>            |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                                   |  |
|--|--|
| <b>Mechanical characteristics</b>                |  |
| <b>Maximum speed</b>                             | IP65 12000 min <sup>-1</sup><br>6000 min <sup>-1</sup> (continuous)<br>IP66/IP67 6000 min <sup>-1</sup><br>3000 min <sup>-1</sup> (continuous) |
| <b>Mass moment of inertia</b>                    | shaft version approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version approx. 6 x 10 <sup>-6</sup> kgm <sup>2</sup>            |
| <b>Starting torque at 20°C [68°F]</b>            | IP65 < 0.01 Nm<br>IP66/IP67 < 0.05 Nm  |
| <b>Shaft load capacity</b>                       | radial 100 N<br>axial 50 N   |
| <b>Weight</b>                                    | approx. 0.4 kg [14.11 oz]  |
| <b>Protection acc. to EN 60529</b>               | without shaft seal IP65<br>with shaft seal IP66/IP67   |
| <b>Working temperature range</b>                 | -40°C <sup>1)</sup> ... +85°C [-40°F <sup>1)</sup> ... +185°F]   |
| <b>Material</b>                                  | shaft stainless steel  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 3000 m/s <sup>2</sup> , 6 ms <sup>2)</sup>   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz <sup>3)</sup>  |

| Electrical characteristics                             |   |                          |                              |                               |                                     |                           |
|--|---|--------------------------|------------------------------|-------------------------------|-------------------------------------|---------------------------|
| Output circuit   | RS422 (TTL compatible)                                | RS422 (TTL compatible)   | Push-pull                    | Push-pull (7272 compatible)   | Push-pull (7272, without capacitor) | Open collector (7273)     |
| Order code   | <b>1</b>  | <b>4</b>                 | <b>5, 7</b>                  | <b>2</b>                      | <b>8</b>                            | <b>3</b>                  |
| <b>Power supply</b>                                    | 5 ... 30 V DC   | 5 V DC (±5 %)            | 10 ... 30 V DC               | 5 ... 30 V DC                 | 5 ... 30 V DC                       | 5 ... 30 V DC             |
| <b>Power consumption (no load)</b>                     | typ. 40 mA<br>max. 90 mA                              | typ. 40 mA<br>max. 90 mA | typ. 50 mA<br>max. 100 mA    | typ. 50 mA<br>max. 100 mA     | typ. 50 mA<br>max. 100 mA           | 100 mA                    |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA  | max. +/- 20 mA           | max. +/- 20 mA               | max. +/- 20 mA                | max. +/- 20 mA                      | +/- 20 mA sink at 30 V DC |
| <b>Pulse frequency</b>                                 | max. 300 kHz  | max. 300 kHz             | max. 300 kHz                 | max. 300 kHz <sup>4)</sup>    | max. 300 kHz                        | max. 300 kHz              |
| <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. 2.5 V<br>max. 0.5 V | min +V - 1.0 V<br>max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V       |                           |
| <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns   | max. 200 ns              | max. 1 μs                    | max. 1 μs                     | max. 1 μs                           |                           |
| <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns   | max. 200 ns              | max. 1 μs                    | max. 1 μs                     | max. 1 μs                           |                           |
| <b>Short circuit proof outputs<sup>5)</sup></b>        | yes <sup>6)</sup>                                     | yes <sup>6)</sup>        | yes                          | yes                           | yes <sup>6)</sup>                   | yes                       |
| <b>Reverse polarity protection of the power supply</b> | yes   | no                       | yes                          | no                            | no                                  | no                        |
| <b>UL approval</b>                                     | file 224618   |                          |                              |                               |                                     |                           |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                          |                              |                               |                                     |                           |

1) With connector: -40°C [-40°F], cable fixed: -30°C [-22°F], cable moved: -20°C [-4°F].  
 2) For MIL connectors: 2500 m/s<sup>2</sup>  
 3) For MIL connectors: 100 m/s<sup>2</sup>  
 4) Max. recommended cable length 30 m [98.43'].  
 5) If power supply correctly applied.  
 6) Only one channel allowed to be shorted-out:  
 at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
 at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

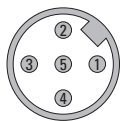
## Terminal assignment

| Output circuit   | Type of connection                            | Cable (isolate unused wires individually before initial start-up) |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|------------------|---|---|-----|----|---------|-----------|-----------|------------------|-----------|-----------|------------------|-----------|------------------|--|
| 1, 2, 3, 4, 5, 8 | 5000: 1, 2, A, B                              | Signal:   | 0 V | +V | 0 Vsens | +Vsens    | A         | $\bar{A}$        | B         | $\bar{B}$ | 0                | $\bar{0}$ | $\perp$          |  |
|                  | 5020: 1, A, E, F                              | Cable color:  | WH  | BN | GY PK   | RD BU     | GN        | YE               | GY        | PK        | BU               | RD        | shield           |  |
| 1, 2, 3, 4, 7, 8 | 5000: P, R<br>5020: R                         | M12 connector, 5-pin  |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | A       | B         | 0         | $\perp$          |           |           |                  |           |                  |  |
|                  |   | Pin:  | 1   | 2  | 3       | 4         | 5         | PH <sup>1)</sup> |           |           |                  |           |                  |  |
| 1, 2, 3, 4, 5, 8 | 5000: 3, 4, L<br>5020: 2, H <sup>2)</sup> , L | M12 connector, 8-pin  |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | A       | $\bar{A}$ | B         | $\bar{B}$        | 0         | $\bar{0}$ | $\perp$          |           |                  |  |
|                  |   | Pin:  | 1   | 2  | 3       | 4         | 5         | 6                | 7         | 8         | PH <sup>1)</sup> |           |                  |  |
| 1, 2, 3, 4, 5, 8 | 5000: 7, 8, M<br>5020: 4, M                   | M23 connector, 12-pin   |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | 0 Vsens | +Vsens    | A         | $\bar{A}$        | B         | $\bar{B}$ | 0                | $\bar{0}$ | $\perp$          |  |
|                  |   | Pin:  | 10  | 12 | 11      | 2         | 5         | 6                | 8         | 1         | 3                | 4         | PH <sup>1)</sup> |  |
| 1, 2, 3, 4, 5, 8 | 5000: Y<br>5020: 7                            | MIL connector, 10-pin   |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | +Vsens  | A         | $\bar{A}$ | B                | $\bar{B}$ | 0         | $\bar{0}$        | $\perp$   |                  |  |
|                  |   | Pin:  | F   | D  | E       | A         | G         | B                | H         | C         | I                | J         |                  |  |
| 1, 3, 4, 7, 8    | 5000: W<br>5020: 6                            | MIL connector, 7-pin  |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | +Vsens  | A         | B         | 0                | $\perp$   |           |                  |           |                  |  |
|                  |   | Pin:  | F   | D  | E       | A         | B         | C                | G         |           |                  |           |                  |  |
| 1, 3, 4, 7, 8    | 5000: 9                                       | MIL connector, 6-pin  |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | A       | B         | 0         | $\perp$          |           |           |                  |           |                  |  |
|                  |   | Pin:  | A   | B  | E       | D         | C         |                  |           |           |                  |           |                  |  |
| 1, 2, 3, 4, 5, 8 | 5000: N<br>5020: N                            | Sub-D connector, 9-pin  |     |    |         |           |           |                  |           |           |                  |           |                  |  |
|                  |   | Signal:   | 0 V | +V | A       | $\bar{A}$ | B         | $\bar{B}$        | 0         | $\bar{0}$ | $\perp$          |           |                  |  |
|                  |   | Pin:  | 9   | 5  | 1       | 6         | 2         | 7                | 3         | 8         | PH <sup>1)</sup> |           |                  |  |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.

A,  $\bar{A}$ : Incremental output channel A  
 B,  $\bar{B}$ : Incremental output channel B  
 0,  $\bar{0}$ : Reference signal  
 PH  $\perp$ : Plug connector housing (shield)

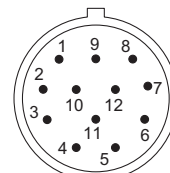
## Top view of mating side, male contact base



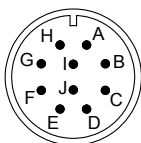
M12 connector, 5-pin



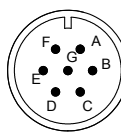
M12 connector, 8-pin



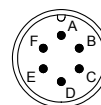
M23 connector, 12-pin



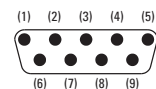
MIL connector, 10-pin



MIL connector, 7-pin



MIL connector, 6-pin



Sub-D connector, 9-pin

1) PH = shield is attached to connector housing.  
 2) With type of connection H shield is not attached to connector housing.

# Incremental encoders

**Standard optical**

**Sendix 5000 / 5020 (shaft / hollow shaft)**

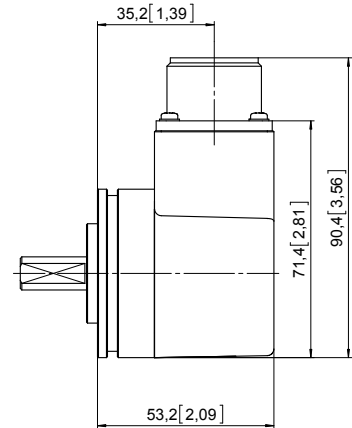
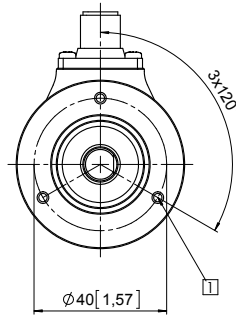
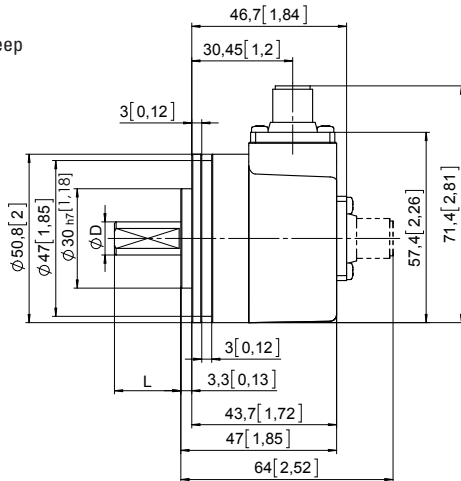
**Push-pull / RS422 / Open collector**

## Dimensions shaft version

Dimensions in mm [inch]

**Synchro flange, ø 50.8 [2]  
Flange type 5 and 6**

1 3 x M3, 6 [0.24] deep



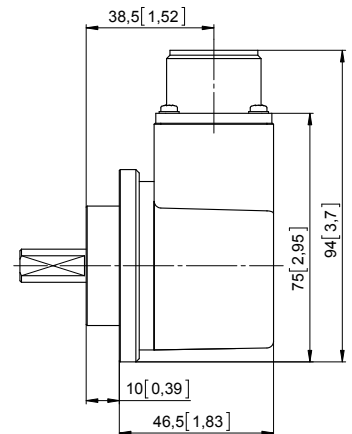
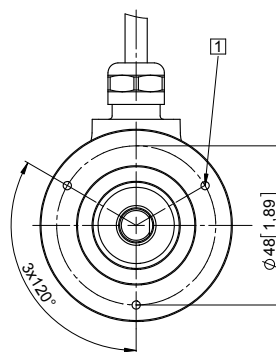
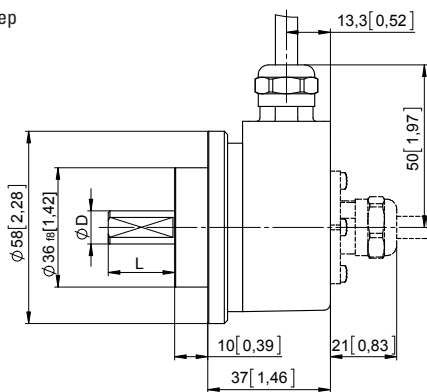
MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

**Clamping flange, ø 58 [2.28]**

**Flange type 7 and 8**

1 3 x M3, 6 [0.24] deep



MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Incremental encoders

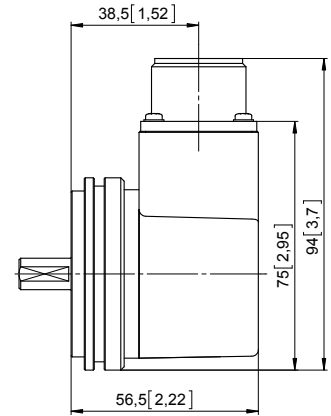
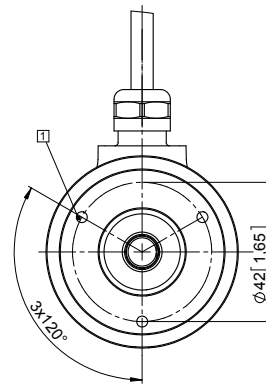
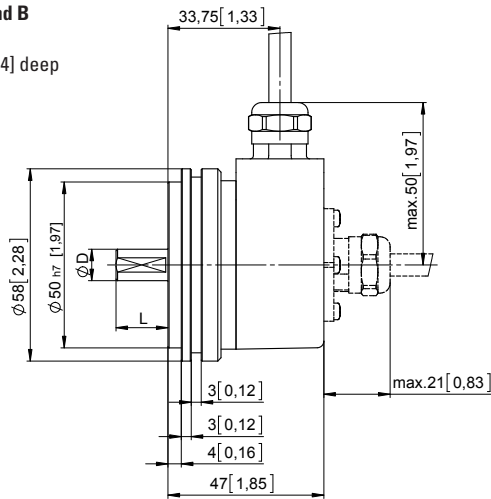
|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

## Dimensions shaft version

Dimensions in mm [inch]

### Synchro flange, $\varnothing 58$ [2.28] Flange type A and B

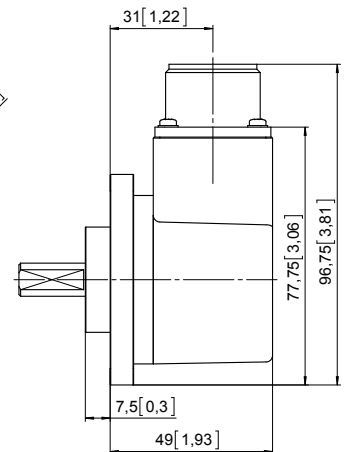
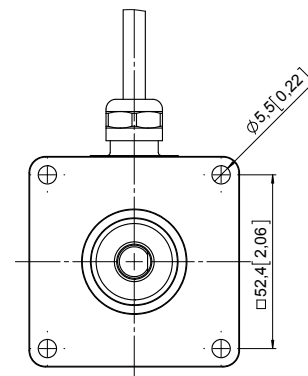
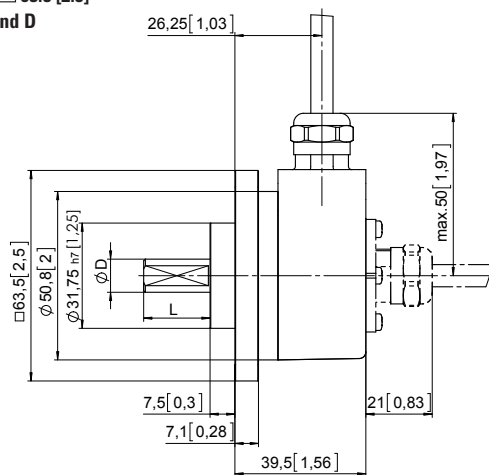
1 3 x M4, 6 [0.24] deep



MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square 63.5$ [2.5] Flange type C and D



MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

Incremental encoders

# Incremental encoders

**Standard optical**

**Sendix 5000 / 5020 (shaft / hollow shaft)**

**Push-pull / RS422 / Open collector**

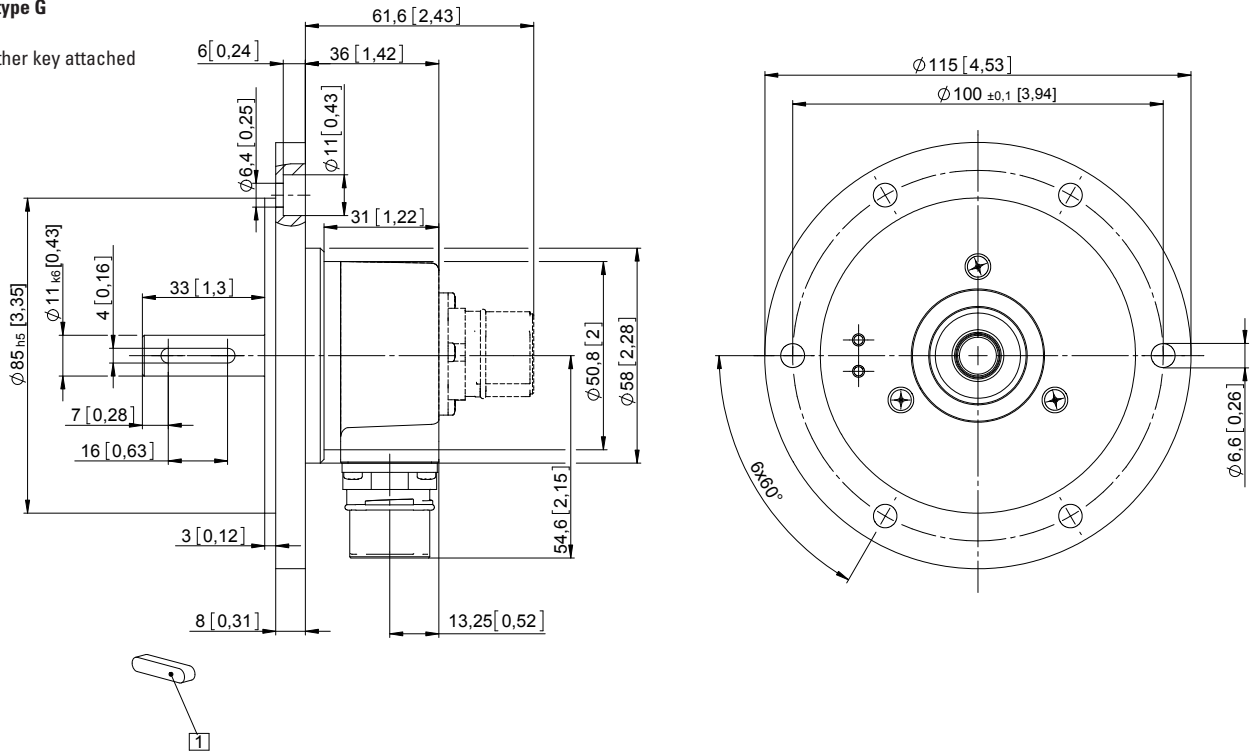
## Dimensions shaft version

Dimensions in mm [inch]

### Euro flange, ø 115 [4.53]

#### Flange type G

1 Feather key attached

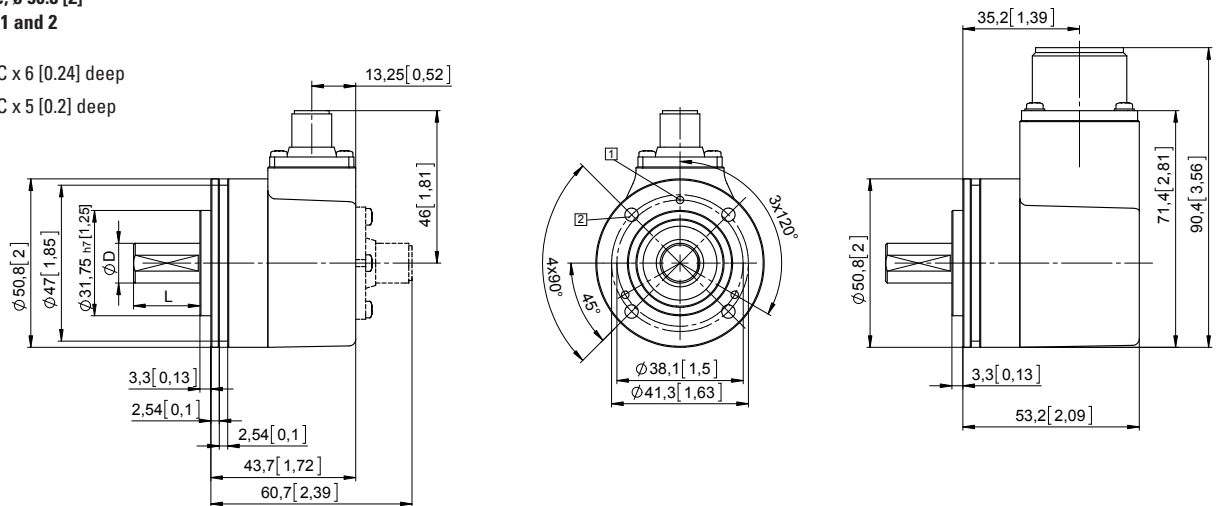


### Servo flange, ø 50.8 [2]

#### Flange type 1 and 2

1 4-40 UNC x 6 [0.24] deep

2 6-32 UNC x 5 [0.2] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

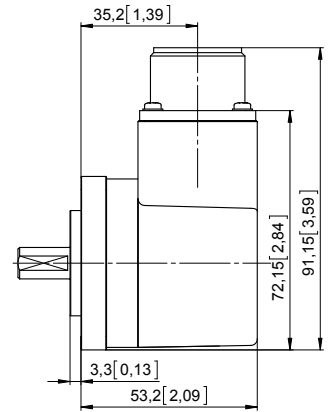
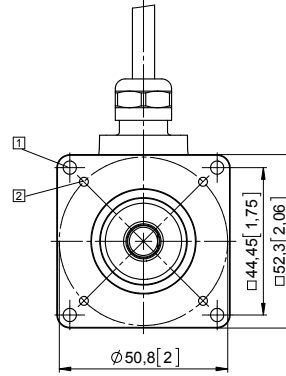
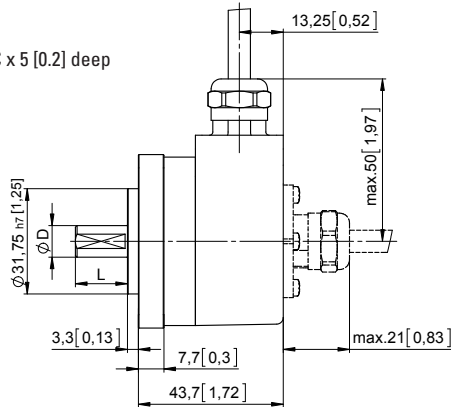
## Dimensions shaft version

Dimensions in mm [inch]

Square flange, □ 52.3 [2.06]

Flange type 3 and 4

- 1  $\varnothing$  4 [0.16]
- 2 6-32 UNC x 5 [0.2] deep



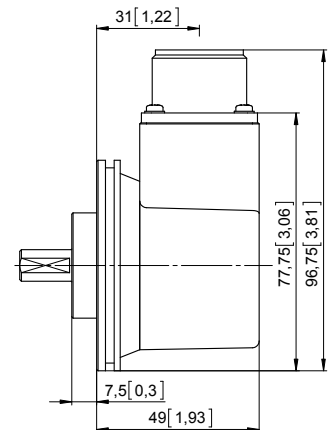
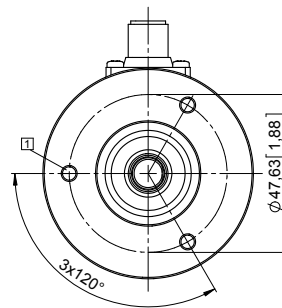
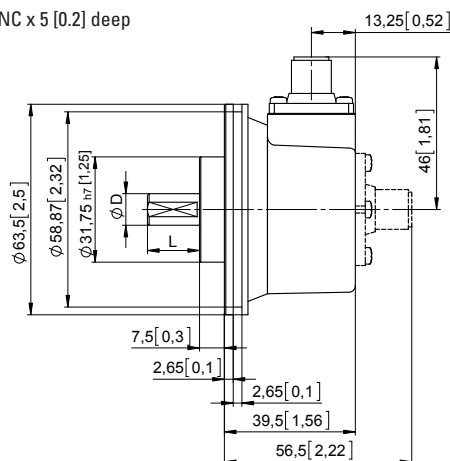
MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

## Servo flange, $\varnothing$ 63.5 [2.5]

Flange type E and F

- 1 6-32 UNC x 5 [0.2] deep



MIL-connector version

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 1/4"      | h7  | 5/8"      |
| 3/8"      | h7  | 5/8"      |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Incremental encoders

**Standard optical**

**Sendix 5000 / 5020 (shaft / hollow shaft)**

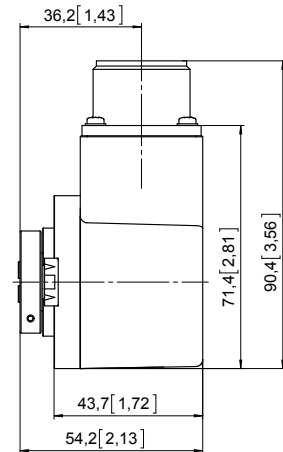
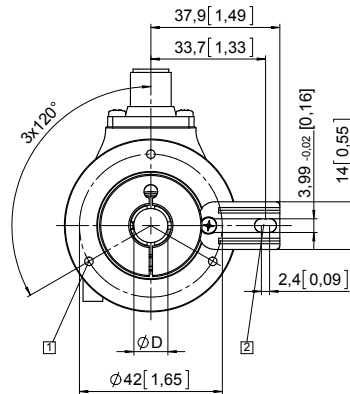
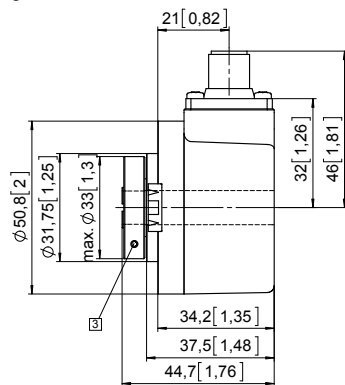
**Push-pull / RS422 / Open collector**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

- 1 3 x M3, 6 [0.24] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm

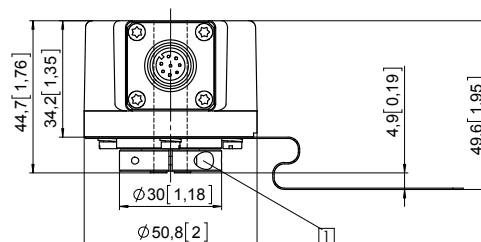
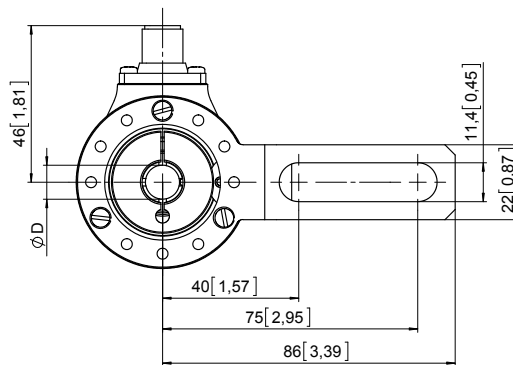


MIL-connector version

| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |

### Flange with torque stop, long Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |



# Incremental encoders

|                         |  |   |
|-------------------------|--|---|
| <b>Standard optical</b> | <b>Sendix 5000 / 5020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|--|---|

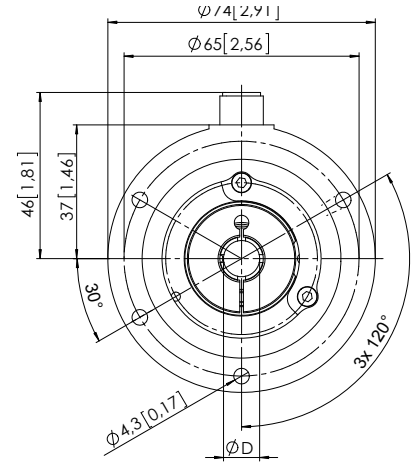
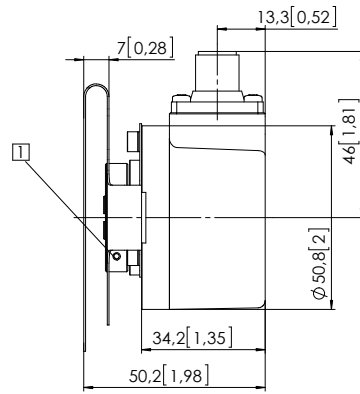
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 7 and 8

1 Recommended torque for the clamping ring 0.6 Nm

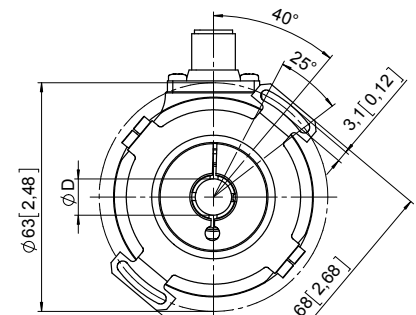
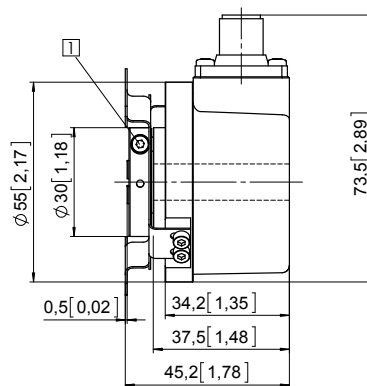
| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |



### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type C and D

1 Recommended torque for the clamping ring 0.6 Nm

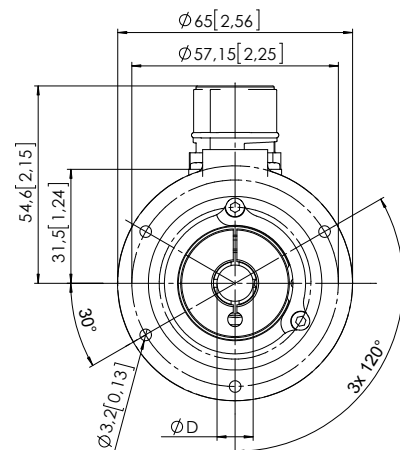
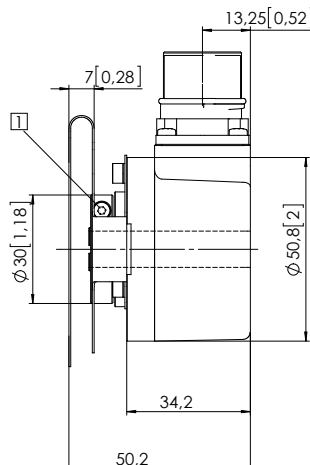
| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |



### Flange with stator coupling, $\varnothing 57.2$ [2.25] Flange type 5 and 6

1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |



# Incremental encoders

**Standard optical**

**Sendix 5000 / 5020 (shaft / hollow shaft)**

**Push-pull / RS422 / Open collector**

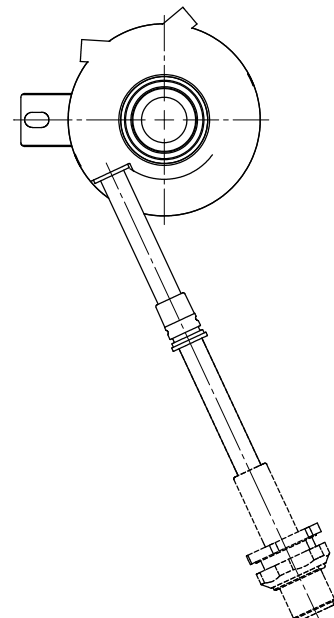
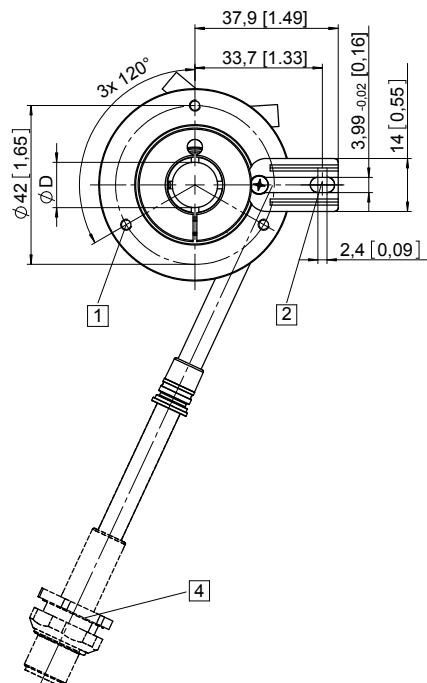
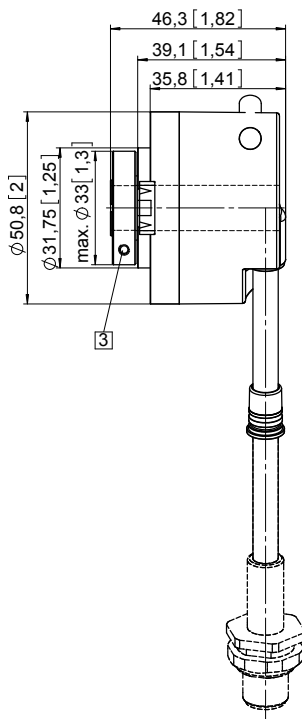
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long and tangential cable outlet

Type of connection E, F and H

- 1 3 x M3, 6 [0.24] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm
- 4 Shield is not applied on connector



| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |
| 5/8"      | H7  |

# Incremental encoders

Incremental encoders

**Standard optical**
**Sendix Base KIS50 / KIH50 (shaft / hollow shaft)**
**Push-pull / RS422 / Open collector**


The encoders Sendix Base KIS50 / KIH50 offer a protection level up to IP65 and can be used with temperatures from -20°C up to +70°C. They are ideal for use in standard applications and in simple machines.

The Sendix Base KIS50 / KIH50 family also features our well proven Safety-Lock™ system, allowing higher tolerance of possible installation errors and increasing the overall performance of this encoder.



|              |                       |                                  |                             |                          |                             |                      |                     |                             |                |
|--------------|-----------------------|----------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|
|              |                       |                                  |                             |                          |                             |                      |                     |                             |                |
| Safety-Lock™ | High rotational speed | Temperature range<br>-20...+70°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor |

### Robust

- Resistant die-cast housing and protection up to IP65.
- Wide temperature range, -20°C ... +70°C.
- Elimination of machine downtime thanks to sturdy bearing construction in "Safety-Lock™ Design".

### Flexible

- Suitable connection variant for every specific case: cable connection, M12 and M23 connector.
- Various mounting options.
- Up to 5000 pulses per revolution.

**Order code**      8.KIS50 . XXXX . XXXX  
**Shaft version**      Type      a      b      c      d      e

- |  |   |  |
|--|---|--|
| <p><b>a Flange</b><br/>8 = clamping flange, IP65    <math>\varnothing</math> 58 mm [2.28"]<br/>B = synchro flange, IP65    <math>\varnothing</math> 58 mm [2.28"]</p> <p><b>b Shaft (<math>\varnothing \times L</math>), with flat</b><br/>1 = <math>\varnothing</math> 6 x 10 mm [0.24 x 0.39"]<br/>6 = <math>\varnothing</math> 8 x 15 mm [0.32 x 0.59"]<br/>3 = <math>\varnothing</math> 10 x 20 mm [0.39 x 0.79"]<br/>5 = <math>\varnothing</math> 12 x 20 mm [0.47 x 0.79"]</p> | <p><b>c Output circuit / power supply</b><br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC<br/>3 = open collector (with inverted signal) / 5 ... 30 V DC</p> | <p><b>d Type of connection</b><br/>1 = axial cable, 1 m [3.28'] PVC<br/>2 = radial cable, 1 m [3.28'] PVC<br/>3 = axial M12 connector, 8-pin<br/>4 = radial M12 connector, 8-pin<br/>7 = axial M23 connector, 12-pin<br/>8 = radial M23 connector, 12-pin</p> <p><b>e Pulse rate</b><br/>100, 200, 250, 256, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> |
|--|---|--|

**Order code**      8.KIH50 . XXXX . XXXX  
**Hollow shaft**      Type      a      b      c      d      e

- |   |   |  |
|---|---|--|
| <p><b>a Flange</b><br/>2 = with spring element, long, IP65<br/>4 = with torque stop, long, IP65<br/>D = with stator coupling, IP65, <math>\varnothing</math> 63 mm [2.48"]</p> <p><b>b Through hollow shaft</b><br/>9 = <math>\varnothing</math> 8 mm [0.32"]<br/>3 = <math>\varnothing</math> 10 mm [0.39"]<br/>5 = <math>\varnothing</math> 12 mm [0.47"]<br/>A = <math>\varnothing</math> 14 mm [0.55"]<br/>8 = <math>\varnothing</math> 15 mm [0.59"]</p> | <p><b>c Output circuit / power supply</b><br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC<br/>3 = open collector (with inverted signal) / 5 ... 30 V DC</p> | <p><b>d Type of connection</b><br/>1 = radial cable, 1 m [3.28'] PVC<br/>2 = radial M12 connector, 8-pin<br/>4 = radial M23 connector, 12-pin<br/>E = tangential cable, 1 m [3.28'] PVC</p> <p><b>e Pulse rate</b><br/>100, 200, 250, 256, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> |
|---|---|--|

# Incremental encoders

|                         |   |   |
|-------------------------|---|---|
| <b>Standard optical</b> | <b>Sendix Base KIS50 / KIH50 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|---|---|

| Mounting accessory for shaft encoders   |   | Order no.                   |
|---|---|-----------------------------|
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]     | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]    | <b>8.0000.1102.1010</b>     |
| Mounting accessory for hollow shaft encoders                                      |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 2) | with fixing thread<br>  | <b>8.0010.4700.0000</b>     |
| Connection technology   |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable  | <b>05.00.6041.8211.002M</b> |
|   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6901.0002</b>     |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut, 8-pin                           | <b>05.CMB 8181-0</b>        |
|   | M23 female connector with coupling nut, 12-pin                          | <b>8.0000.5012.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   |
|--|---|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup><br>3000 min <sup>-1</sup> (continuous)   |
| <b>Mass moment of inertia</b>                    | shaft version approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version approx. 6 x 10 <sup>-6</sup> kgm <sup>2</sup> |
| <b>Starting torque at 20°C [68°F]</b>            | < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial 80 N<br>axial 40 N   |
| <b>Weight</b>                                    | approx. 0.4 kg [14.11 oz]   |
| <b>Protection acc. to EN 60529</b>               | IP65  |
| <b>Working temperature range</b>                 | -20°C ... +70°C [-4°F ... +158°F]   |
| <b>Material</b>                                  | shaft stainless steel   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz   |

| Electrical characteristics                             |   |                           |                              |                                |                              |
|--|---|---------------------------|------------------------------|--------------------------------|------------------------------|
| Output circuit   | RS422<br>(TTL compatible)                             | RS422<br>(TTL compatible) | Push-pull                    | Push-pull<br>(7272 compatible) | Open collector<br>(7273)     |
|  | Order code <b>1</b>                                   | <b>4</b>                  | <b>5</b>                     | <b>2</b>                       | <b>3</b>                     |
| <b>Power supply</b>                                    | 5 ... 30 V DC   | 5 V DC ( $\pm 5\%$ )      | 10 ... 30 V DC               | 5 ... 30 V DC                  | 5 ... 30 V DC                |
| <b>Power consumption (no load)</b>                     | typ. 40 mA<br>max. 90 mA                              | typ. 40 mA<br>max. 90 mA  | typ. 50 mA<br>max. 100 mA    | typ. 50 mA<br>max. 100 mA      | 100 mA                       |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA  | max. +/- 20 mA            | max. +/- 20 mA               | max. +/- 20 mA                 | +/- 20 mA sink<br>at 30 V DC |
| <b>Pulse frequency</b>                                 | max. 300 kHz  | max. 300 kHz              | max. 300 kHz                 | max. 300 kHz <sup>1)</sup>     | max. 300 kHz                 |
| <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. 2.5 V<br>max. 0.5 V  | min +V - 1.0 V<br>max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V  |                              |
| <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns   | max. 200 ns               | max. 1 $\mu$ s               | max. 1 $\mu$ s                 |                              |
| <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns   | max. 200 ns               | max. 1 $\mu$ s               | max. 1 $\mu$ s                 |                              |
| <b>Short circuit proof outputs<sup>2)</sup></b>        | yes <sup>3)</sup>                                     | yes <sup>3)</sup>         | yes                          | yes                            | yes                          |
| <b>Reverse polarity protection of the power supply</b> | yes   | no                        | yes                          | no                             | no                           |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                           |                              |                                |                              |

1) Max. recommended cable length 30 m [98.43'].  
2) If power supply correctly applied.

3) Only one channel allowed to be shorted-out:  
at +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
at +V = 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

# Incremental encoders

|                         |   |   |
|-------------------------|---|---|
| <b>Standard optical</b> | <b>Sendix Base KIS50 / KIH50 (shaft / hollow shaft)</b> | <b>Push-pull / RS422 / Open collector</b> |
|-------------------------|---|---|

## Terminal assignment

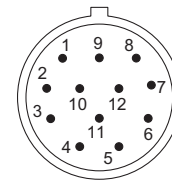
| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |        |    |           |    |           |    |           |                  |  |
|----------------|--------------------|---|-----|----|---------|--------|----|-----------|----|-----------|----|-----------|------------------|--|
| 1, 2, 3, 4, 5  | KIS50: 1, 2        | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |  |
|                | KIH50: 1, E        | Cable color:  | WH  | BN | GY PK   | RD BU  | GN | YE        | GY | PK        | BU | RD        | shield           |  |
| Output circuit | Type of connection | M12 connector, 8-pin  |     |    |         |        |    |           |    |           |    |           |                  |  |
| 1, 2, 3, 4, 5  | KIS50: 3, 4        | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |  |
|                | KIH50: 2           | Pin:  | 1   | 2  |         |        | 3  | 4         | 5  | 6         | 7  | 8         | PH <sup>1)</sup> |  |
| Output circuit | Type of connection | M23 connector, 12-pin   |     |    |         |        |    |           |    |           |    |           |                  |  |
| 1, 2, 3, 4, 5  | KIS50: 7, 8        | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |  |
|                | KIH50: 4           | Pin:  | 10  | 12 | 11      | 2      | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>1)</sup> |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

## Dimensions shaft version

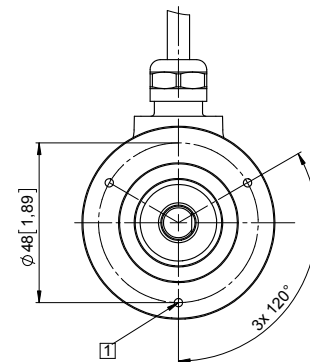
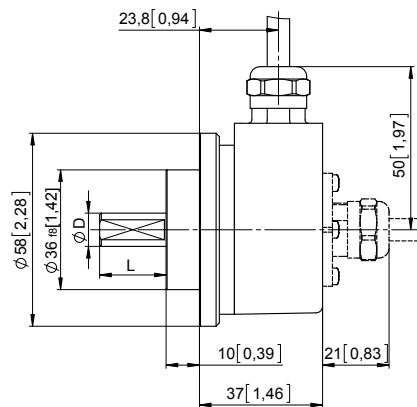
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 8

1) 3 x M3, 6 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |

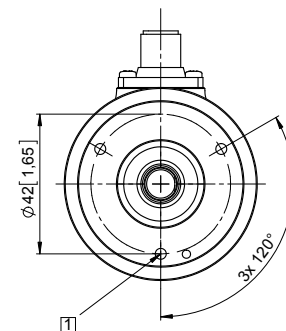
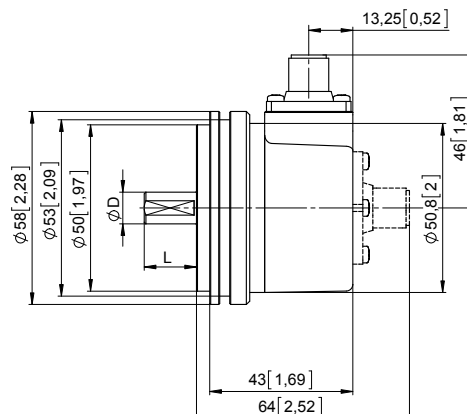


### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type B

1) 3 x M4, 6 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 8 [0.32]  | h7  | 15 [0.59] |
| 10 [0.39] | f7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |



1) PH = shield is attached to connector housing.

# Incremental encoders

**Standard optical**

**Sendix Base KIS50 / KIH50 (shaft / hollow shaft)**

**Push-pull / RS422 / Open collector**

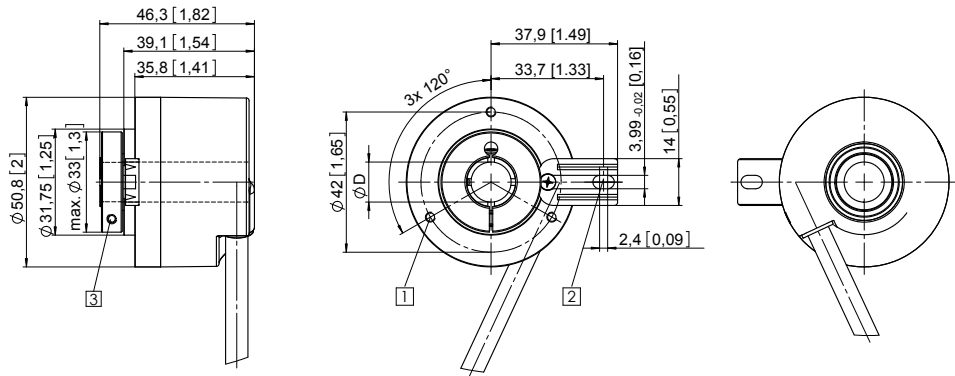
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 2

- 1 3 x M3, 6 [0.24] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm

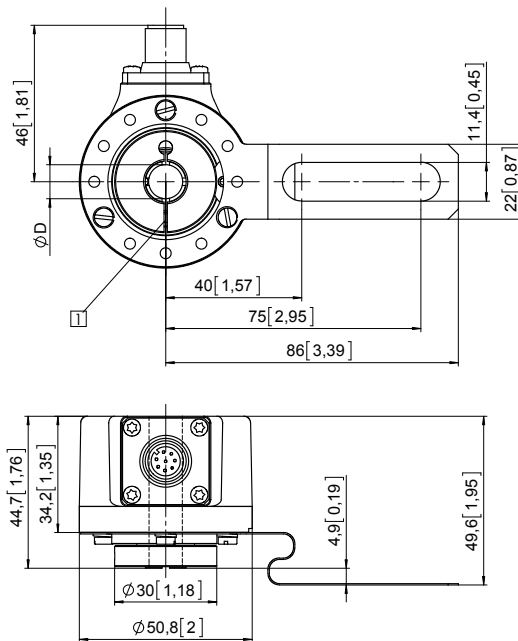
| D         | Fit |
|-----------|-----|
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |



### Flange with torque stop, long Flange type 4

- 1 Recommended torque for the clamping ring 0.6 Nm

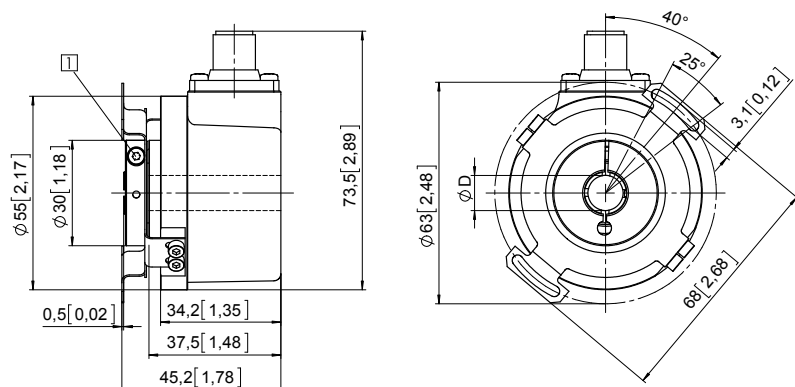
| D         | Fit |
|-----------|-----|
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |



### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type D

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit |
|-----------|-----|
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |



# Incremental encoders

Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Standard<br/>high temperature, optical</b> | <b>5803 / 5823 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|



The incremental encoders of the high temperature series 5803 / 5823 can be used at up to max. 110°C.

The high heat resistance – at the same time as high speed – make these encoders the ideal solution for all applications in a high temperature environment.



|                       |                   |                       |                          |                             |                      |                     |                             |                |
|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|
|                       |                   |                       |                          |                             |                      |                     |                             |                |
| High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor |

### Powerful

- Can be used at temperatures of up to max. 110°C.
- High resolution up to 5000 pulses per revolution.
- Maximum speed of 12000 revolutions per minute.

### Flexible

- Various connection types for different application purposes.
- Shaft or hollow shaft version.
- With push-pull or RS422 interface.

|                      |               |                |             |
|----------------------|---------------|----------------|-------------|
| <b>Order code</b>    | <b>8.5803</b> | <b>.XXXXX.</b> | <b>XXXX</b> |
| <b>Shaft version</b> | Type          | a b c d        | e           |

|  |   |   |
|--|---|---|
| <p><b>a Flange</b></p> <p>1 = clamping flange    <math>\varnothing</math> 58 mm [2.28"]</p> <p>2 = synchro flange    <math>\varnothing</math> 58 mm [2.28"]</p> <p>P = synchro flange    <math>\varnothing</math> 63.5 mm [2.5"]</p> <p>M = square flange    <math>\square</math> 63.5 mm [2.5"]</p> | <p><b>c Output circuit / power supply</b></p> <p>4 = RS422 (with inverted signal) / 5 V DC</p> <p>5 = RS422 (with inverted signal) / 10 ... 30 V DC</p> <p>6 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <p>7 = push-pull (without inverted signal) / 10 ... 30 V DC</p>  | <p><b>e Pulse rate</b></p> <p>25, 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 720, 800, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 100 pulses =&gt; 0100)</p> <p><i>Optional on request</i><br/>- other pulse rates</p> |
| <p><b>b Shaft (<math>\varnothing \times L</math>), with flat</b></p> <p>1 = <math>\varnothing</math> 6 x 10 mm [0.24 x 0.39"]</p> <p>2 = <math>\varnothing</math> 10 x 20 mm [0.39 x 0.79"]</p> <p>P = <math>\varnothing</math> 3/8" x 7/8" <sup>1)</sup></p>  | <p><b>d Type of connection</b></p> <p>1 = axial cable, 1 m [3.28'] TPE</p> <p>2 = radial cable, 1 m [3.28'] TPE</p> <p>3 = axial M23 connector, 12-pin, without mating connector</p> <p>5 = radial M23 connector, 12-pin, without mating connector</p> <p>W = radial MIL connector, 7-pin, without mating connector <sup>2)</sup></p> <p>Y = radial MIL connector, 10-pin, without mating connector</p> |   |

1) Only in conjunction with flange M or P.  
2) Only with output circuit 7.

# Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Standard high temperature, optical</b> | <b>5803 / 5823 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

|                     |               |              |              |
|---------------------|---------------|--------------|--------------|
| <b>Order code</b>   | <b>8.5823</b> | <b>.XXXX</b> | <b>.XXXX</b> |
| <b>Hollow shaft</b> | Type          | a b c d      | e            |

|   |  |  |
|---|--|--|
| <p><b>a Flange</b></p> <p>1 = with hollow shaft and spring element, short<br/>         2 = with blind hollow shaft and spring element, short<br/>         3 = with hollow shaft and stator coupling, <math>\varnothing</math> 65 mm [2.56"]<br/>         4 = with blind hollow shaft and stator coupling, <math>\varnothing</math> 65 mm [2.56"]</p> <p><b>b Hollow shaft</b><br/> <i>(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])</i></p> <p>1 = <math>\varnothing</math> 6 mm [0.24"], IP40<br/>         2 = <math>\varnothing</math> 6 mm [0.24"], IP66<br/>         3 = <math>\varnothing</math> 8 mm [0.32"], IP40<br/>         4 = <math>\varnothing</math> 8 mm [0.32"], IP66<br/>         5 = <math>\varnothing</math> 10 mm [0.39"], IP40<br/>         6 = <math>\varnothing</math> 10 mm [0.39"], IP66<br/>         7 = <math>\varnothing</math> 12 mm [0.47"], IP40<br/>         8 = <math>\varnothing</math> 12 mm [0.47"], IP66</p> | <p><b>c Output circuit / power supply</b></p> <p>1 = RS422 (with inverted signal) / 5 V DC<br/>         4 = RS422 (with inverted signal) / 10 ... 30 V DC<br/>         3 = push-pull (with inverted signal) / 10 ... 30 V DC<br/>         2 = push-pull (without inverted signal) / 10 ... 30 V DC</p> <p><b>d Type of connection</b></p> <p>1 = radial cable, 1 m [3.28'] TPE<br/>         2 = radial M23 connector, 12-pin, without mating connector</p> | <p><b>e Pulse rate</b></p> <p>25, 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 720, 800, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 100 pulses =&gt; 0100)</p> <p><i>Optional on request</i><br/>         - other pulse rates</p> |
|---|--|--|

| Mounting accessory for shaft encoders | Order no. |
|---------------------------------------|-----------|
|---------------------------------------|-----------|

|                 |  |                         |
|-----------------|--|-------------------------|
| <b>Coupling</b> | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                 | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

|   |                    |                         |
|---|--------------------|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread | <b>8.0010.4700.0000</b> |
|---|--------------------|-------------------------|

|  |  |                         |
|--|--|-------------------------|
| <b>Stator coupling, <math>\varnothing</math> 63 mm</b> |  | <b>8.0010.4D00.0000</b> |
|--|--|-------------------------|

| Connection technology | Order no. |
|-----------------------|-----------|
|-----------------------|-----------|

|  |   |                         |
|--|---|-------------------------|
| <b>Cordset, pre-assembled</b>              | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6E01.0002</b> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin                          | <b>8.0000.5012.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).



# Incremental encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Standard high temperature, optical</b> | <b>5803 / 5823 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

## Technical data

| Mechanical characteristics                       |                                 |   | Electrical characteristics                             |   |                               |
|--|---------------------------------|---|--|---|-------------------------------|
| <b>Maximum speed</b>                             | shaft IP65                      | 12000 min <sup>-1</sup>                         | <b>Output circuit</b>                                  | RS422 (TTL compatible)                                | Push-pull                     |
|  | hollow shaft IP40               | 12000 min <sup>-1</sup>                         |  |   |                               |
|  | hollow shaft IP66 <sup>1)</sup> | 6000 min <sup>-1</sup>                          | <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC                       | 10 ... 30 V DC                |
| <b>Mass moment of inertia</b>                    | shaft                           | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup> | <b>Power consumption (no load)</b>                     |   |                               |
|  | hollow shaft                    | approx. 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup> | without inverted signal – typ. 55 mA / max. 125 mA     |   |                               |
| <b>Starting torque – at 20°C [68°F]</b>          | shaft IP65 / hollow shaft IP40  | < 0.01 Nm                                       | with inverted signal typ. 40 mA / max. 100 mA          |   |                               |
|  | hollow shaft IP66               | < 0.05 Nm                                       | <b>Permissible load / channel</b>                      | max. +/- 20 mA  | max. +/- 30 mA                |
| <b>Load capacity of shaft</b>                    | radial                          | 80 N  | <b>Pulse frequency</b>                                 | max. 300 kHz  | max. 300 kHz                  |
|  | axial                           | 40 N  | <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V - 2.5 V<br>max. 2.0 V |
| <b>Weight</b>                                    |                                 | approx. 0.4 kg [14.11 oz]                       | <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns   | max. 1 µs                     |
| <b>Protection acc. to EN 60529</b>               | shaft                           | IP65  | <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns   | max. 1 µs                     |
|  | hollow shaft without seal       | IP40  | <b>Short circuit proof outputs <sup>2)</sup></b>       | yes <sup>3)</sup>                                     | yes                           |
|  | hollow shaft with seal          | IP66  | <b>Reverse polarity protection of the power supply</b> | no; 10 ... 30 V DC: yes                               | yes                           |
| <b>Working temperature range</b>                 | shaft IP65 / hollow shaft IP40  | -20°C ... +110°C [-4°F ... +230°F]              | <b>UL approval</b>                                     | file 224618   |                               |
|  | hollow shaft IP66               | -20°C ... +90°C [-4°F ... +194°F]               | <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                               |
| <b>Material</b>                                  | shaft                           | stainless steel H7                              |  |   |                               |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                                 | 1000 m/s <sup>2</sup> , 6 ms                    |  |   |                               |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                                 | 100 m/s <sup>2</sup> , 10 ... 2000 Hz           |  |   |                               |

Incremental encoders

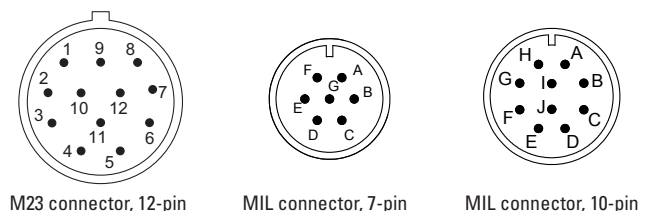
## Terminal assignment

| Output circuit      | Type of connection | Cable (isolate unused wires individually before initial start-up) |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|---------------------|--------------------|---|------------------------|------------------------|----------------------|----------------------|----|-----------|----|-----------|----|-----------|------------------|
| 1, 2, 3, 4, 5, 6, 7 | 5803: 1, 2         | Signal:   | 0 V                    | +V                     | 0Vsens <sup>5)</sup> | +Vsens <sup>5)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     | 5823: 1            | Cable color:  | WH 0.5 mm <sup>2</sup> | BN 0.5 mm <sup>2</sup> | WH                   | BN                   | GN | YE        | GY | PK        | BU | RD        | shield           |
| 1, 2, 3, 4, 5, 6, 7 | 5803: 3, 5         | M23 connector, 12-pin   |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|                     | 5823: 2            | Signal:   | 0 V                    | +V                     | 0Vsens <sup>5)</sup> | +Vsens <sup>5)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     |                    | Pin:  | 10                     | 12                     | 11                   | 2                    | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>4)</sup> |
| 7                   | 5803: W            | MIL connector, 7-pin  |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|                     | 5823: –            | Signal:   | 0 V                    | +V                     | 0Vsens <sup>5)</sup> | +Vsens <sup>5)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     |                    | Pin:  | F                      | D                      | –                    | E                    | A  | –         | B  | –         | C  | –         | G                |
| 1, 2, 3, 4, 5, 6, 7 | 5803: Y            | MIL connector, 10-pin   |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|                     | 5823: –            | Signal:   | 0 V                    | +V                     | 0Vsens <sup>5)</sup> | +Vsens <sup>5)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     |                    | Pin:  | F                      | D                      | –                    | E                    | A  | G         | B  | H         | C  | I         | J                |

Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



1) For continuous operation max. 3000 min<sup>-1</sup>, ventilated.  
 2) If power supply correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 if +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
 if +V = 10 ... 30 V DC, short-circuit to channel or 0 V is permitted.

4) PH = shield is attached to connector housing.  
 5) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

# Incremental encoders

**Standard**  
high temperature, optical

5803 / 5823 (shaft / hollow shaft)

Push-pull / RS422

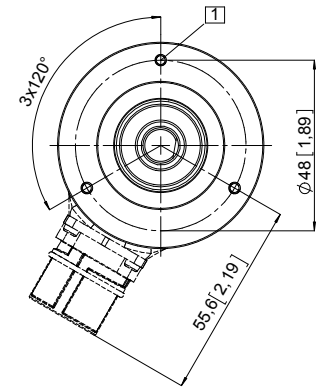
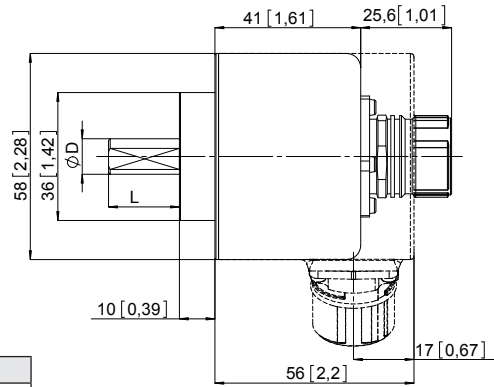
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1

1 3 x M3, 5 [0.2] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 3/8"      | h7  | 7/8"      |

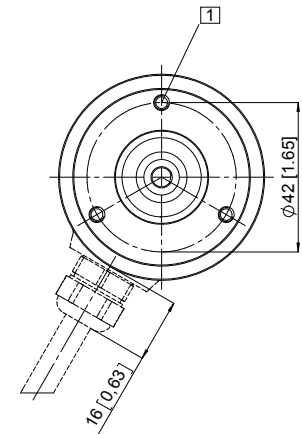
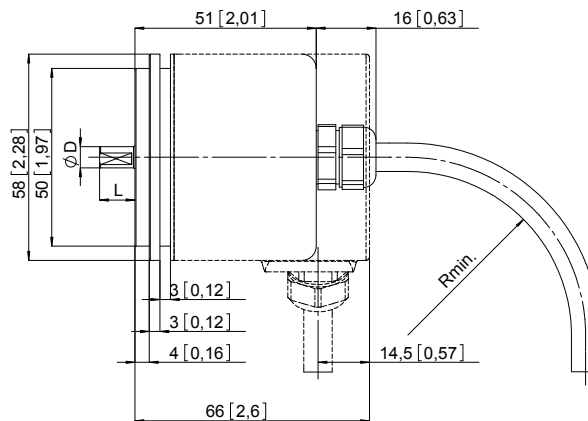
### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2

1 3 x M4, 5 [0.2] deep

R<sub>min</sub>:

- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 3/8"      | h7  | 7/8"      |

# Incremental encoders

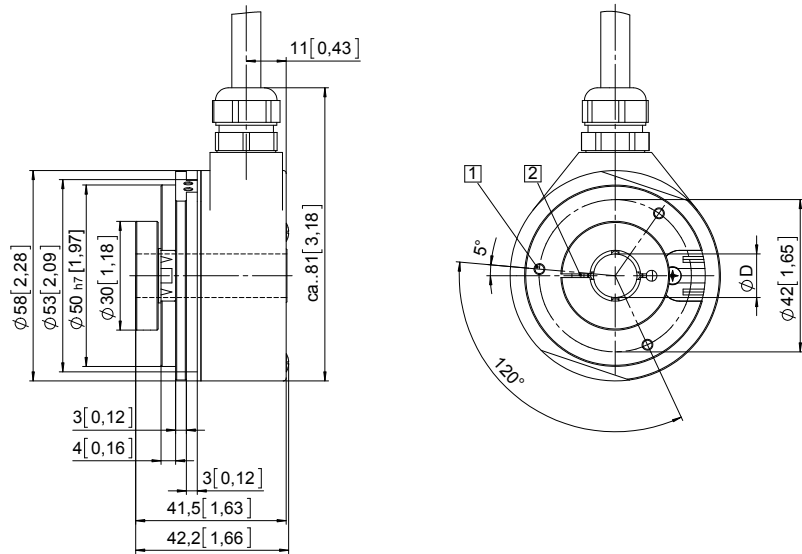
|   |   |                          |
|---|---|--------------------------|
| <b>Standard<br/>high temperature, optical</b> | <b>5803 / 5823 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1 and 2

- 1 3 x M3, 5 [0.2] deep
- 2 Recommended torque for the clamping ring 0.6 Nm

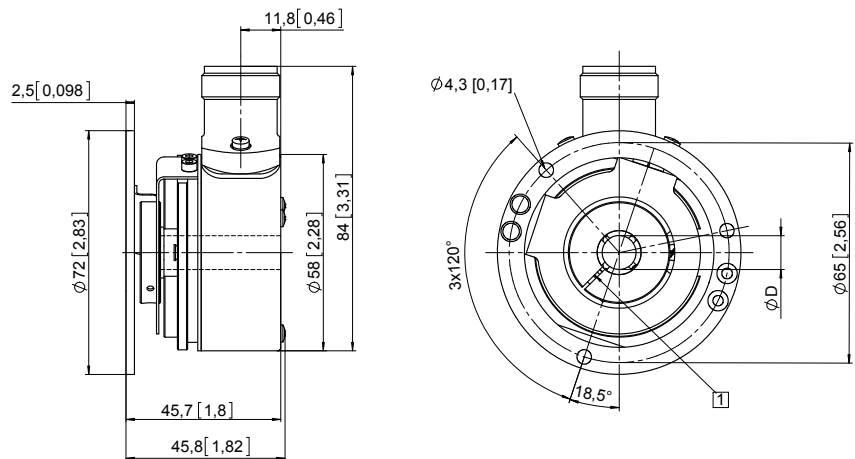


| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Insertion depth blind hollow shaft with flange 2:  
max. 30 mm [1.18"]

### Flange with stator coupling, ø 65 [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Min. insertion depth = 1.5 x D  
Insertion depth blind hollow shaft with flange 4:  
max. 30 mm [1.18"]

Incremental encoders

# Incremental encoders

**Standard**  
sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos



The incremental encoders type 5804 / 5824 offer a SinCos interface.

They are ideal for use in drive engineering.

These encoders are used preferably in applications for which a standard SinCos interface is sufficient.



High rotational speed



Temperature range  
-20°...+85°C



High protection level  
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Optical sensor

## High performance

- High resolution up to 5000 pulses per revolution.
- Maximum speed up to 12000 revolutions per minute.
- High IP protection up to max. IP66.

## Adaptable

- Shaft or hollow shaft version.
- With cable or connector.

## Order code Shaft version

8.5804 . XXXXX . XXXX  
Type                    a b c d e

### a Flange

- 1 = clamping flange ø 58 mm [2.28"]
- 2 = synchro flange ø 58 mm [2.28"]

### b Shaft (ø x L), with flat

- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 2 = ø 10 x 20 mm [0.39 x 0.79"]

### c Output circuit / power supply

- 1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

### d Type of connection

- 1 = axial cable, 1 m [3.28'] TPE
- 2 = radial cable, 1 m [3.28'] TPE
- 3 = axial M23 connector, 12-pin, without mating connector
- 5 = radial M23 connector, 12-pin, without mating connector

### e Pulse rate

- 512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 512 pulses => 0512)

Optional on request  
- other pulse rates

## Order code Hollow shaft

8.5824 . XXXXX . XXXX  
Type                    a b c d e

### a Flange

- 1 = with hollow shaft and spring element, short
- 2 = with blind hollow shaft and spring element, short
- 3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
- 4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56"]

### b Hollow shaft

(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])

- 1 = ø 6 mm [0.24"], IP40
- 2 = ø 6 mm [0.24"], IP66
- 3 = ø 8 mm [0.32"], IP40
- 4 = ø 8 mm [0.32"], IP66
- 5 = ø 10 mm [0.39"], IP40
- 6 = ø 10 mm [0.39"], IP66
- 7 = ø 12 mm [0.47"], IP40
- 8 = ø 12 mm [0.47"], IP66

### c Output circuit / power supply

- 1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

### d Type of connection

- 1 = radial cable, 1 m [3.28'] TPE
- 2 = radial M23 connector, 12-pin, without mating connector

### e Pulse rate

- 512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 512 pulses => 0512)

Optional on request  
- other pulse rates

# Incremental encoders

|   |   |   |
|---|---|---|
| <b>Standard sine wave output, with zero pulse, optical</b>                            | <b>5804 / 5824 (shaft / hollow shaft)</b>   | <b>SinCos</b>   |
| <b>Mounting accessory for shaft encoders</b>  |   |   |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]<br>bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | Order no.<br><b>8.0000.1102.0606</b><br><b>8.0000.1102.1010</b> |
| <b>Mounting accessory for hollow shaft encoders</b>                                   |   |   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]<br>with fixing thread<br>   | Order no.<br><b>8.0010.4700.0000</b>                            |
| <b>Stator coupling, <math>\varnothing</math> 63 mm [2.48"]</b>                        |   | Order no.<br><b>8.0010.4D00.0000</b>                            |
| <b>Connection technology</b>  |   |   |
| <b>Cordset, pre-assembled</b>   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56"] PVC cable   | Order no.<br><b>8.0000.6E01.0002</b>                            |
| <b>Connector, self-assembly (straight)</b>  | M23 female connector with coupling nut, 12-pin  | Order no.<br><b>8.0000.5012.0000</b>                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |   |   |
|---|---|---|
| <b>Mechanical characteristics</b>                       |   |   |
| <b>Maximum Speed</b>                                    | shaft IP65  | 12000 min <sup>-1</sup>                         |
|   | hollow shaft IP40                                     | 12000 min <sup>-1</sup>                         |
|   | hollow shaft IP66 <sup>1)</sup>                       | 6000 min <sup>-1</sup>                          |
| <b>Mass moment of inertia</b>                           | shaft   | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup> |
|   | hollow shaft  | approx. 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup> |
| <b>Starting torque – at 20°C [68°F]</b>                 | shaft IP65 / hollow shaft IP40                        | < 0.01 Nm                                       |
|   | hollow shaft IP66                                     | < 0.05 Nm                                       |
| <b>Load capacity of shaft</b>                           | radial  | 80 N  |
|   | axial   | 40 N  |
| <b>Weight</b>   |   | approx. 0.4 kg [14.11 oz]                       |
| <b>Protection</b> acc. to EN 60529                      | shaft   | IP65  |
|   | hollow shaft without seal                             | IP40  |
|   | hollow shaft with seal                                | IP66  |
| <b>Working temperature range</b>                        | shaft IP65 / hollow shaft IP40                        | -20°C ... +85°C [-4°F ... +185°F] <sup>2)</sup> |
|   | hollow shaft IP66                                     | -20°C ... +80°C [-4°F ... +176°F] <sup>2)</sup> |
| <b>Material</b>   | shaft   | stainless steel H7                              |
| <b>Shock resistance</b> acc. EN 60068-2-27              |   | 1000 m/s <sup>2</sup> , 6 ms                    |
| <b>Vibration resistance</b> acc. to EN 60068-2-6        |   | 100 m/s <sup>2</sup> , 10 ... 2000 Hz           |
| <b>Electrical characteristics</b>                       |   |   |
| <b>Output circuit</b>                                   | <b>SinCos, U = 1 V<sub>pp</sub></b>                   | <b>SinCos, U = 1 V<sub>pp</sub></b>             |
| <b>Power supply</b>                                     | 5 V DC (±5 %)   | 10 ... 30 V DC                                  |
| <b>Power consumption with inverted signal (no load)</b> | typ. 65 mA<br>max. 110 mA                             | typ. 65 mA<br>max. 110 mA                       |
| <b>-3 dB frequency</b>                                  | ≤ 180 kHz   | ≤ 180 kHz                                       |
| <b>Signal level</b>                                     | channels A/B  | 1 V <sub>pp</sub> (±20 %)                       |
|   | channel 0   | 0.1 ... 1.2 V                                   |
| <b>Short circuit proof outputs</b> <sup>3)</sup>        | yes   | yes   |
| <b>Reverse polarity protection of the power supply</b>  | no  | yes   |
| <b>UL approval</b>                                      | file 224618   |   |
| <b>CE compliant</b> acc. to                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |   |

1) For continuous operation max. 3000 min<sup>-1</sup>, ventilated.

2) 70°C [158°F] for cable version.

3) If power supply correctly applied.

# Incremental encoders

**Standard**  
sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos

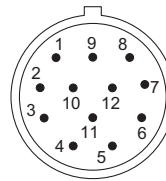
## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|----------------|--------------------|---|------------------------|------------------------|----------------------|----------------------|----|-----------|----|-----------|----|-----------|------------------|
| 1, 2           | 5804: 1, 2         | Signal:   | 0 V                    | +V                     | 0Vsens <sup>2)</sup> | +Vsens <sup>2)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                | 5824: 1            | Cable color:  | WH 0.5 mm <sup>2</sup> | BN 0.5 mm <sup>2</sup> | WH                   | BN                   | GN | YE        | GY | PK        | BU | RD        | shield           |
| Output circuit | Type of connection | M23 connector, 12-pin   |                        |                        |                      |                      |    |           |    |           |    |           |                  |
| 1, 2           | 5804: 3, 5         | Signal:   | 0 V                    | +V                     | 0Vsens <sup>2)</sup> | +Vsens <sup>2)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                | 5824: 2            | Pin:  | 10                     | 12                     | 11                   | 2                    | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>1)</sup> |

Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M23 connector, 12-pin

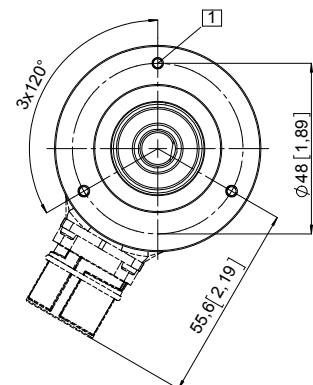
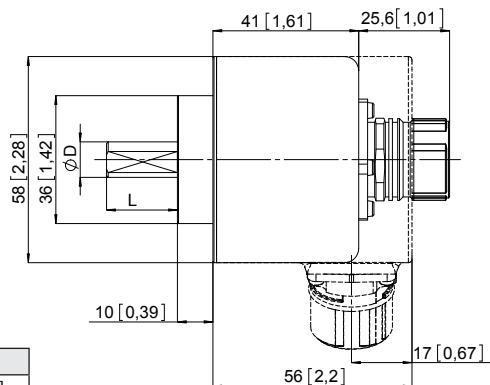
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1

- 1) 3 x M3, 5 [0.2] deep



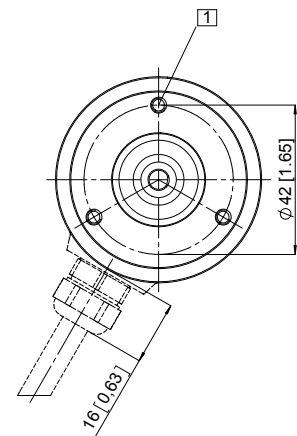
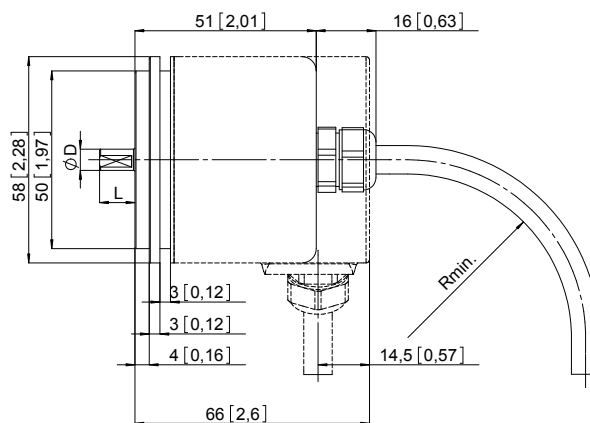
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2

- 1) 3 x M4, 5 [0.2] deep

- R<sub>min.</sub>:
- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |

1) PH = shield is attached to connector housing.  
2) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

# Incremental encoders

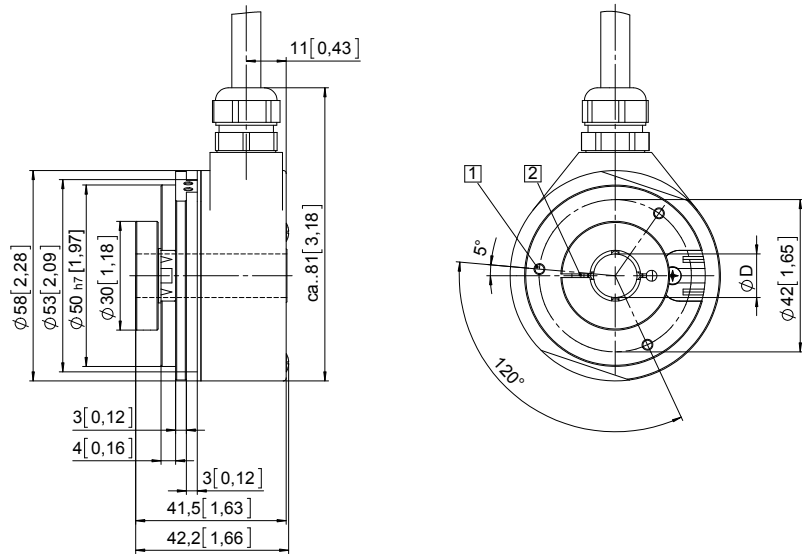
|  |   |               |
|--|---|---------------|
| <b>Standard<br/>sine wave output, with zero pulse, optical</b> | <b>5804 / 5824 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|---|---------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1 and 2

- 1 3 x M3, 5 [0.2] deep
- 2 Recommended torque for the clamping ring 0.6 Nm

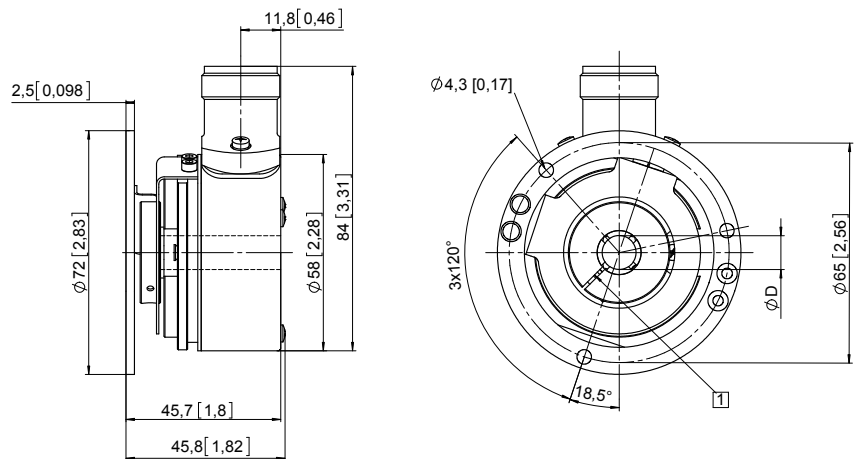


| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Insertion depth blind hollow shaft with flange 2:  
max. 30 mm [1.18"]

### Flange with stator coupling, $\phi 65 [2.56]$ Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Min. insertion depth = 1.5 x D  
Insertion depth blind hollow shaft with flange 4:  
max. 30 mm [1.18"]

Incremental encoders

# Incremental encoders

**Standard**  
sine wave output, highly interpolable, optical

**Sendix 5814 / 5834 (shaft / hollow shaft)**

**SinCos**



The incremental encoders Sendix 5814 and 5834 with SinCos interface are particularly suited for applications in the field of drive technology.

Thanks to their high signal quality, they are optimally suited for further interpolation.



## Powerful

- With incremental SinCos tracks.
- Very high signal quality.
- Suited for motor feedback applications.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

**Order code** 8.5814  
**Shaft version** Type . 1 2 XX . XXXX  
a b c d e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



**a Flange**  
1 = clamping flange, IP65, ø 58 mm [2.28"]

**b Shaft (ø x L)**  
2 = 10 x 20 mm [0.39 x 0.79"], with flat

**c Output circuit / power supply**  
1 = SinCos / 5 V DC  
2 = SinCos / 10 ... 30 V DC

**d Type of connection**  
1 = axial cable, 1 m [3.28'] PVC  
A = axial cable, special length PVC \*)  
2 = radial cable, 1 m [3.28'] PVC  
B = radial cable, special length PVC \*)  
5 = axial M12 connector, 8-pin  
6 = radial M12 connector, 8-pin  
\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5814.122A.2048.0030 (for cable length 3 m)

**e Pulse rate**  
1024, 2048  
*Optional on request*  
- Ex 2/22 <sup>1)</sup>  
- surface protection salt spray tested

**Order code** 8.5834  
**Hollow shaft** Type . XXXX . XXXX  
a b c d e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



**a Flange**  
1 = with spring element, long, IP65  
5 = with stator coupling, IP65, ø 63 mm [2.48"]

**b Through hollow shaft**  
3 = ø 10 mm [0.39"]  
4 = ø 12 mm [0.47"]  
5 = ø 14 mm [0.55"]  
6 = ø 15 mm [0.59"]  
8 = ø 3/8"  
9 = ø 1/2"  
*Tapered shaft*  
K = ø 10 mm [0.39"]

**c Output circuit / power supply**  
1 = SinCos / 5 V DC  
2 = SinCos / 10 ... 30 V DC

**d Type of connection**  
2 = radial cable, 1 m [3.28'] PVC  
B = radial cable, special length PVC \*)  
E = tangential cable, 1 m [3.28'] PVC  
F = tangential cable, special length PVC \*)  
6 = radial M12 connector, 8-pin  
\*) Available special lengths (connection types B, F):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5834.142B.2048.0030 (for cable length 3 m)

**e Pulse rate**  
1024, 2048  
*Optional on request*  
- Ex 2/22  
(not for type of connection E, F) <sup>1)</sup>  
- surface protection salt spray tested

1) For the cable connection type, cable material PUR.



# Incremental encoders

|   |  |               |
|---|--|---------------|
| <b>Standard</b><br>sine wave output, highly interpolable, optical | <b>Sendix 5814 / 5834 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|---|--|---------------|

| Connection technology                      |  | Order no.                   |
|--|--|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable | <b>05.00.6041.8211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                          | <b>05.CMB 8181-0</b>        |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |  |   |
|--|--|---|
| <b>Maximum speed</b>                             | IP65   | 12000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous) |
|  | IP67   | 8000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | IP65   | < 0.01 Nm   |
|  | IP67   | < 0.05 Nm   |
| <b>Mass moment of inertia</b>                    | shaft  | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                       |
|  | hollow shaft                                     | 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                       |
| <b>Load capacity of shaft</b>                    | radial   | 80 N  |
|  | axial  | 40 N  |
| <b>Weight</b>                                    | approx. 0.45 kg [15.85 oz]                       |   |
| <b>Protection</b> acc. to EN 60529               |  |   |
|  | housing side                                     | IP67  |
|  | shaft side                                       | IP65, opt. IP67   |
| <b>Working temperature range</b>                 | -40°C ... +90°C [-40°F ... +194°F] <sup>1)</sup> |   |
| <b>Materials</b>                                 | shaft / hollow shaft                             | stainless steel   |
|  | flange   | aluminum  |
|  | housing  | zinc die-cast   |
|  | cable  | PVC (PUR for Ex 2/22)   |
| <b>Shock resistance</b> acc. to EN 60068-2-27    | 2500 m/s <sup>2</sup> , 6 ms                     |   |
| <b>Vibration resistance</b> acc. to EN 60068-2-6 | 100 m/s <sup>2</sup> , 55 ... 2000 Hz            |   |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC                       |
| <b>Current consumption</b><br>(no load)                | 5 V DC max. 70 mA                                     |
|  | 10 ... 30 V DC max. 45 mA                             |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant</b> acc. to                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 1024 / 2048 ppr           |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |         |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|---------|
| 1, 2           | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | $\perp$ |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | shield  |

| Output circuit | Type of connection | M12 connector, 8-pin |     |    |   |           |   |           |                  |
|----------------|--------------------|----------------------|-----|----|---|-----------|---|-----------|------------------|
| 1, 2           | 5, 6               | Signal:              | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$          |
|                |                    | Pin:                 | 1   | 2  | 3 | 4         | 5 | 6         | PH <sup>3)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M12 connector, 8-pin

- 1) Cable version: -30°C ... +90°C [-22°F ... +194°F] fixed installation.
- 2) Short circuit to 0V or to output, one channel at a time, power supply correctly applied.
- 3) PH = shield is attached to connector housing.

# Incremental encoders

**Standard**  
sine wave output, highly interpolable, optical

Sendix 5814 / 5834 (shaft / hollow shaft)

SinCos

## Dimensions shaft version

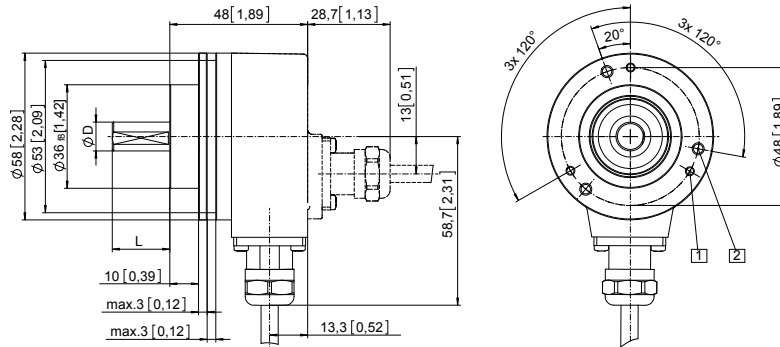
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 with shaft type 2

(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

## Dimensions hollow shaft version

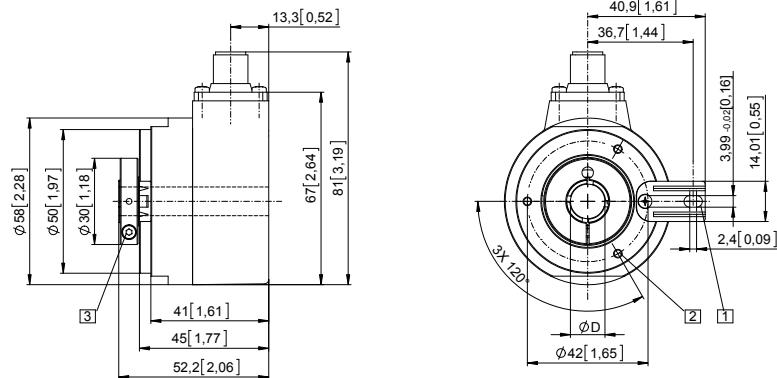
Dimensions in mm [inch]

### Flange with spring element, long

#### Flange type 1

(drawing with M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |



# Incremental encoders

**Standard**  
sine wave output, SIL2/PLd, optical

**Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)**

**SinCos**



The incremental encoders 5814FS2 and 5834FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

These encoders are particularly suited for applications in the field of safe drive technology.



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



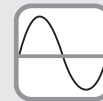
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

## Order code

**8.5814FS2 . 1 XXXX . XXXX**

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

1 = clamping flange, IP65, ø 58 mm [2.28"]

### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

A = 10 x 20 mm [0.39 x 0.79"], with feather key

### c Output circuit / power supply

1 = SinCos / 5 V DC

2 = SinCos / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 1 m [3.28'] PVC

A = axial cable, special length PVC \*)

2 = radial cable, 1 m [3.28'] PVC

B = radial cable, special length PVC \*)

3 = axial M23 connector, 12-pin

4 = radial M23 connector, 12-pin

5 = axial M12 connector, 8-pin

6 = radial M12 connector, 8-pin

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5814FS2.122A.2048.0030 (for cable length 3 m)

### e Pulse rate

1024, 2048

Optional on request

- Ex 2/22 <sup>1)</sup>

1) For the cable connection type, cable material PUR.

# Incremental encoders

|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL2/PLd, optical | <b>Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

|  |   |   |   |  |
|--|---|---|---|--|
| <b>Order code</b><br>Hollow shaft  | <b>8.5834FS2</b><br>Type  | <b>.XXXXX</b><br>a b c d e  | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p>  | <b>10 by 10</b>  |
| <b>a Flange</b><br>9 = with torque stop, flexible, IP65<br>A = with torque stop set, rigid, IP65<br><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u> | <b>b Through hollow shaft</b><br>3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>Tapered shaft<br>K = ø 10 mm [0.39"] | <b>c Output circuit / power supply</b><br>1 = SinCos / 5 V DC<br><u>2 = SinCos / 10 ... 30 V DC</u> | <b>d Type of connection</b><br>2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br>E = tangential cable, 1 m [3.28'] PVC<br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u><br>6 = radial M12 connector, 8-pin<br><br>*) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5834FS2.B42B.2048.0030 (for cable length 3 m) | <b>e Pulse rate</b><br>1024, <u>2048</u><br><br><i>Optional on request</i><br>- Ex 2/22<br>(not for connection type E + F) <sup>1)</sup> |

| Accessories                                      |   | Order no.               |
|--|---|-------------------------|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting   | <b>8.0000.4G06.0000</b> |
| <b>Screw retention</b>                           | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b> |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                         |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                         |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      |   | Order no.                   |
|--|---|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable <sup>2)</sup>  | <b>05.00.6041.8211.002M</b> |
|  | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable <sup>2)</sup> | <b>8.0000.6901.0002</b>     |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin   | <b>05.CMB 8181-0</b>        |
|  | M23 female connector with coupling nut, 12-pin  | <b>8.0000.5012.0000</b>     |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |   |
|---|---|
| <b>Notes regarding "Functional Safety"</b>  | <b>Safety characteristics</b>   |
| These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.<br>Additional functions can be found in the operating manual. | <b>Classification</b> PLd / SIL2  |
|   | <b>System structure</b> 2 channel (Cat. 3)  |
|   | <b>PFH<sub>d</sub> value <sup>3)</sup></b> 2.16 x 10 <sup>-8</sup> h <sup>-1</sup>          |
|   | <b>Mission time / Proof test interval</b> 20 years  |
|   | <b>Relevant standards</b> EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |

1) For the cable connection type, cable material PUR.  
2) Other lengths available.  
3) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

# Incremental encoders

|   |  |               |
|---|--|---------------|
| <b>Standard sine wave output, SIL2/PLd, optical</b> | <b>Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|---|--|---------------|

| Mechanical characteristics                       |  |  |
|--|--|--|
| <b>Maximum speed, shaft version</b>              |  |  |
| up to 70°C [158°F]                               | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |  |
| up to T <sub>max</sub>                           | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| <b>Maximum speed, hollow shaft version</b>       |  |  |
| up to 70°C [158°F]                               | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |  |
| up to T <sub>max</sub>                           | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |  |
| <b>Starting torque – at 20°C [68°F]</b>          |  |  |
| shaft version                                    | < 0.01 Nm  |  |
| hollow shaft version                             | < 0.03 Nm  |  |
| <b>Mass moment of inertia</b>                    |  |  |
| shaft version                                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |  |
| hollow shaft version                             | 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |  |
| <b>Insertion depth for shaft</b>                 |  |  |
| hollow shaft version                             | min. 34 mm [1.34"]   |  |
| <b>Load capacity of shaft</b>                    |  |  |
| radial   | 80 N   |  |
| axial  | 40 N   |  |
| <b>Weight</b>                                    |  |  |
| approx. 0.45 kg [15.87 oz]                       |  |  |
| <b>Protection acc. to EN 60529</b>               |  |  |
| IP65   |  |  |
| <b>Working temperature range</b>                 |  |  |
| -40°C ... +90°C [-40°F ... +194°F] <sup>1)</sup> |  |  |
| <b>Materials</b>                                 |  |  |
| shaft / hollow shaft                             | stainless steel  |  |
| flange   | aluminum   |  |
| housing  | zinc die-cast  |  |
| cable  | PVC (PUR for Ex 2/22)  |  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  |  |
| 500 m/s <sup>2</sup> , 11 ms                     |  |  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  |  |
| 200 m/s <sup>2</sup> , 10 ... 150 Hz             |  |  |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   |
| <b>Power consumption (no load)</b>                     | 5 V DC max. 70 mA<br>10 ... 30 V DC max. 45 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |   |
|---------------------------|---|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 1024 / 2048 ppr           |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |         |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|---------|
| 1, 2           | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | $\perp$ |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | shield  |

| Output circuit | Type of connection | M23 connector, 12-pin |     |    |   |           |   |           |                  |
|----------------|--------------------|-----------------------|-----|----|---|-----------|---|-----------|------------------|
| 1, 2           | 3, 4               | Signal:               | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$          |
|                |                    | Pin:                  | 10  | 12 | 5 | 6         | 8 | 1         | PH <sup>3)</sup> |

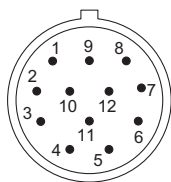
| Output circuit | Type of connection | M12 connector, 8-pin |     |    |   |           |   |           |                  |
|----------------|--------------------|----------------------|-----|----|---|-----------|---|-----------|------------------|
| 1, 2           | 5, 6               | Signal:              | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$          |
|                |                    | Pin:                 | 1   | 2  | 3 | 4         | 5 | 6         | PH <sup>3)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

1) Cable version: -30°C ... +90°C [-22°F ... +194°F] fixed installation.  
 2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
 3) PH = shield is attached to connector housing.

# Incremental encoders

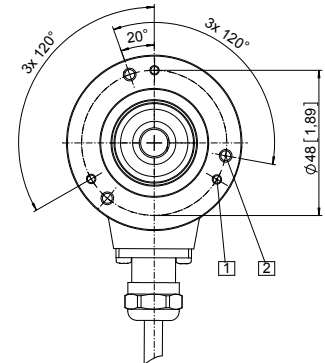
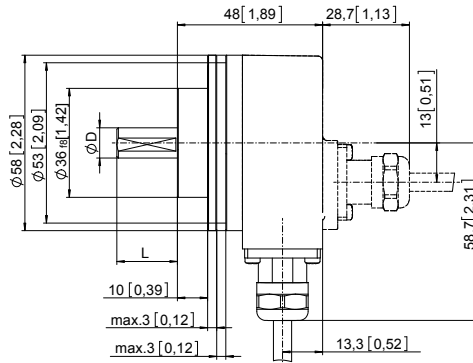
|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL2/PLd, optical | <b>Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange,  $\varnothing$  58 [2.28]**  
**Flange type 1 with shaft type 2**  
 (drawing with cable)

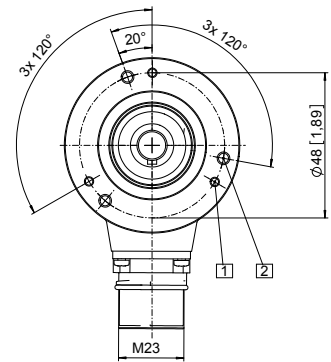
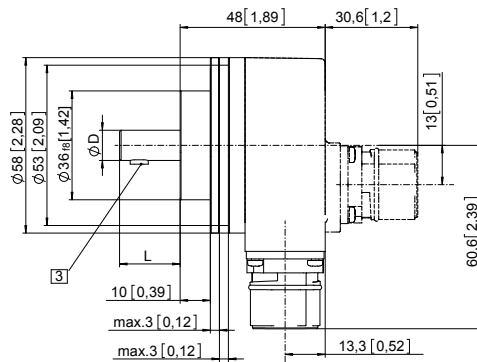
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

**Clamping flange,  $\varnothing$  58 [2.28]**  
**Flange type 1 with shaft type A**  
 (drawing with M23 connector)

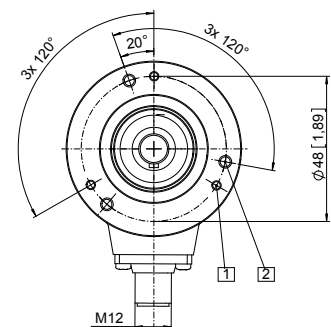
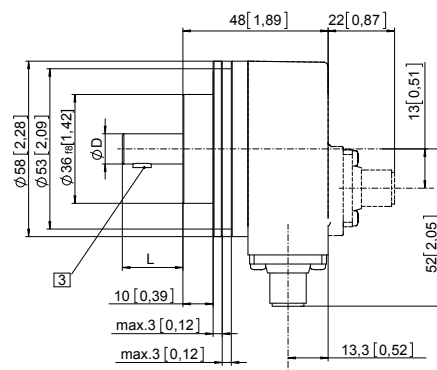
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

(drawing with M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

Incremental encoders





# Incremental encoders

|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL2/PLd, optical | <b>Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

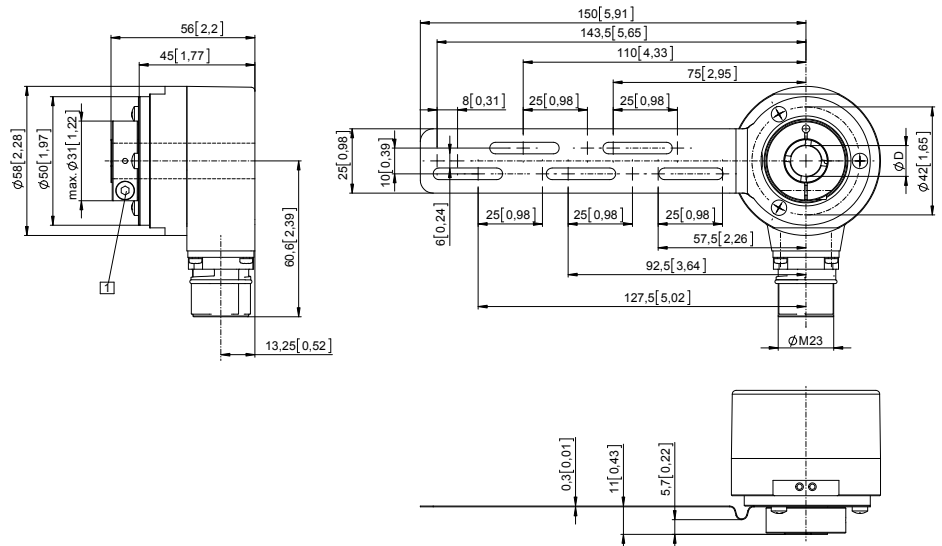
### Flange with torque stop, flexible

#### Flange type 9

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

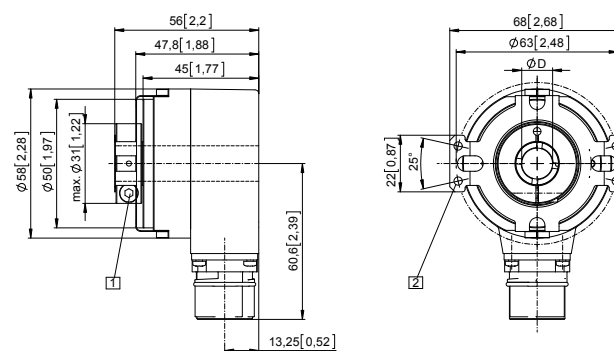
### Flange with stator coupling, ø 63 [2.48]

#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- 2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

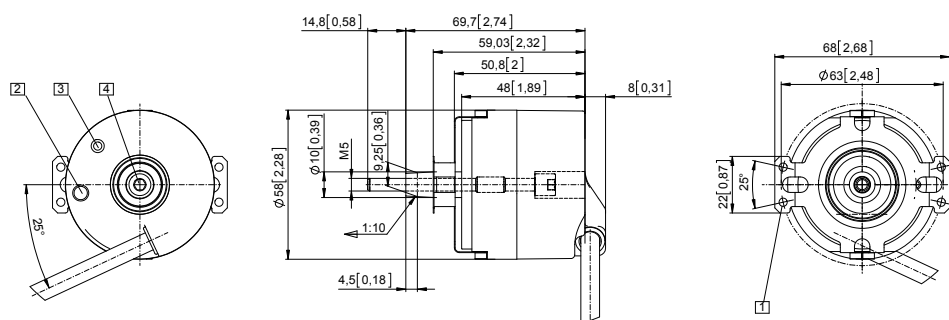
### Flange with stator coupling, ø 63 [2.48]

#### Flange type B

#### Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 Status LED
- 3 SET button
- 4 Recommended torque for (SW 4) tightening screw 3<sup>+0.5</sup> Nm



# Incremental encoders

**Standard**  
sine wave output, SIL3/PLe, optical

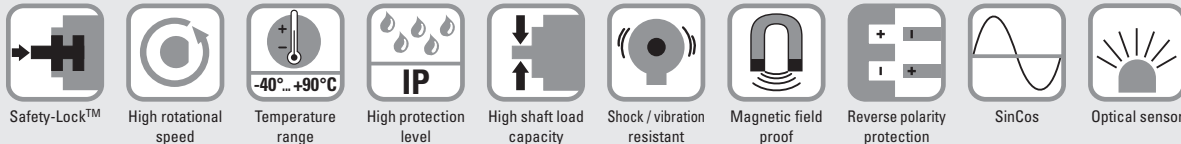
**Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)**

**SinCos**



The incremental encoders 5814FS3 and 5834FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

These encoders are particularly suited for applications in the field of safe drive technology.



## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

**Order code**  
**Shaft version**

**8.5814FS3 . 1 XXXX . XXXX**  
Type                      a    b    c    d                      e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

1 = clamping flange, IP65, ø 58 mm [2.28"]

### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat  
A = 10 x 20 mm [0.39 x 0.79"], with feather key

### c Output circuit / power supply

1 = SinCos / 5 V DC  
2 = SinCos / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 1 m [3.28'] PVC  
A = axial cable, special length PVC \*)  
2 = radial cable, 1 m [3.28'] PVC  
B = radial cable, special length PVC \*)  
3 = axial M23 connector, 12-pin  
4 = radial M23 connector, 12-pin  
5 = axial M12 connector, 8-pin  
6 = radial M12 connector, 8-pin

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5814FS3.122A.2048.0030 (for cable length 3 m)

### e Pulse rate

1024, 2048

Optional on request  
- Ex 2/22 <sup>1)</sup>

1) For the cable connection type, cable material PUR.

# Incremental encoders

|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL3/PLe, optical | <b>Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

|  |   |   |   |   |
|--|---|---|---|---|
| <b>Order code</b><br><b>Hollow shaft</b>   | <b>8.5834FS3</b><br>Type  | <b>.XXXXX</b><br>a b c d e  | <b>.XXXX</b><br>e   | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <p><b>10 by 10</b></p> |
| <b>a Flange</b><br>9 = with torque stop, flexible, IP65<br>A = with torque stop set, rigid, IP65<br><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u> | <b>b Through hollow shaft</b><br>3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>Tapered shaft<br>K = ø 10 mm [0.39"] | <b>c Output circuit / power supply</b><br>1 = SinCos / 5 V DC<br><u>2 = SinCos / 10 ... 30 V DC</u> | <b>d Type of connection</b><br>2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br>E = tangential cable, 1 m [3.28'] PVC<br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u><br>6 = radial M12 connector, 8-pin<br><br>*) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5834FS3.B42B.2048.0030 (for cable length 3 m) | <b>e Pulse rate</b><br>1024, <u>2048</u><br><br><i>Optional on request</i><br>- Ex 2/22<br>(not for connection type E + F) <sup>1)</sup>  |

| Accessories                                      |   | Order no.               |
|--|---|-------------------------|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting   | <b>8.0000.4G06.0000</b> |
| <b>Screw retention</b>                           | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b> |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                         |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                         |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      |   | Order no.                   |
|--|---|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable <sup>2)</sup>  | <b>05.00.6041.8211.002M</b> |
|  | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable <sup>2)</sup> | <b>8.0000.6901.0002</b>     |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin   | <b>05.CMB 8181-0</b>        |
|  | M23 female connector with coupling nut, 12-pin  | <b>8.0000.5012.0000</b>     |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |  |                       |            |                         |                    |  |   |   |          |                           |   |
|---|--|-----------------------|------------|-------------------------|--------------------|--|---|---|----------|---------------------------|---|
| <b>Notes regarding "Functional Safety"</b>  | <b>Safety characteristics</b>  |                       |            |                         |                    |  |   |   |          |                           |   |
| These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.<br>Additional functions can be found in the operating manual. | <table border="1"> <tr> <td><b>Classification</b></td> <td>PLe / SIL3</td> </tr> <tr> <td><b>System structure</b></td> <td>2 channel (Cat. 4)</td> </tr> <tr> <td><b>PFH<sub>d</sub> value <sup>3)</sup></b></td> <td>1.09 x 10<sup>-8</sup> h<sup>-1</sup></td> </tr> <tr> <td><b>Mission time / Proof test interval</b></td> <td>20 years</td> </tr> <tr> <td><b>Relevant standards</b></td> <td>EN ISO 13849-1:2008;<br/>EN ISO 13849-2:2013;<br/>EN 61800-5-2:2007</td> </tr> </table> | <b>Classification</b> | PLe / SIL3 | <b>System structure</b> | 2 channel (Cat. 4) | <b>PFH<sub>d</sub> value <sup>3)</sup></b> | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup> | <b>Mission time / Proof test interval</b> | 20 years | <b>Relevant standards</b> | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |
| <b>Classification</b>   | PLe / SIL3   |                       |            |                         |                    |  |   |   |          |                           |   |
| <b>System structure</b>   | 2 channel (Cat. 4)   |                       |            |                         |                    |  |   |   |          |                           |   |
| <b>PFH<sub>d</sub> value <sup>3)</sup></b>  | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>  |                       |            |                         |                    |  |   |   |          |                           |   |
| <b>Mission time / Proof test interval</b>   | 20 years   |                       |            |                         |                    |  |   |   |          |                           |   |
| <b>Relevant standards</b>   | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007  |                       |            |                         |                    |  |   |   |          |                           |   |

1) For the cable connection type, cable material PUR.  
2) Other lengths available.  
3) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.

# Incremental encoders

**Standard**  
sine wave output, SIL3/PLe, optical

**Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)**

**SinCos**

| Mechanical characteristics                       |                        |  |
|--|------------------------|--|
| <b>Maximum speed, shaft version</b>              | up to 70°C [158°F]     | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |
|  | up to T <sub>max</sub> | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |
| <b>Maximum speed, hollow shaft version</b>       | up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |
|  | up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque – at 20°C [68°F]</b>          | shaft version          | < 0.01 Nm  |
|  | hollow shaft version   | < 0.03 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version          | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |
|  | hollow shaft version   | 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |
| <b>Insertion depth for shaft</b>                 | hollow shaft version   | min. 34 mm [1.34"]   |
| <b>Load capacity of shaft</b>                    | radial                 | 80 N   |
|  | axial                  | 40 N   |
| <b>Weight</b>                                    |                        | approx. 0.45 kg [15.87 oz]                                     |
| <b>Protection acc. to EN 60529</b>               |                        | IP65   |
| <b>Working temperature range</b>                 |                        | -40°C ... +90°C [-40°F ... +194°F] <sup>1)</sup>               |
| <b>Materials</b>                                 | shaft / hollow shaft   | stainless steel  |
|  | flange                 | aluminum   |
|  | housing                | zinc die-cast  |
|  | cable                  | PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                        | 500 m/s <sup>2</sup> , 11 ms                                   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                        | 200 m/s <sup>2</sup> , 10 ... 150 Hz                           |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   |
| <b>Power consumption (no load)</b>                     | 5 V DC max. 70 mA   |
|  | 10 ... 30 V DC max. 45 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |   |
|---------------------------|---|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 1024 / 2048 ppr           |

## Terminal assignment

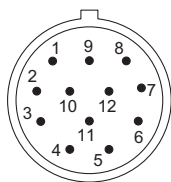
| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |                  |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|------------------|
| 1, 2           | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | $\perp$          |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | shield           |
| Output circuit | Type of connection | M23 connector, 12-pin   |     |    |    |           |    |           |                  |
| 1, 2           | 3, 4               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | $\perp$          |
|                |                    | Pin:  | 10  | 12 | 5  | 6         | 8  | 1         | PH <sup>3)</sup> |
| Output circuit | Type of connection | M12 connector, 8-pin  |     |    |    |           |    |           |                  |
| 1, 2           | 5, 6               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | $\perp$          |
|                |                    | Pin:  | 1   | 2  | 3  | 4         | 5  | 6         | PH <sup>3)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

1) Cable version: -30°C ... +90°C [-22°F ... +194°F] fixed installation.  
 2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
 3) PH = shield is attached to connector housing.

# Incremental encoders

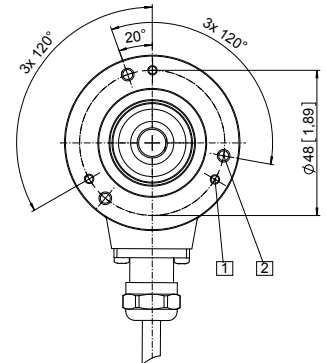
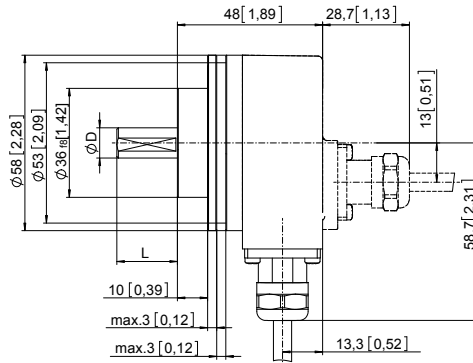
|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL3/PLe, optical | <b>Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange, ø 58 [2.28]**  
**Flange type 1 with shaft type 2**  
 (drawing with cable)

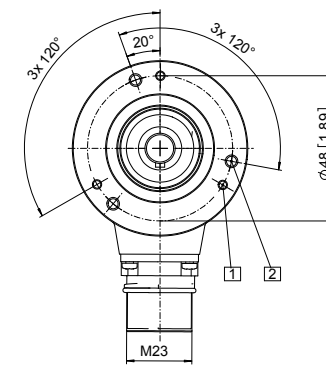
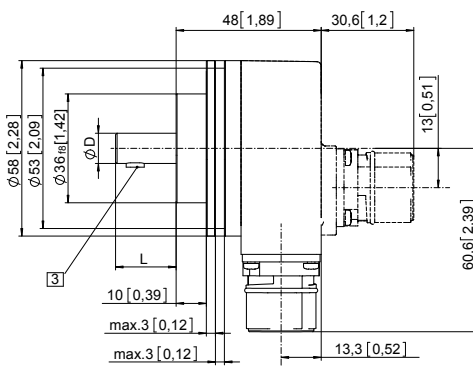
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

**Clamping flange, ø 58 [2.28]**  
**Flange type 1 with shaft type A**  
 (drawing with M23 connector)

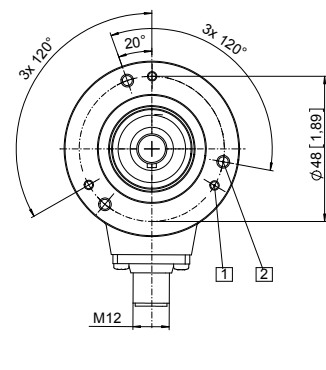
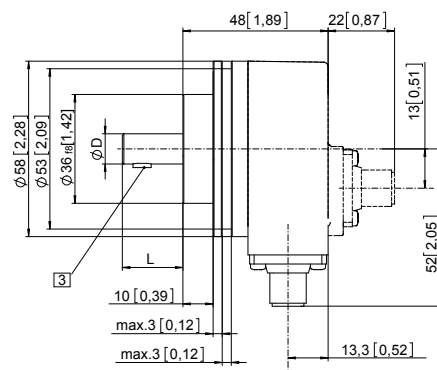
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

(drawing with M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Incremental encoders

|  |  |               |
|--|--|---------------|
| <b>Standard</b><br>sine wave output, SIL3/PLe, optical | <b>Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)</b> | <b>SinCos</b> |
|--|--|---------------|

## Dimensions hollow shaft version

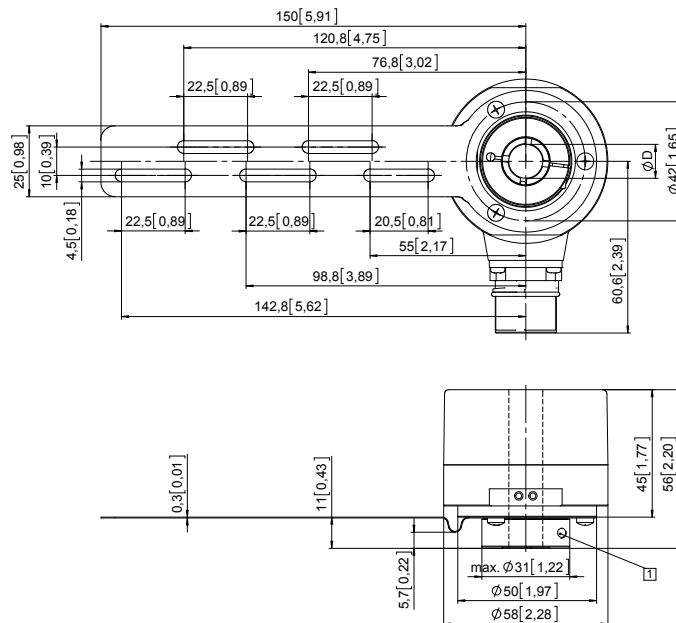
Dimensions in mm [inch]

### Flange with torque stop, flexible Flange type 9

#### Through hollow shaft

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

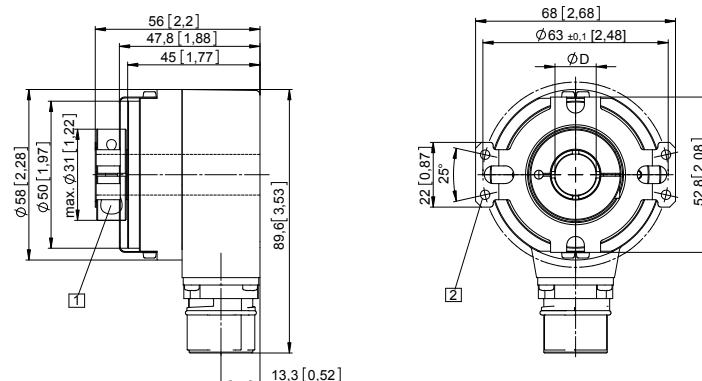
### Flange with stator coupling, Ø 63 [2.48]

#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- 2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

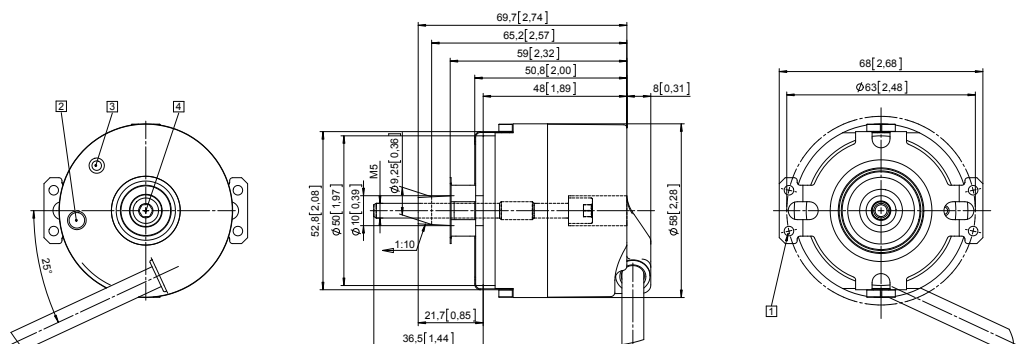
### Flange with stator coupling, Ø 63 [2.48]

#### Flange type B

#### Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 Status LED
- 3 SET button
- 4 Recommended torque for (SW 4) tightening screw 3<sup>+0.5</sup> Nm



Incremental encoders

# Incremental encoders

**Standard**  
high resolution, optical

5805 / 5825 (shaft / hollow shaft)

Push-pull / RS422



The incremental encoders type 5805 / 5825 offer resolutions up to max. 36000 pulses per revolution.

They are thus perfect for use in applications where a very high level of accuracy is required.



High rotational speed



Temperature range  
-20°...+85°C



High protection level  
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Optical sensor

## High performance

- High shaft loading capability.
- Maximum speed up to 12000 revolutions per minute.
- High IP protection up to max. IP66.

## Many variants

- With RS422 or push-pull interface.
- With cable or connector.

### Order code Shaft version

8.5805 . XXXXX . XXXXX  
Type a b c d e

#### a Flange

- 1 = clamping flange ø 58 mm [2.28"]
- 2 = synchro flange ø 58 mm [2.28"]

#### b Shaft (ø x L), with flat

- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 2 = ø 10 x 20 mm [0.39 x 0.79"]

#### c Output circuit / power supply

- 4 = RS422 (with inverted signal) / 5 V DC
- 5 = RS422 (with inverted signal) / 10 ... 30 V DC
- 6 = push-pull (with inverted signal) / 10 ... 30 V DC
- 7 = push-pull (without inverted signal) / 10 ... 30 V DC

#### e Pulse rate

- 6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000)

Optional on request  
- other pulse rates

#### d Type of connection

- 1 = axial cable, 1 m [3.28'] PUR
- 2 = radial cable, 1 m [3.28'] PUR
- 3 = axial M23 connector, 12-pin, without mating connector
- 5 = radial M23 connector, 12-pin, without mating connector
- T = axial M12 connector, 8-pin
- G = radial M12 connector, 8-pin

### Order code Hollow shaft

8.5825 . XXXXX . XXXXX  
Type a b c d e

#### a Flange

- 1 = with hollow shaft and spring element, short
- 2 = with blind hollow shaft and spring element, short
- 3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
- 4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56"]

#### b Hollow shaft (insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])

- 1 = ø 6 mm [0.24"], IP40
- 2 = ø 6 mm [0.24"], IP66
- 3 = ø 8 mm [0.32"], IP40
- 4 = ø 8 mm [0.32"], IP66
- 5 = ø 10 mm [0.39"], IP40
- 6 = ø 10 mm [0.39"], IP66
- 7 = ø 12 mm [0.47"], IP40
- 8 = ø 12 mm [0.47"], IP66

#### c Output circuit / power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 2 = push-pull (without inverted signal) / 10 ... 30 V DC
- 3 = push-pull (with inverted signal) / 10 ... 30 V DC

#### e Pulse rate

- 6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000)

Optional on request  
- other pulse rates

#### d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- 2 = radial M23 connector, 12-pin, without mating connector
- C = radial M12 connector, 8-pin



# Incremental encoders

| Standard high resolution, optical   |   | 5805 / 5825 (shaft / hollow shaft) | Push-pull / RS422           |
|---|---|------------------------------------|-----------------------------|
| <b>Mounting accessory for shaft encoders</b>  |   |                                    | Order no.                   |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]     |                                    | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]    |                                    | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>                                   |   |                                    | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]   |                                    | <b>8.0010.4700.0000</b>     |
|   | with fixing thread<br>  |                                    |                             |
| <b>Stator coupling, <math>\varnothing</math> 63 mm [2.48"]</b>                        |   |                                    | <b>8.0010.4D00.0000</b>     |
| <b>Connection technology</b>  |   |                                    | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable  |                                    | <b>05.00.6041.8211.002M</b> |
|   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | for 5805                           | <b>8.0000.6101.0002</b>     |
|   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | for 5825                           | <b>8.0000.6901.0002</b>     |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut, 8-pin                           |                                    | <b>05.CMB 8181-0</b>        |
|   | M23 female connector with coupling nut, 12-pin                          |                                    | <b>8.0000.5012.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |                                 |   |                           |
|--|---------------------------------|---|---------------------------|
| <b>Mechanical characteristics</b>                      |                                 |   |                           |
| <b>Speed</b>   | shaft IP65                      | 12000 min <sup>-1</sup>                               |                           |
|  | hollow shaft IP40               | 12000 min <sup>-1</sup>                               |                           |
|  | hollow shaft IP66 <sup>1)</sup> | 6000 min <sup>-1</sup>                                |                           |
| <b>Mass moment of inertia</b>                          | shaft                           | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup>       |                           |
|  | hollow shaft                    | approx. 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>       |                           |
| <b>Starting torque – at 20°C [68°F]</b>                | shaft IP65 / hollow shaft IP40  | < 0.01 Nm   |                           |
|  | hollow shaft IP66               | < 0.05 Nm   |                           |
|  |                                 |   |                           |
| <b>Load capacity of shaft</b>                          | radial                          | 80 N  |                           |
|  | axial                           | 40 N  |                           |
| <b>Weight</b>  |                                 | approx. 0.4 kg [14.11 oz]                             |                           |
| <b>Protection acc. to EN 60529</b>                     | shaft                           | IP65  |                           |
|  | hollow shaft without seal       | IP40  |                           |
|  | hollow shaft with seal          | IP66  |                           |
| <b>Working temperature range</b>                       | shaft IP65 / hollow shaft IP40  | -20°C ... +105°C [-4°F ... +221°F]                    |                           |
|  | hollow shaft IP66               | -20°C ... +90°C [-4°F ... +194°F]                     |                           |
| <b>Material</b>  | shaft                           | stainless steel H7                                    |                           |
| <b>Shock resistance acc. to EN 60068-2-27</b>          |                                 | 1000 m/s <sup>2</sup> , 6 ms                          |                           |
| <b>Vibration resistance acc. to EN 60068-2-6</b>       |                                 | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                 |                           |
| <b>Electrical characteristics</b>                      |                                 |   |                           |
| <b>Output circuit</b>                                  |                                 | RS422 (TTL compatible)                                | Push-pull                 |
| <b>Power supply</b>                                    |                                 | 5 V DC ( $\pm$ 5 %) or 10...30 V DC                   | 10 ... 30 V DC            |
| <b>Power consumption (no load)</b>                     | without inverted signal         | –   | typ. 90 mA / max. 135 mA  |
|  | with inverted signal            | typ. 70 mA / max. 120 mA                              | typ. 115 mA / max. 160 mA |
| <b>Permissible load / channel</b>                      |                                 | max. +/- 20 mA  | max. +/- 30 mA            |
| <b>Pulse frequency</b>                                 |                                 | max. 800 kHz  | max. 600 kHz              |
| <b>Signal level</b>                                    | HIGH                            | min. 2.5 V  | min. +V - 2.5 V           |
|  | LOW                             | max. 0.5 V  | max. 2.0 V                |
| <b>Rising edge time t<sub>r</sub></b>                  |                                 | max. 200 ns   | max. 1 $\mu$ s            |
| <b>Falling edge time t<sub>f</sub></b>                 |                                 | max. 200 ns   | max. 1 $\mu$ s            |
| <b>Short circuit proof outputs <sup>2)</sup></b>       |                                 | yes <sup>3)</sup>                                     | yes                       |
| <b>Reverse polarity protection of the power supply</b> |                                 | no; 10 ... 30 V DC: yes                               | yes                       |
| <b>UL approval</b>                                     |                                 | file 224618   |                           |
| <b>CE compliant acc. to</b>                            |                                 | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                           |

1) For continuous operation max. 3000 min<sup>-1</sup>, ventilated.  
2) If power supply correctly applied.

3) Only one channel allowed to be shorted-out at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted. at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

# Incremental encoders

**Standard  
high resolution, optical**

**5805 / 5825 (shaft / hollow shaft)**

**Push-pull / RS422**

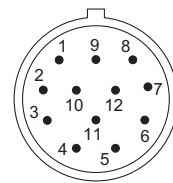
## Terminal assignment

| Output circuit      | Type of connection | Cable (isolate unused wires individually before initial start-up) |                        |                        |                      |                      |    |           |    |           |    |           |                  |
|---------------------|--------------------|---|------------------------|------------------------|----------------------|----------------------|----|-----------|----|-----------|----|-----------|------------------|
| 1, 2, 3, 4, 5, 6, 7 | 5805: 1, 2         | Signal:   | 0 V                    | +V                     | 0Vsens <sup>2)</sup> | +Vsens <sup>2)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     | 5825: 1            | Cable color:  | WH 0.5 mm <sup>2</sup> | BN 0.5 mm <sup>2</sup> | WH                   | BN                   | GN | YE        | GY | PK        | BU | RD        | shield           |
| Output circuit      | Type of connection | M23 connector, 12-pin   |                        |                        |                      |                      |    |           |    |           |    |           |                  |
| 1, 2, 3, 4, 5, 6, 7 | 5805: 3, 5         | Signal:   | 0 V                    | +V                     | 0Vsens <sup>2)</sup> | +Vsens <sup>2)</sup> | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     | 5825: 2            | Pin:  | 10                     | 12                     | 11                   | 2                    | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>1)</sup> |
| Output circuit      | Type of connection | M12 connector, 8-pin  |                        |                        |                      |                      |    |           |    |           |    |           |                  |
| 1, 2, 3, 4, 5, 6, 7 | 5805: G, T         | Signal:   | 0 V                    | +V                     | 0 Vsens              | +Vsens               | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                     | 5825: C            | Pin:  | 1                      | 2                      |                      |                      | 3  | 4         | 5  | 6         | 7  | 8         | PH <sup>1)</sup> |

Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M23 connector, 12-pin



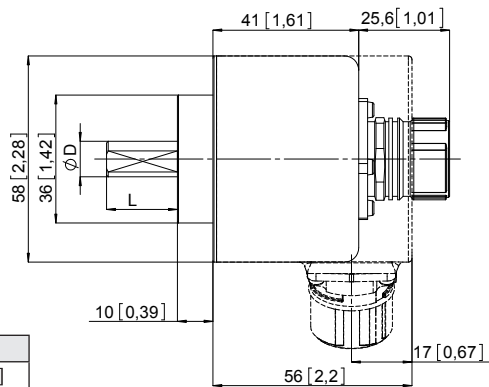
M12 connector, 8-pin

## Dimensions shaft version

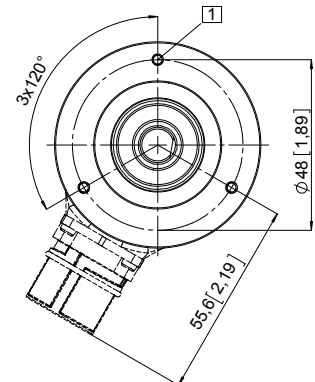
Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28] Flange type 1

- 1) 3 x M3, 5 [0.2] deep



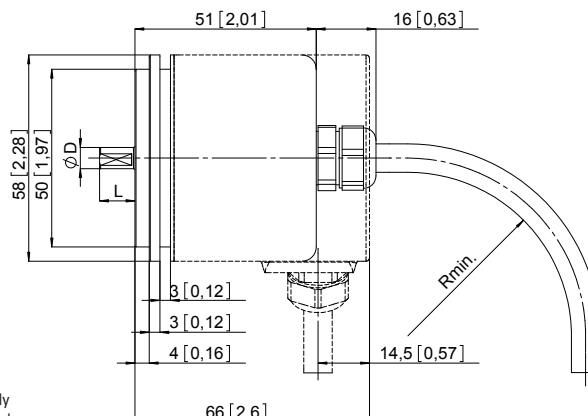
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |



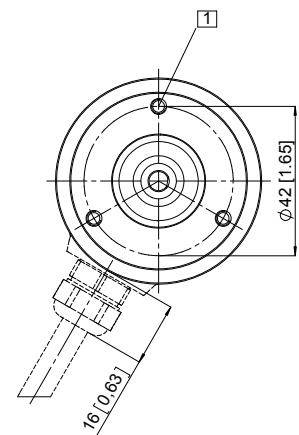
### Synchro flange, ø 58 [2.28] Flange type 2

- 1) 3 x M4, 5 [0.2] deep

- R<sub>min</sub>:
- securely installed: 55 [2.17]
  - flexibly installed: 70 [2.76]



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |



- 1) PH = shield is attached to connector housing.
- 2) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

# Incremental encoders

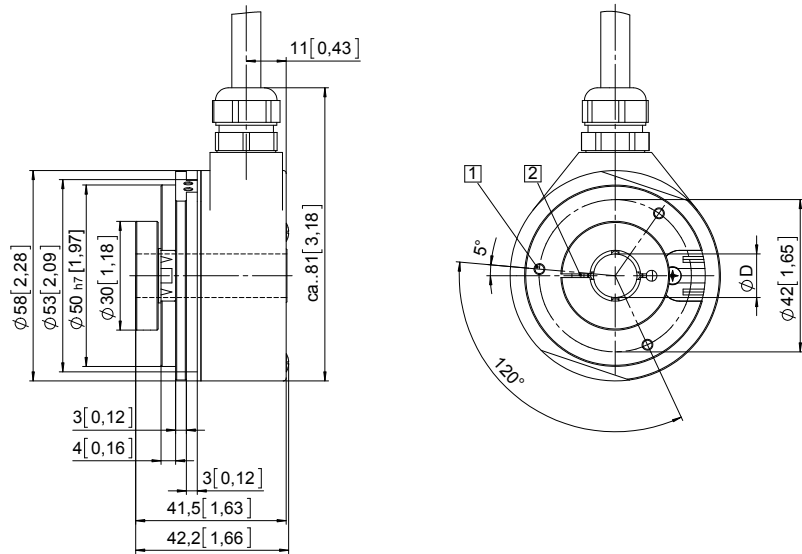
|  |   |                          |
|--|---|--------------------------|
| <b>Standard<br/>high resolution, optical</b> | <b>5805 / 5825 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|---|--------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1 and 2

- 1 3 x M3, 5 [0.2] deep
- 2 Recommended torque for the clamping ring 0.6 Nm

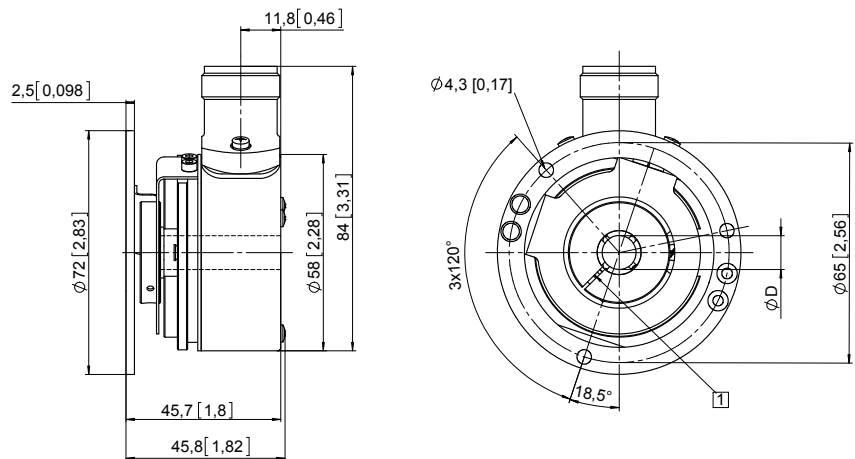


| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Insertion depth blind hollow shaft with flange 2:  
max. 30 mm [1.18"]

### Flange with stator coupling, ø 65 [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 6 [0.24]  | H7  |
| 8 [0.32]  | H7  |
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Min. insertion depth = 1.5 x D  
Insertion depth blind hollow shaft with flange 4:  
max. 30 mm [1.18"]

Incremental encoders

# Incremental encoders

**Standard  
stainless steel, optical**

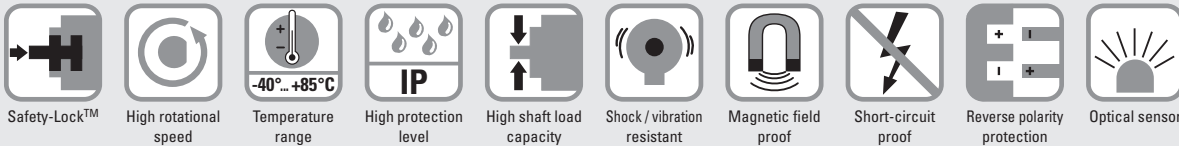
**Sendix 5006 / 5026 (shaft / hollow shaft)**

**Push-pull / RS422**



The incremental Sendix encoders 5006 / 5026 in stainless steel offers optimum material resistance and thus virtually unlimited durability.

The high-grade seals, the IP66/IP67 level of protection as well as the wide temperature range additionally ensure impermeability and ruggedness.



## Durable and sealed

- Protection rating IP66/IP67.
- Rugged stainless steel housing.
- Wide temperature range -40 ... +85°C.
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors.

## Flexible in use

- Compatible with all common US and european standards.
- Power supply 5 ... 30 V DC, various interface options, max. 5000 pulses per revolution.
- Compact dimensions:  
outer diameter 50 mm, installation depth max. 47 mm.

**Order code**      **8.5006** . **XXXX4** . **XXXX**  
**Shaft version**      Type      a b c d      e



- |   |   |  |
|---|---|--|
| <p><b>a</b> Flange</p> <p>7 = clamping flange    ø 58 mm [2.28"]<br/> A = synchro flange    ø 58 mm [2.28"]<br/> C = square flange    □ 63.5 mm [2.5"]</p> <p><b>b</b> Shaft (ø x L), with flat</p> <p>1 = ø 6 x 10 mm [0.24 x 0.39"]<br/> 3 = ø 10 x 20 mm [0.39 x 0.79"]<br/> 8 = ø 3/8" x 7/8"</p> | <p><b>c</b> Output circuit / power supply</p> <p>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/> 5 = push-pull (with inverted signal) / 10 ... 30 V DC<br/> 4 = RS422 (with inverted signal) / 5 V DC</p> <p><b>d</b> Type of connection</p> <p>4 = radial M12 connector, 8-pin</p> | <p><b>e</b> Pulse rate</p> <p>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400,<br/> 500, 512, 600, 800, 1000, 1024, 1200, 2000,<br/> 2048, 2500, 3600, 4096, 5000<br/> (e.g. 100 pulses =&gt; 0100)</p> <p><i>Optional on request</i><br/> - other pulse rates<br/> - Ex 2/22</p> |
|---|---|--|

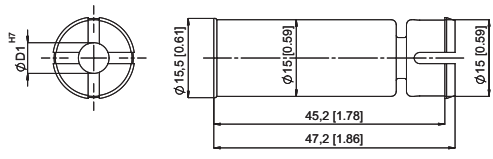
**Order code**      **8.5026** . **XXXX2** . **XXXX**  
**Hollow shaft**      Type      a b c d      e

- |  |  |  |
|--|--|--|
| <p><b>a</b> Flange</p> <p>1 = with spring element, long<br/> C = with stator coupling, ø 63 mm</p> <p><b>b</b> Through hollow shaft</p> <p>2 = ø 1/4"<br/> 4 = ø 3/8"<br/> 3 = ø 10 mm [0.39"]<br/> 5 = ø 12 mm [0.47"]<br/> 6 = ø 1/2"<br/> 8 = ø 15 mm [0.59"]</p> | <p><b>c</b> Output circuit / power supply</p> <p>2 = push-pull (7272 compatible, with inverted signal) / 5 ... 30 V DC<br/> 5 = push-pull (with inverted signal) / 10 ... 30 V DC<br/> 4 = RS422 (with inverted signal) / 5 V DC</p> <p><b>d</b> Type of connection</p> <p>2 = radial M12 connector, 8-pin</p> | <p><b>e</b> Pulse rate</p> <p>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400,<br/> 500, 512, 600, 800, 1000, 1024, 1200, 2000,<br/> 2048, 2500, 3600, 4096, 5000<br/> (e.g. 100 pulses =&gt; 0100)</p> <p><i>Optional on request</i><br/> - other pulse rates<br/> - Ex 2/22</p> |
|--|--|--|

# Incremental encoders

|  |  |                          |
|--|--|--------------------------|
| <b>Standard stainless steel, optical</b> | <b>Sendix 5006 / 5026 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|

| Mounting accessory for hollow shaft encoders   | Dimensions in mm [inch]  | Order no.               |                         |
|--|--|-------------------------|-------------------------|
| <b>Isolation / adapter inserts for hollow shaft encoders</b>   |  |                         |                         |
| <b>Thermal and electrical isolation of the encoders</b><br>(Temperature range -40 ... +115°C [-40°F ... +239°F])<br>Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder. |  | D1                      |                         |
|  |   | 6 mm [0.24"]            | <b>8.0010.4021.0000</b> |
|  |  | 8 mm [0.32"]            | <b>8.0010.4020.0000</b> |
|  |  | 10 mm [0.39"]           | <b>8.0010.4023.0000</b> |
|  |  | 12 mm [0.47"]           | <b>8.0010.4025.0000</b> |
|  |  | 1/4"                    | <b>8.0010.4022.0000</b> |
|  | 3/8"   | <b>8.0010.4024.0000</b> |                         |
|  | 1/2"   | <b>8.0010.4026.0000</b> |                         |



Tip:  
By using these adapter inserts you can achieve six different hollow shaft diameters, all on the basis of the encoder 8.5026.X8X2.XXXX.

Incremental encoders

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Electrical characteristics                                |   |            |                           |                             |
|---|---|------------|---------------------------|-----------------------------|
| Output circuit  | RS422 (TTL compatible))                               |            | Push-pull                 | Push-pull (7272 compatible) |
| <b>Power supply</b>                                       | 5 V DC (±5 %)   |            | 10 ... 30 V DC            | 5 ... 30 V DC               |
| <b>Current consumption with inverted signal (no load)</b> | typ. 40 mA<br>max. 90 mA                              |            | typ. 50 mA<br>max. 100 mA | typ. 50 mA<br>max. 100 mA   |
| <b>Permissible load / channel</b>                         | max. +/- 20 mA  |            | max. +/- 20 mA            | max. +/- 20 mA              |
| <b>Pulse frequency</b>                                    | max. 300 kHz  |            | max. 300 kHz              | max. 300 kHz                |
| <b>Signal level</b>                                       | HIGH  | min. 2.5 V | min +V - 1.0 V            | min. +V - 2.0 V             |
|   | LOW   | max. 0.5 V | max. 0.5 V                | max. 0.5 V                  |
| <b>Rising edge time t<sub>r</sub></b>                     | max. 200 ns   |            | max. 1 µs                 | max. 1 µs                   |
| <b>Falling edge time t<sub>f</sub></b>                    | max. 200 ns   |            | max. 1 µs                 | max. 1 µs                   |
| <b>Short circuit proof outputs<sup>1)</sup></b>           | yes <sup>2)</sup>                                     |            | yes                       | yes                         |
| <b>Reverse polarity protection of the power supply</b>    | no  |            | yes                       | no                          |
| <b>UL approval</b>  | file 224618   |            |                           |                             |
| <b>CE compliant acc. to</b>                               | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |            |                           |                             |

| Mechanical characteristics                       |   |  |  |  |
|--|---|--|--|--|
| <b>Maximum speed<sup>3)</sup></b>                | 6000 min <sup>-1</sup>                          |  |  |  |
| <b>Mass moment of inertia</b>                    | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup> |  |  |  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm                                       |  |  |  |
| <b>Weight</b>                                    | approx. 0.4 kg [14.11 oz]                       |  |  |  |
| <b>Load capacity of shaft</b>                    | radial  | 80 N   |  |  |
|  | axial   | 40 N   |  |  |
| <b>Protection acc. to EN 60529</b>               | IP66 / IP67                                     |  |  |  |
| <b>Working temperature</b>                       | -40°C ... +85°C [-40°F ... +185°F]              |  |  |  |
| <b>Material</b>                                  | housing, flange, shaft connector                | stainless steel, 1.4305 (V2A)<br>stainless steel |  |  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms                    |  |  |  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz           |  |  |  |

1) If power supply correctly applied.  
2) Only one channel allowed to be shorted-out:  
at +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
at +V = 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.  
3) For continuous operation max. 3000 min<sup>-1</sup>.

# Incremental encoders

**Standard  
stainless steel, optical**

**Sendix 5006 / 5026 (shaft / hollow shaft)**

**Push-pull / RS422**

## Terminal assignment

| Output circuit | Type of connection | M12 connector, 8-pin |     |    |   |           |   |           |   |           |                  |
|----------------|--------------------|----------------------|-----|----|---|-----------|---|-----------|---|-----------|------------------|
| 2, 4, 5        | 5006: 4            | Signal:              | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | 0 | $\bar{0}$ | $\perp$          |
|                | 5026: 2            | Pin:                 | 1   | 2  | 3 | 4         | 5 | 6         | 7 | 8         | PH <sup>1)</sup> |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 A,  $\bar{A}$ : Incremental output channel A  
 B,  $\bar{B}$ : Incremental output channel B  
 0,  $\bar{0}$ : Reference signal  
 PH  $\perp$ : Plug connector housing (shield)

Top view of mating side, male contact base



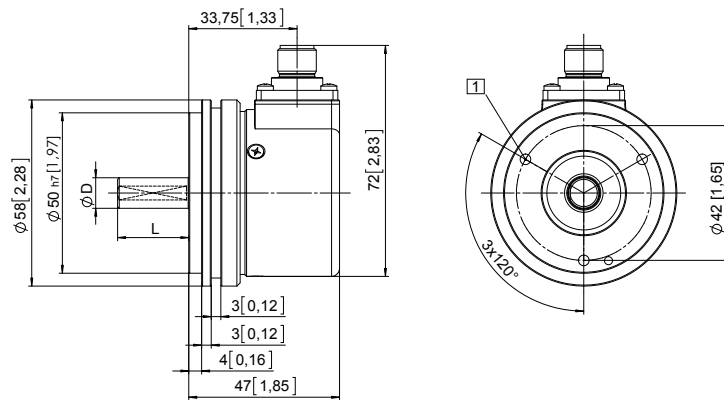
M12 connector, 8-pin

## Dimensions shaft version

Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 58 [2.28] Flange type A

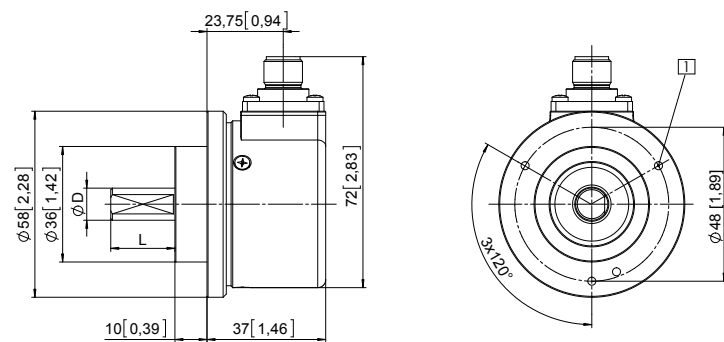
1 3 x M4, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 3/8"      | h8  | 7/8"      |

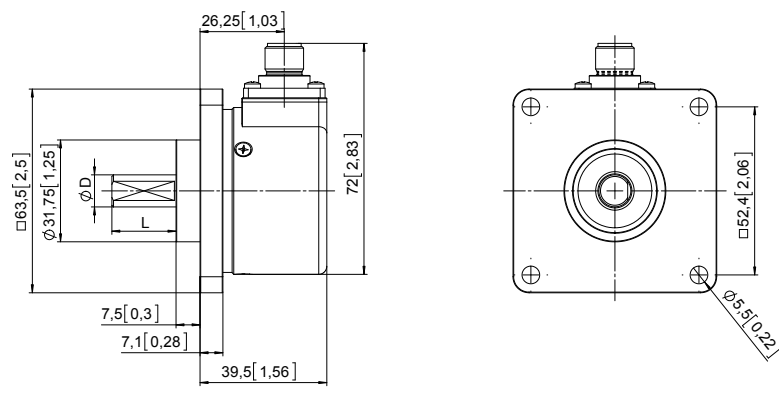
### Clamping flange, $\varnothing$ 58 [2.28] Flange type 7

1 3 x M3, 5.5 [0.22] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5] Flange type C



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 3/8"      | h8  | 7/8"      |

1) PH = shield is attached to connector housing.

# Incremental encoders

|  |  |                          |
|--|--|--------------------------|
| <b>Standard stainless steel, optical</b> | <b>Sendix 5006 / 5026 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|

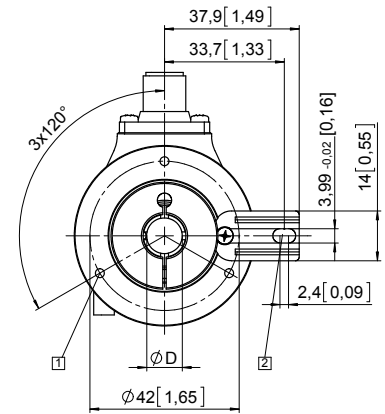
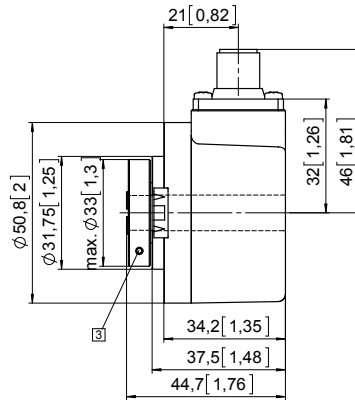
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1

- 1 3 x M3, 6 [0.24] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm

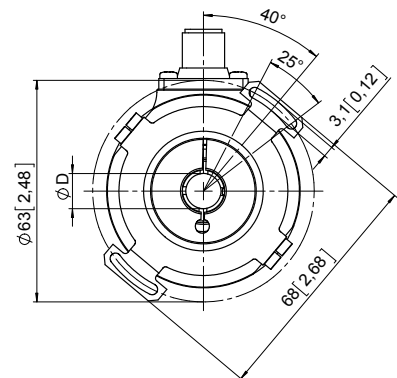
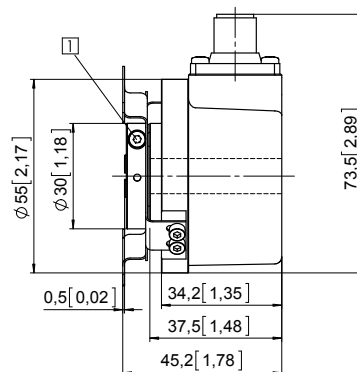
| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 15 [0.99] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |



### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type C

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 15 [0.99] | H7  |
| 1/4"      | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |



Incremental encoders

# Incremental encoders

Standard, ATEX/IECEX – zone 1/21  
optical

Sendix 7000 / 7020 (shaft / hollow shaft)

Push-pull / RS422



The Sendix 7000 / 7020 incremental encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per rotation; they are also available with axial and radial cable outlets.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater durable

## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code Shaft version

8.7000 . 1 X X X . X X X X . X X X X  
Type      a b c d      e      f

### a Flange

1 = clamping / synchronous flange, IP67,  $\varnothing$  70 mm [2.76"]

### b Shaft ( $\varnothing \times L$ )

2 = 10 x 20 mm [0.39 x 0.79"], with flat

1 = 12 x 25 mm [0.47 x 0.98"],

with keyway for 4 x 4 mm [0.16 x 0.16"] key

### c Output circuit / power supply

4 = RS422 (with inverted signal) / 5 V DC

1 = RS422 (with inverted signal) / 5 ... 30 V DC

2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC

5 = push-pull (with inverted signal) / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 2 m [6.56'] PUR

2 = radial cable, 2 m [6.56'] PUR

A = axial cable, length > 2 m [6.56']

B = radial cable, length > 2 m [6.56']

### e Pulse rate

1, 5, 10, 12, 36, 100, 200, 250, 256,  
360, 400, 500, 512, 600, 800, 1000,  
1024, 1200, 2000, 2048, 2500, 3600,  
4096, 5000

(e.g. 100 pulses => 0100)

### f Cable length in dm <sup>1)</sup>

0050 = 5 m [16.40']

0100 = 10 m [32.81']

0150 = 15 m [49.21']

### Optional on request

- other pulse rates
- special cable length
- stainless steel version
- IP65 version for T6

1) Not applicable with connection types 1 and 2.



# Incremental encoders

|   |  |                          |
|---|--|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7000 / 7020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|--|--------------------------|

|  |  |   |                  |       |      |                  |                  |                  |                  |                  |                  |  |  |  |  |   |   |
|--|--|---|------------------|-------|------|------------------|------------------|------------------|------------------|------------------|------------------|--|--|--|--|---|---|
| <b>Order code</b><br>Hollow shaft  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">8.7020<br/><small>Type</small></td> <td style="text-align: center; padding: 2px;">.XXXXX.</td> <td style="text-align: center; padding: 2px;">XXXX.</td> <td style="text-align: center; padding: 2px;">XXXX</td> </tr> <tr> <td style="text-align: center; padding: 2px;"><small>a</small></td> <td style="text-align: center; padding: 2px;"><small>b</small></td> <td style="text-align: center; padding: 2px;"><small>c</small></td> <td style="text-align: center; padding: 2px;"><small>d</small></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><small>e</small></td> <td colspan="3" style="text-align: center; padding: 2px;"><small>f</small></td> </tr> </table> | 8.7020<br><small>Type</small>   | .XXXXX.          | XXXX. | XXXX | <small>a</small> | <small>b</small> | <small>c</small> | <small>d</small> | <small>e</small> | <small>f</small> |  |  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top; padding: 2px;"> <p><b>a</b> Flange</p> <p>1 = with spring element, short<br/>5 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])</p> <p>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply</p> <p>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> </td> <td style="width: 33%; vertical-align: top; padding: 2px;"> <p><b>d</b> Type of connection</p> <p>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate</p> <p>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> </td> <td style="width: 33%; vertical-align: top; padding: 2px;"> <p><b>f</b> Cable length in dm <sup>1)</sup></p> <p>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- other pulse rates</li> <li>- special cable length</li> <li>- stainless steel version</li> <li>- IP65 version for T6</li> </ul> </td> </tr> </table> | <p><b>a</b> Flange</p> <p>1 = with spring element, short<br/>5 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])</p> <p>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply</p> <p>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> | <p><b>d</b> Type of connection</p> <p>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate</p> <p>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> | <p><b>f</b> Cable length in dm <sup>1)</sup></p> <p>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- other pulse rates</li> <li>- special cable length</li> <li>- stainless steel version</li> <li>- IP65 version for T6</li> </ul> |
| 8.7020<br><small>Type</small>  | .XXXXX.  | XXXX.   | XXXX             |       |      |                  |                  |                  |                  |                  |                  |  |  |  |  |   |   |
| <small>a</small>   | <small>b</small>   | <small>c</small>  | <small>d</small> |       |      |                  |                  |                  |                  |                  |                  |  |  |  |  |   |   |
| <small>e</small>   | <small>f</small>   |   |                  |       |      |                  |                  |                  |                  |                  |                  |  |  |  |  |   |   |
| <p><b>a</b> Flange</p> <p>1 = with spring element, short<br/>5 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])</p> <p>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply</p> <p>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> | <p><b>d</b> Type of connection</p> <p>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate</p> <p>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p>  | <p><b>f</b> Cable length in dm <sup>1)</sup></p> <p>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- other pulse rates</li> <li>- special cable length</li> <li>- stainless steel version</li> <li>- IP65 version for T6</li> </ul> |                  |       |      |                  |                  |                  |                  |                  |                  |  |  |  |  |   |   |

Incremental encoders

| Mounting accessory for shaft encoders                                    | Order no.               |
|--|-------------------------|
| <b>Coupling</b> bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

**Technical data**

| Explosion protection Sendix 7000 |   |
|----------------------------------|---|
| ATEX                             |   |
| EC type-examination certificate  | PTB09 ATEX 1106 X   |
| Category (gas)                   | II 2 G Ex d IIC T4 - T6 Gb                                  |
| Category (dust)                  | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| Relevant standards               | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| IECEX                            |   |
| Certificate of Conformity (CoC)  | IECEX PTB 13.0026 X   |
| Category (gas)                   | Ex d IIC T4 - T6 Gb   |
| Category (dust)                  | Ex tb IIIC T135°C - T85°C Db                                |
| Relevant standards               | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7020 |   |
|----------------------------------|---|
| ATEX                             |   |
| EC type-examination certificate  | IBExU 15 ATEX 1091 X  |
| Category (gas)                   | II 2 G Ex d IIC T4 - T6 Gb                                  |
| Category (dust)                  | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| Relevant standards               | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| IECEX                            |   |
| Certificate of Conformity (CoC)  | IECEX IBE 15.0020 X   |
| Category (gas)                   | Ex d IIC T4 - T6 Gb   |
| Category (dust)                  | Ex tb IIIC T135°C - T85°C Db                                |
| Relevant standards               | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

1) Not applicable with connection types 1 and 2.

# Incremental encoders

|   |  |                          |
|---|--|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7000 / 7020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|--|--------------------------|

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Materials</b>                                 | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

| Electrical characteristics                             |  |                          |                              |                               |
|--|--|--------------------------|------------------------------|-------------------------------|
| Output circuit   | RS422 (TTL compatible)   | RS422 (TTL compatible)   | Push-pull                    | Push-pull (7272 compatible)   |
| Order code   | 1  | 4                        | 5                            | 2                             |
| <b>Power supply</b>                                    | 5 ... 30 V DC  | 5 V DC (±5 %)            | 10 ... 30 V DC               | 5 ... 30 V DC                 |
| <b>Power consumption (no load)</b>                     | typ. 40 mA<br>max. 90 mA   | typ. 40 mA<br>max. 90 mA | typ. 50 mA<br>max. 100 mA    | typ. 50 mA<br>max. 100 mA     |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA   | max. +/- 20 mA           | max. +/- 20 mA               | max. +/- 20 mA                |
| <b>Pulse frequency</b>                                 | max. 300 kHz   | max. 300 kHz             | max. 300 kHz                 | max. 300 kHz <sup>1)</sup>    |
| <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V  | min. 2.5 V<br>max. 0.5 V | min +V - 1.0 V<br>max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V |
| <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns  | max. 200 ns              | max. 1 µs                    | max. 1 µs                     |
| <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns  | max. 200 ns              | max. 1 µs                    | max. 1 µs                     |
| <b>Short circuit proof outputs<sup>2)</sup></b>        | yes <sup>3)</sup>  | yes <sup>3)</sup>        | yes                          | yes                           |
| <b>Reverse polarity protection of the power supply</b> | yes  | no                       | yes                          | no                            |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |                          |                              |                               |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |   |           |   |           |   |           |                     |                    |        |  |
|----------------|--------------------|---|-----|----|---|-----------|---|-----------|---|-----------|---------------------|--------------------|--------|--|
| 1, 2, 4, 5     | 1, 2, A, B         | Signal:   | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | 0 | $\bar{0}$ | 0 V <sub>sens</sub> | +V <sub>sens</sub> | ⊥      |  |
|                |                    | Cable marking:  | 1   | 2  | 3 | 4         | 5 | 6         | 7 | 8         | 9                   | 10                 | shield |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A / cosine signal
- B,  $\bar{B}$ : Incremental output channel B / sine signal
- 0,  $\bar{0}$ : Reference signal
- ⊥: Plug connector housing (shield)

1) Max. recommended cable length 30 m [98.43'].

2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

3) Only one channel allowed to be shorted-out:  
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

# Incremental encoders

|   |  |                          |
|---|--|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>optical</b> | <b>Sendix 7000 / 7020 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|--|--------------------------|

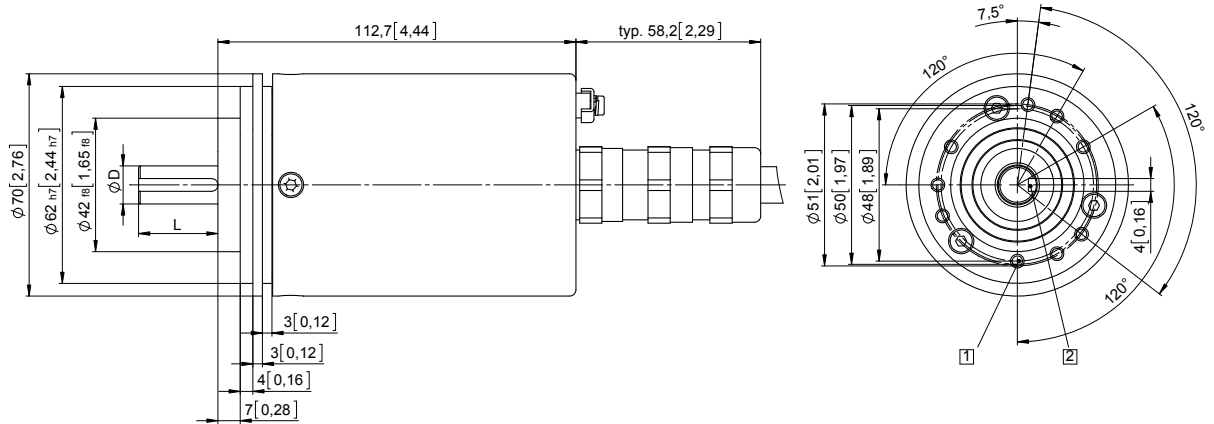
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

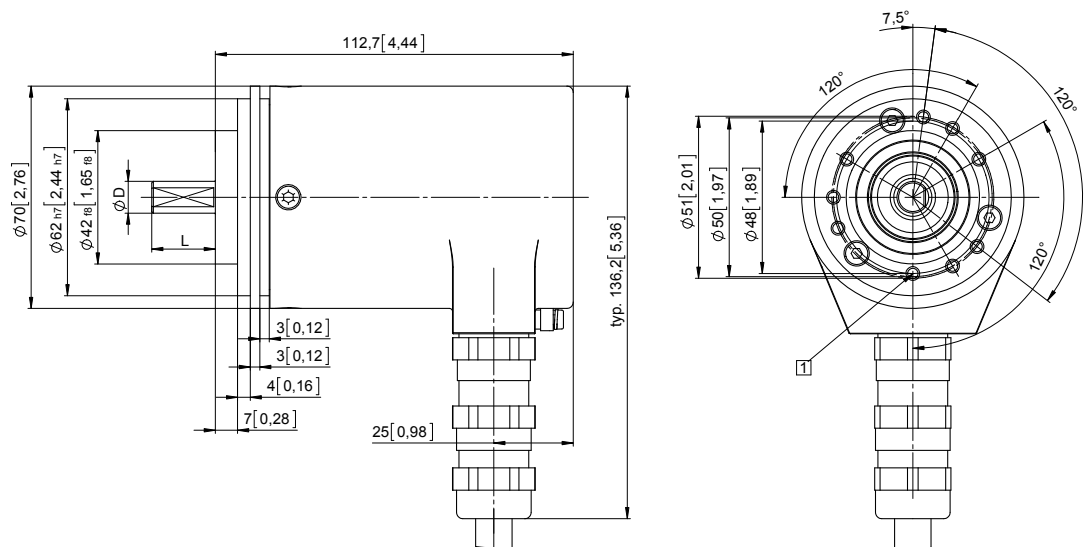


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

Incremental encoders

# Incremental encoders

**Standard, ATEX/IECEX – zone 1/21  
optical**

**Sendix 7000 / 7020 (shaft / hollow shaft)**

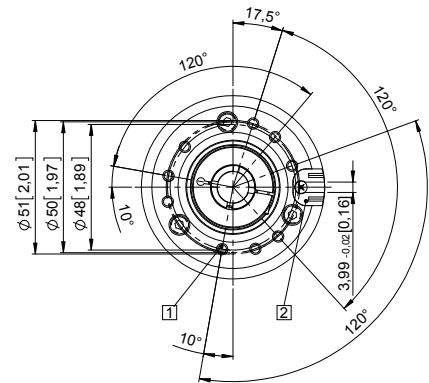
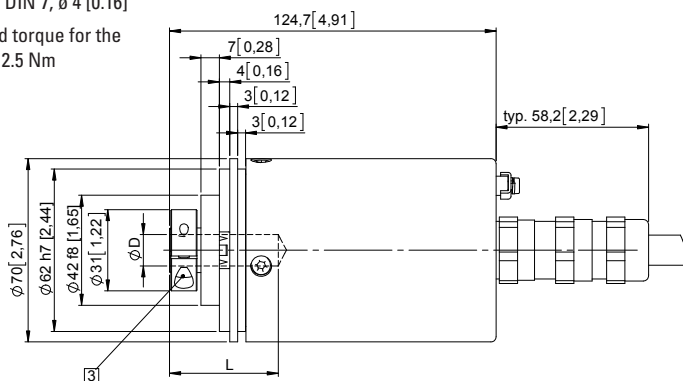
**Push-pull / RS422**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



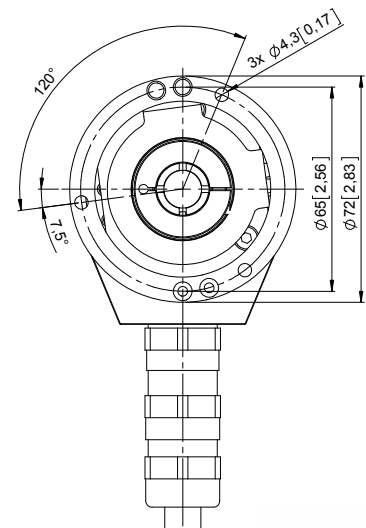
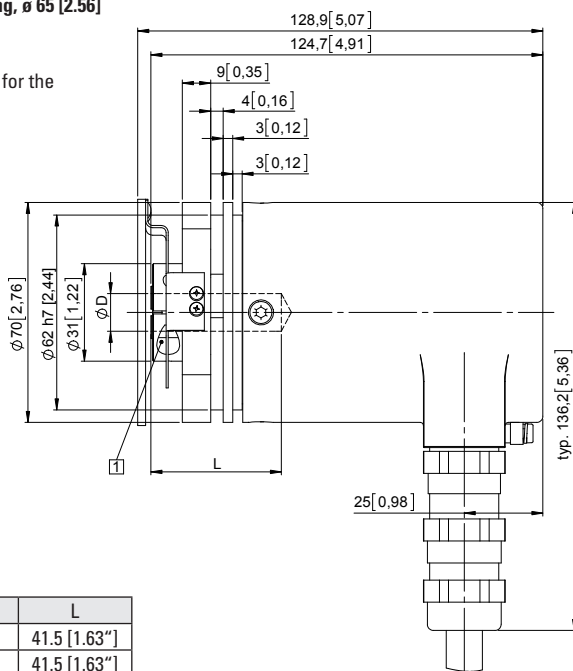
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Incremental encoders

|   |                                   |               |
|---|-----------------------------------|---------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 7014FS2 (shaft)</b> | <b>SinCos</b> |
|---|-----------------------------------|---------------|



**Ex protection and Functional Safety in one device.**

The incremental encoders 7014FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Incremental encoders



## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

## Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

|                      |                   |            |          |          |          |               |               |
|----------------------|-------------------|------------|----------|----------|----------|---------------|---------------|
| <b>Order code</b>    | <b>8.7014 FS2</b> | <b>. 1</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>. XXXX</b> | <b>. XXXX</b> |
| <b>Shaft version</b> | Type              | a          | b        | c        | d        | e             | f             |

|   |   |  |  |
|---|---|--|--|
| <b>a Flange</b><br>1 = clamping / synchronous flange, IP67<br>ø 70 mm [2.76"]   | <b>c Output circuit / power supply</b><br>1 = SinCos / 5 V DC<br>2 = SinCos / 10 ... 30 V DC  | <b>e Pulse rate</b><br>1024, 2048  | Optional on request<br>- special cable length<br>- stainless steel version |
| <b>b Shaft (ø x L)</b><br>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br>1 = 12 x 25 mm [0.47 x 0.98"],<br>with keyway for 4 x 4 mm [0.16 x 0.16"] key | <b>d Type of connection</b><br>1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] | <b>f Cable length in dm <sup>1)</sup></b><br>0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21'] |  |

| Accessories                                      |   | Order no.               |
|--|---|-------------------------|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting   | <b>8.0000.4G06.0000</b> |
| <b>Screw retention</b>                           | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b> |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                         |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                         |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Not applicable with connection types 1 and 2.

# Incremental encoders

|   |                                   |               |
|---|-----------------------------------|---------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 7014FS2 (shaft)</b> | <b>SinCos</b> |
|---|-----------------------------------|---------------|

## Technical data

| Explosion protection                   |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

**Notes regarding "Functional Safety"**

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 45 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short circuit proof outputs</b>                  | yes <sup>2)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

| Safety characteristics                     |   |
|--|---|
| <b>Classification</b>                      | PLd / SIL2  |
| <b>System structure</b>                    | 2 channel (Cat. 3)  |
| <b>PFH<sub>d</sub> value <sup>1)</sup></b> | 2.16 x 10 <sup>-8</sup> h <sup>-1</sup>                           |
| <b>Mission time / Proof test interval</b>  | 20 years  |
| <b>Relevant standards</b>                  | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |

| Mechanical characteristics                       |  |   |
|--|--|---|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |   |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |   |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |   |
| <b>Load capacity of shaft</b>                    | radial   | 80 N  |
|  | axial  | 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |   |
| <b>Protection acc. to EN 60529</b>               | IP67   |   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |   |
| <b>Materials</b>                                 | shaft  | stainless steel                                 |
|  | flange / housing   | seawater durable Al, type AlSiMgMn (EN AW-6082) |
|  | cable  | PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |   |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 1024 / 2048 ppr           |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |   |           |   |           |         |
|----------------|--------------------|---|-----|----|---|-----------|---|-----------|---------|
|                |                    | Signal:   | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |
| 1, 2           | 1, 2, A, B         | Cable marking:  | 6   | 1  | 7 | 8         | 9 | 10        | shield  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Plug connector housing (shield)

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

# Incremental encoders

|   |                                   |               |
|---|-----------------------------------|---------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 7014FS2 (shaft)</b> | <b>SinCos</b> |
|---|-----------------------------------|---------------|

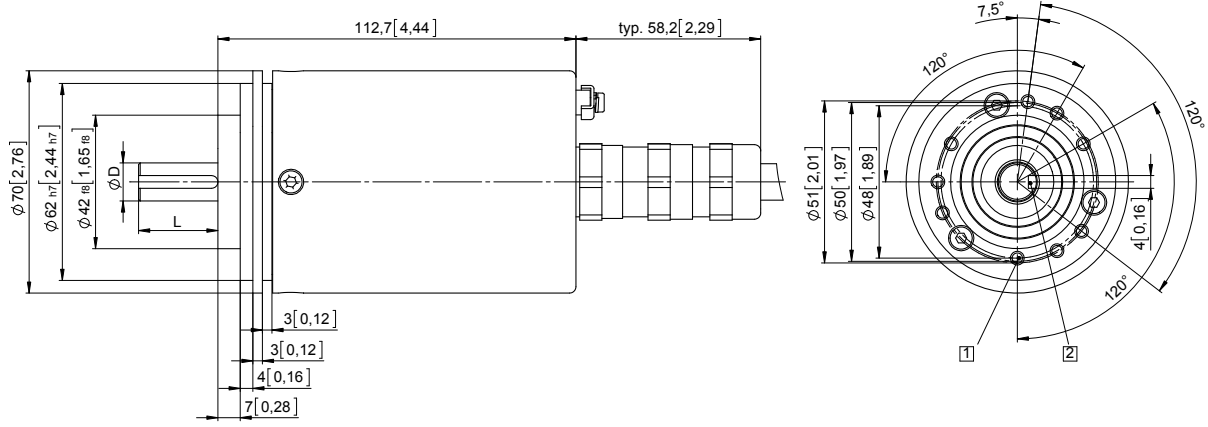
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

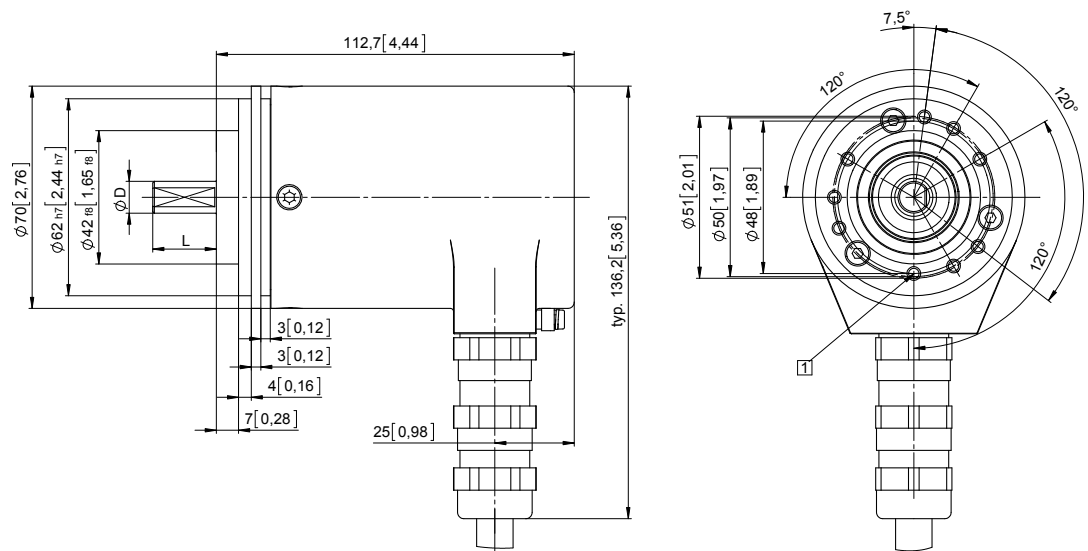


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

Incremental encoders

# Incremental encoders

**Standard, ATEX/IECEx – zone 1/21  
SIL3/PLe, optical**

**Sendix SIL 7014FS3 (shaft)**

**SinCos**



**Ex protection and Functional Safety in one device.**

The incremental encoders 7014FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



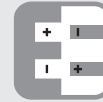
Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater durable

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code

**8.7014 FS3 . 1 XXX . XXXX . XXXX**

## Shaft version

Type

a

b

c

d

e

f

### a Flange

- 1 = clamping / synchronous flange, IP67  
ø 70 mm [2.76"]

### b Shaft (ø x L)

- 2 = 10 x 20 mm [0.39 x 0.79"], with flat
- 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

### c Output circuit / power supply

- 1 = SinCos / 5 V DC
- 2 = SinCos / 10 ... 30 V DC

### d Type of connection

- 1 = axial cable, 2 m [6.56'] PUR
- 2 = radial cable, 2 m [6.56'] PUR
- A = axial cable, length > 2 m [6.56']
- B = radial cable, length > 2 m [6.56']

### e Pulse rate

- 1024, 2048

### f Cable length in dm<sup>1)</sup>

- 0050 = 5 m [16.40']
- 0100 = 10 m [32.81']
- 0150 = 15 m [49.21']

### Optional on request

- special cable length
- stainless steel version

## Accessories

Order no.

### EMC shield terminal

for top-hat rail mounting

**8.0000.4G06.0000**

### Screw retention

Loctite 243, 5 ml

**8.0000.4G05.0000**

### Bellows coupling, safety-oriented

You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

### Safety modules Safety-M compact / modular

You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under [www.kuebler.com/safety](http://www.kuebler.com/safety).

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Not applicable with connection types 1 and 2.



# Incremental encoders

|   |                                   |               |
|---|-----------------------------------|---------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 7014FS3 (shaft)</b> | <b>SinCos</b> |
|---|-----------------------------------|---------------|

## Technical data

| Explosion protection                   |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

**Notes regarding "Functional Safety"**

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 45 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short circuit proof outputs</b>                  | yes <sup>2)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |   |           |   |           |         |
|----------------|--------------------|---|-----|----|---|-----------|---|-----------|---------|
| 1, 2           | 1, 2, A, B         | Signal:   | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |
|                |                    | Cable marking:  | 6   | 1  | 7 | 8         | 9 | 10        | shield  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Plug connector housing (shield)

| Safety characteristics                    |   |
|---|---|
| <b>Classification</b>                     | PLe / SIL3  |
| <b>System structure</b>                   | 2 channel (Cat. 4)  |
| <b>PFH<sub>d</sub> value<sup>1)</sup></b> | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>                           |
| <b>Mission time / Proof test interval</b> | 20 years  |
| <b>Relevant standards</b>                 | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Materials</b>                                 | shaft stainless steel<br>flange / housing seawater durable Al, type AISiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 1024 / 2048 ppr           |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.

2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

Incremental encoders

# Incremental encoders

**Standard, ATEX/IECEX – zone 1/21  
SIL3/PLe, optical**

**Sendix SIL 7014FS3 (shaft)**

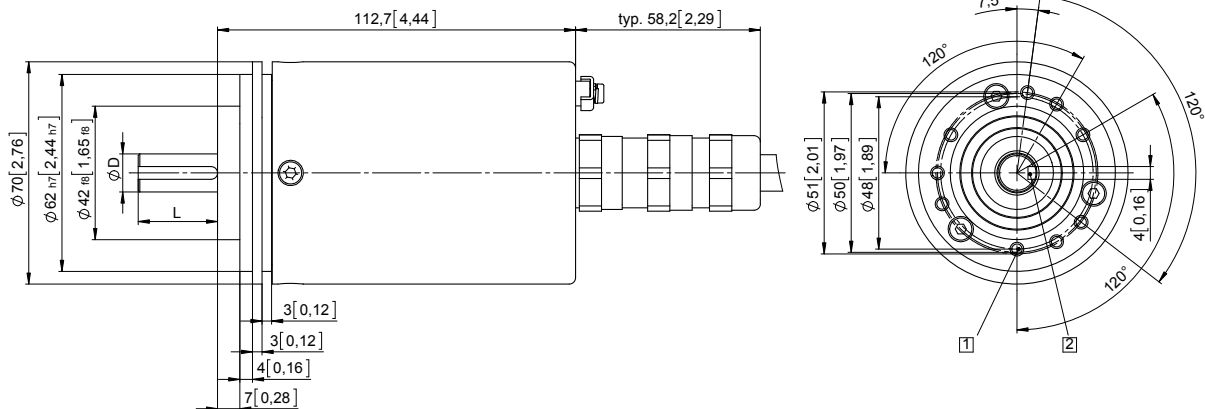
**SinCos**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

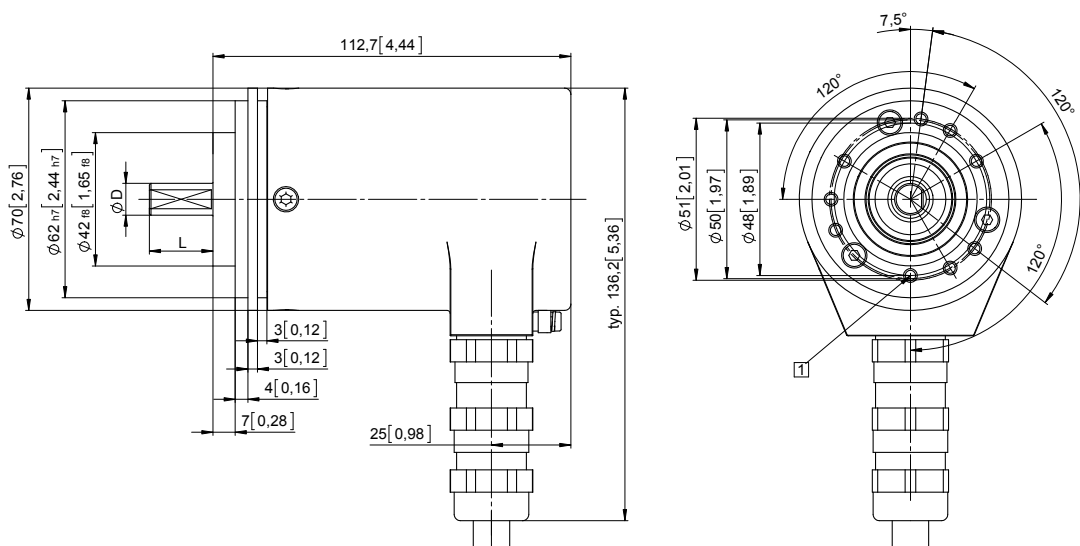
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Incremental encoders

|  |  |                          |
|--|--|--------------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7100 / 7120 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|



The incremental encoders **Sendix 7100 / 7120** in a compact 70 mm stainless steel housing have an ATEX/IECEX mining approval.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per revolution; they are also available with axial and radial cable outlets.



Incremental encoders

|             |              |                       |                       |                          |                             |                      |                     |                             |                |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor |

### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Order code</b>    | <b>8.7100 . 2 XXXX . XXXX . XXXX</b> |
| <b>Shaft version</b> | Type    a    b    c    d    e    f   |

- |   |   |   |
|---|---|---|
| <p><b>a Flange</b><br/>2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b Shaft (ø x L)</b><br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"],<br/>with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c Output circuit / power supply</b><br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> | <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e Pulse rate</b><br/>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> | <p><b>f Cable length in dm <sup>1)</sup></b><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- other pulse rates<br/>- special cable length</p> |
|---|---|---|

1) Not applicable with connection types 1 and 2.

# Incremental encoders

|  |  |                          |
|--|--|--------------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7100 / 7120 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|---|---|
| <b>Order code</b><br><b>Hollow shaft</b>  | <b>8.7120</b><br>Type   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> <td style="text-align: center;">f</td> <td style="text-align: center;">g</td> <td style="text-align: center;">h</td> <td style="text-align: center;">i</td> <td style="text-align: center;">j</td> </tr> </table> | X | X | X | X | X | X | X | X | X | X | a | b | c | d | e | f | g | h | i | j | <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply<br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> </td> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate<br/>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> </td> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>f</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- other pulse rates<br/>- special cable length</p> </td> </tr> </table> | <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply<br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> | <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate<br/>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> | <p><b>f</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- other pulse rates<br/>- special cable length</p> |
| X   | X   | X   | X | X | X | X | X | X | X |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |
| a   | b   | c   | d | e | f | g | h | i | j |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |
| <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Output circuit / power supply<br/>4 = RS422 (with inverted signal) / 5 V DC<br/>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br/>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC<br/>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> | <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate<br/>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000<br/>(e.g. 100 pulses =&gt; 0100)</p> | <p><b>f</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- other pulse rates<br/>- special cable length</p>   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |

## Technical data

| Explosion protection 7100              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Explosion protection 7120              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Materials</b>                                 | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

1) Not applicable with connection types 1 and 2.

# Incremental encoders

|  |  |                          |
|--|--|--------------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7100 / 7120 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|

| Electrical characteristics                             |  |                           |                              |                                |
|--|--|---------------------------|------------------------------|--------------------------------|
| Output circuit   | RS422<br>(TTL compatible)  | RS422<br>(TTL compatible) | Push-pull                    | Push-pull<br>(7272 compatible) |
|  | Order code <b>1</b>  | <b>4</b>                  | <b>5</b>                     | <b>2</b>                       |
| <b>Power supply</b>                                    | 5 ... 30 V DC  | 5 V DC (±5 %)             | 10 ... 30 V DC               | 5 ... 30 V DC                  |
| <b>Power consumption (no load)</b>                     | typ. 40 mA<br>max. 90 mA   | typ. 40 mA<br>max. 90 mA  | typ. 50 mA<br>max. 100 mA    | typ. 50 mA<br>max. 100 mA      |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA   | max. +/- 20 mA            | max. +/- 20 mA               | max. +/- 20 mA                 |
| <b>Pulse frequency</b>                                 | max. 300 kHz   | max. 300 kHz              | max. 300 kHz                 | max. 300 kHz <sup>1)</sup>     |
| <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V  | min. 2.5 V<br>max. 0.5 V  | min +V - 1.0 V<br>max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V  |
| <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns  | max. 200 ns               | max. 1 µs                    | max. 1 µs                      |
| <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns  | max. 200 ns               | max. 1 µs                    | max. 1 µs                      |
| <b>Short circuit proof outputs <sup>2)</sup></b>       | yes <sup>3)</sup>  | yes <sup>3)</sup>         | yes                          | yes                            |
| <b>Reverse polarity protection of the power supply</b> | yes  | no                        | yes                          | no                             |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |                           |                              |                                |

Incremental encoders

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |   |           |   |           |   |           |                     |                    |        |
|----------------|--------------------|---|-----|----|---|-----------|---|-----------|---|-----------|---------------------|--------------------|--------|
| 1, 2, 4, 5     | 1, 2, A, B         | Signal:   | 0 V | +V | A | $\bar{A}$ | B | $\bar{B}$ | 0 | $\bar{0}$ | 0 V <sub>sens</sub> | +V <sub>sens</sub> | ⊥      |
|                |                    | Cable marking:  | 1   | 2  | 3 | 4         | 5 | 6         | 7 | 8         | 9                   | 10                 | shield |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- ⊥: Plug connector housing (shield)

1) Max. recommended cable length 30 m [98.43'].  
 2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
 at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

# Incremental encoders

**Standard, ATEX/IECEX – mining optical**

**Sendix 7100 / 7120 (shaft / hollow shaft)**

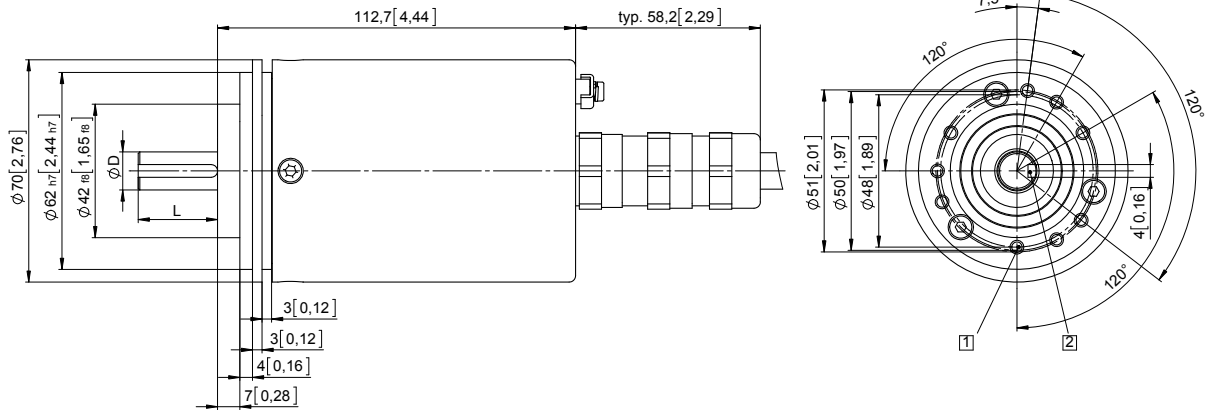
**Push-pull / RS422**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

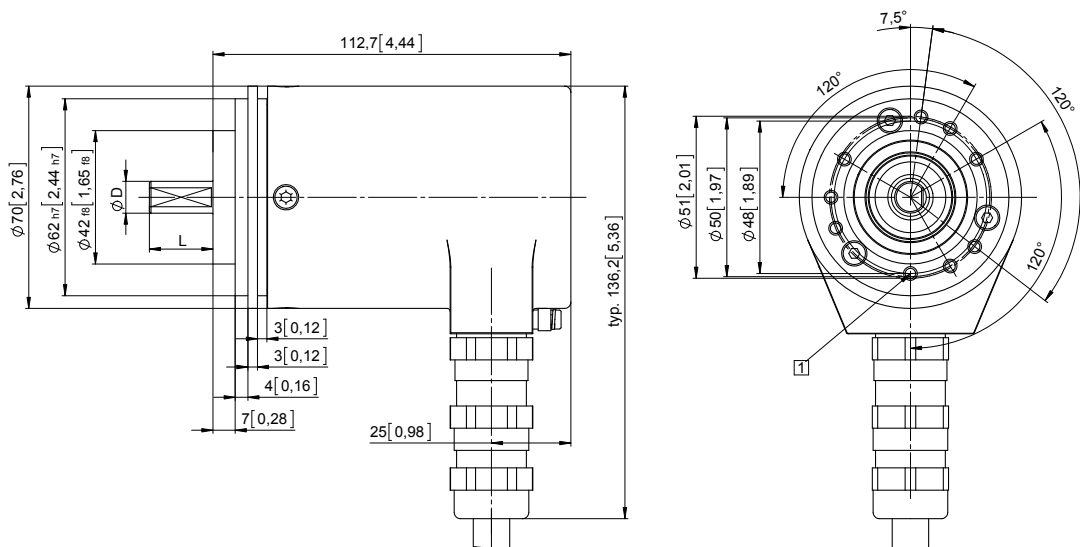
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Incremental encoders

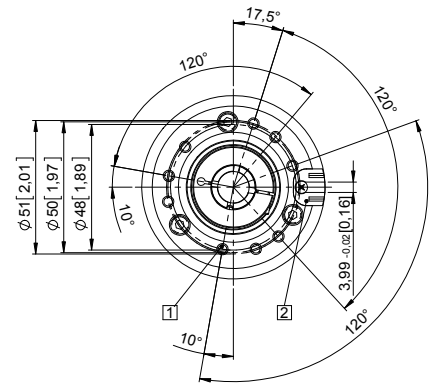
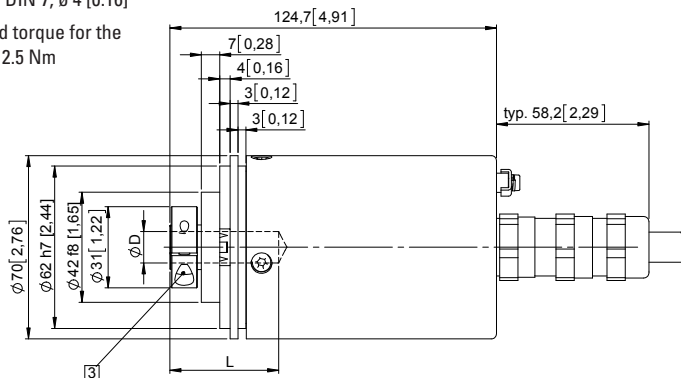
|  |  |                          |
|--|--|--------------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7100 / 7120 (shaft / hollow shaft)</b> | <b>Push-pull / RS422</b> |
|--|--|--------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



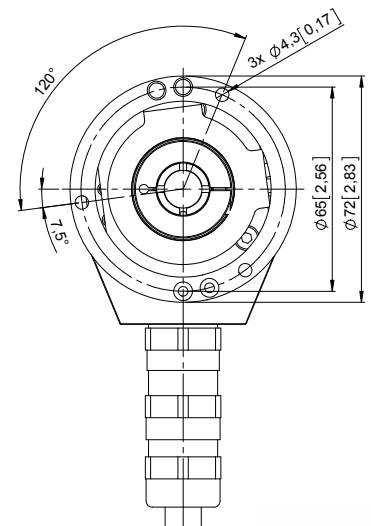
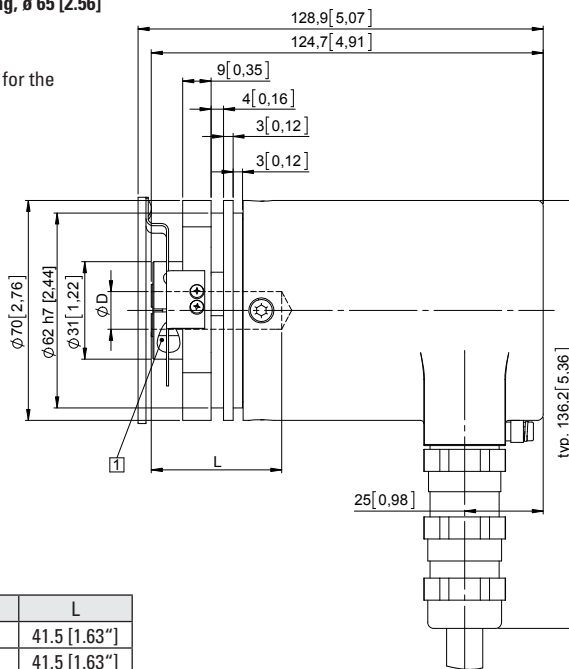
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Incremental encoders

**Large hollow shaft  
optical**

**5821 (hollow shaft)**

**Push-pull / RS422**



**Optimized proportions, optimized costs:**

**With an overall diameter of just 58 millimeters the series 5821 boasts a hollow shaft of up to 28 millimeters diameter.**



Temperature range



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection

## Adaptable

- Through hollow shaft from 16 mm up to 28 mm.
- With cable connection or M12 connector.
- High resolution up to 5000 pulses per revolution.

## Order code Hollow shaft

**8.5821** . **1XXX** . **XXXX**  
Type      a b c d e

### a Flange

1 = with spring element, ø 58 mm [2.28"]

### b Through hollow shaft

K = ø 16 mm [0.63"]  
C = ø 20 mm [0.79"]  
6 = ø 24 mm [0.94"]  
5 = ø 25 mm [0.98"]  
3 = ø 28 mm [1.10"]

### c Output circuit / power supply

1 = RS422 (with inverted signal) / 5 V DC  
4 = RS422 (with inverted signal) / 8 ... 30 V DC  
3 = Push-pull (with inverted signal) / 8 ... 30 V DC

### d Type of connection

1 = radial cable, 1 m [3.28'] PVC  
E = radial M12 connector, 8-pin

### e Pulse rate

50, 60, 100, 125, 250, 400, 500, 512, 960, 1000, 1024, 2000, 2048, 5000 (e.g. 100 pulses => 0100)

### Optional on request

- other pulse rates  
- other hollow shaft diameters

## Connection technology

Order no.

### Cordset, pre-assembled

M12 female connector with coupling nut, 8-pin  
2 m [6.56'] PVC cable

**05.00.6041.8211.002M**

### Connector, self-assembly (straight)

M12 female connector with coupling nut, 8-pin

**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).



# Incremental encoders

|                                   |                            |                          |
|-----------------------------------|----------------------------|--------------------------|
| <b>Large hollow shaft optical</b> | <b>5821 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|-----------------------------------|----------------------------|--------------------------|

## Technical data

| Mechanical characteristics                       |   |
|--|---|
| <b>Maximum speed</b>                             | 2500 min <sup>-1</sup>                          |
| <b>Mass moment of inertia</b>                    | approx. 3.5 x 10 <sup>-6</sup> kgm <sup>2</sup> |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.1 Nm  |
| <b>Weight</b>                                    | approx. 0.4 kg [14.11 oz]                       |
| <b>Protection acc. to EN 60529</b>               | IP64  |
| <b>Working temperature range</b>                 |   |
| at max. speed 2000 min <sup>-1</sup>             | -20°C ... +70°C [-4°F ... +158°F]               |
| at max. speed 2500 min <sup>-1</sup>             | -20°C ... +60°C [-4°F ... +140°F]               |
| <b>Material</b>                                  | hollow shaft steel                              |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms                    |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 35 ... 2000 Hz           |

| Electrical characteristics                              |   |                               |
|---|---|-------------------------------|
| Output circuit  | RS422   | Push-pull (7272 compatible)   |
| <b>Power supply</b>                                     | 5 V DC (±5 %) or 8 ... 30 V DC                        | 8 ... 30 V DC                 |
| <b>Power consumption with inverted signal (no load)</b> | typ. 40 mA<br>max. 90 mA                              | typ. 40 mA<br>max. 100 mA     |
| <b>Permissible load / channel</b>                       | max. +/- 20 mA  | max. +/- 40 mA                |
| <b>Pulse frequency</b>                                  | max. 300 kHz  | max. 200 kHz                  |
| <b>Signal level</b>                                     | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V - 3.0 V<br>max. 2.5 V |
| <b>Rising edge time t<sub>r</sub></b>                   | max. 200 ns   | max. 1 µs                     |
| <b>Falling edge time t<sub>f</sub></b>                  | max. 200 ns   | max. 1 µs                     |
| <b>Short circuit proof outputs <sup>1)</sup></b>        | yes   | yes                           |
| <b>Reverse polarity protection of the power supply</b>  | yes   | yes                           |
| <b>CE compliant acc. to</b>                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                               |

Incremental encoders

### Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |                  |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|------------------|
| 1, 3, 4        | 1                  | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield           |
| Output circuit | Type of connection | M12 connector, 8-pin  |     |    |    |           |    |           |    |           |                  |
| 1, 3, 4        | E                  | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | 1   | 2  | 3  | 4         | 5  | 6         | 7  | 8         | PH <sup>2)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin

1) If power supply correctly applied.  
2) PH = shield is attached to connector housing.

# Incremental encoders

## Large hollow shaft optical

5821 (hollow shaft)

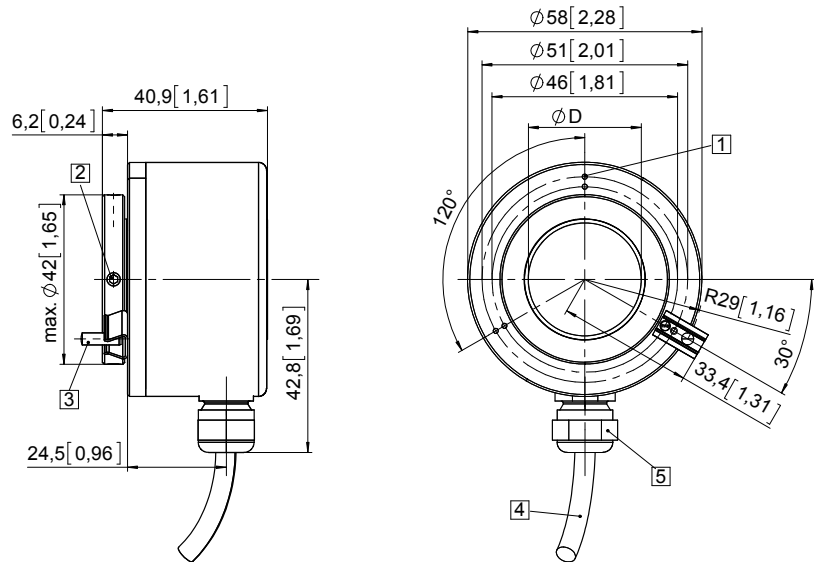
Push-pull / RS422

### Dimensions

Dimensions in mm [inch]

#### Flange with spring element, $\varnothing 58$ [2.28] Cable version, connection type 1

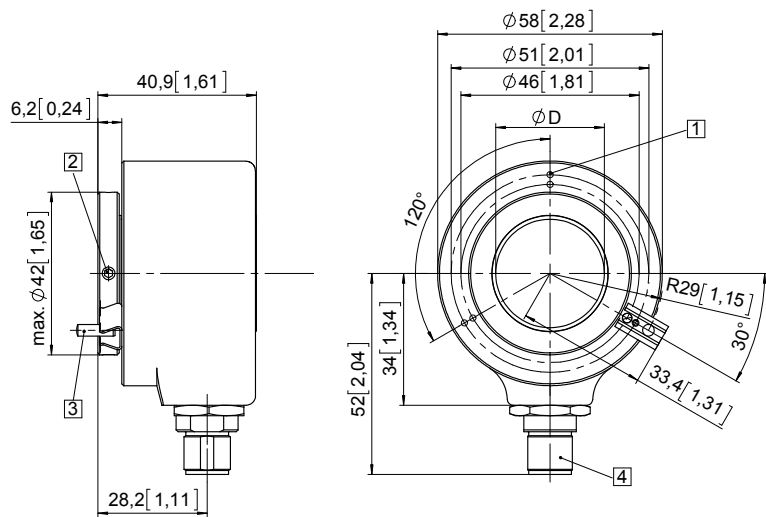
- 1 M1.6 / 5 [0.2] deep
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cylindrical pin 3m6x12 DIN 6325 included
- 4 Cable length 1 m [3.28']
- 5 Cable gland PG7



| D         | Fit |
|-----------|-----|
| 16 [0.63] | F7  |
| 20 [0.79] | F7  |
| 24 [0.94] | F7  |
| 25 [0.98] | F7  |
| 28 [1.10] | F7  |

#### Flange with spring element, $\varnothing 58$ [2.28] M12 connector version, connection type E

- 1 M1.6 / 5 [0.2] deep
- 2 Cylindrical pin 3m6x12 DIN 6325 included
- 3 4 x socket set screw M4x6 DIN 913
- 4 Connector M12



| D         | Fit |
|-----------|-----|
| 16 [0.63] | F7  |
| 20 [0.79] | F7  |
| 24 [0.94] | F7  |
| 25 [0.98] | F7  |
| 28 [1.10] | F7  |

# Incremental encoders

|                                   |                            |                                   |
|-----------------------------------|----------------------------|-----------------------------------|
| <b>Large hollow shaft optical</b> | <b>A020 (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|-----------------------------------|----------------------------|-----------------------------------|



The incremental encoder type A020 with optical sensor technology is available with a through hollow shaft up to max. 42 mm diameter.

With an installation depth of just 43 mm it is optimally suited for mounting on large shafts, even where space is tight.



Incremental encoders

|                       |                       |                             |                      |                |
|-----------------------|-----------------------|-----------------------------|----------------------|----------------|
|                       |                       |                             |                      |                |
| High rotational speed | High protection level | Shock / vibration resistant | Magnetic field proof | Optical sensor |

### Compact

- Minimal installation depth but large hollow shaft.
- Available with compact M12 connector.
- Torque stop can be implemented even with small radius.

### Flexible

- With push-pull, RS422 or SinCos interface.
- Hollow shaft from 20 mm up to 42 mm as standard.
- With cable connection, M12 or M23 connectors.

### Order code Hollow shaft

**8.A020** . **XXXX** . **XXXX**  
Type                      a   b   c   d                      e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



**a Flange**  
 2 = with spring element, short  
3 = with spring element, long  
 5 = with torque stop, long

**b Through hollow shaft**  
 C = ø 20 mm [0.79"]  
 6 = ø 24 mm [0.94"]  
5 = ø 25 mm [0.98"]  
 3 = ø 28 mm [1.10"]  
**A = ø 30 mm [1.18"]**  
 2 = ø 38 mm [1.50"]  
 B = ø 40 mm [1.57"]  
 1 = ø 42 mm [1.65"]  
 4 = ø 1"

**c Output circuit / power supply**  
1 = RS422 (with inverted signal) / 5 V DC  
 4 = RS422 (with inverted signal) / 10 ... 30 V DC  
 2 = Push-pull (without inverted signal) / 10 ... 30 V DC  
 5 = Push-pull (with inverted signal) / 5 ... 30 V DC  
**3 = Push-pull! (with inverted signal) / 10 ... 30 V DC**  
 A = Push-pull (7272 compatible) / 5 ... 30 V DC  
 8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC  
 9 = SinCos, 1 Vpp (with inverted signal) / 10 .. 30 V DC

**d Type of connection**  
 1 = radial cable, 1 m [3.28'] PVC  
 A = radial cable, special length PVC \*)  
**2 = radial M23 connector, 12-pin, without mating connector**  
 E = radial M12 connector, 8-pin

\*) Available special lengths (connection type A):  
 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.A020.351A.2048.0030 (for cable length 3 m)

**e Pulse rate**  
 50, 360, 512, 600, 1000, 1024, 1500,  
 2000, 2048, 2500, 4096, 5000  
 (e.g. 360 pulses => 0360)  
  
 SinCos version only available with pulses ≥ 1024  
  
*Optional on request*  
 - other pulse rates

# Incremental encoders

|                                   |                            |                                   |
|-----------------------------------|----------------------------|-----------------------------------|
| <b>Large hollow shaft optical</b> | <b>A020 (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|-----------------------------------|----------------------------|-----------------------------------|

| Mounting accessory for hollow shaft encoders  | Dimensions in mm [inch]   | Order no.                                       |
|---|---|---|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 2 + 3) | with fixing thread<br>  | <b>8.0010.4700.0003</b>                         |
| Connection technology   |   | Order no.                                       |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable                          | <b>05.00.6041.8211.002M</b>                     |
|   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable                         | <b>8.0000.6201.0002</b>                         |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut, 8-pin<br>M23 female connector with coupling nut, 12-pin | <b>05.CMB 8181-0</b><br><b>8.0000.5012.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |   |
|---|---|
| Mechanical characteristics                              |   |
| <b>Maximum speed</b>                                    | 3000 min <sup>-1</sup> 1)   |
| <b>Mass moment of inertia</b> 2)                        | < 150 x 10 <sup>-6</sup> kgm <sup>2</sup>   |
| <b>Starting torque with sealing</b><br>at 20°C [68°F]   | < 0.2 Nm  |
| <b>Weight</b>   | approx. 0.7 kg [24.69 oz]   |
| <b>Protection</b> acc. to EN 60529                      | IP65  |
| <b>Working temperature range</b>                        | -40°C 3) ... +70°C [-40°F 3) ... +158°F]  |
| <b>Material</b>   | shaft stainless steel H7  |
| <b>Shock resistance</b> acc. to EN 60068-2-27           | 1000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance</b> acc. to EN 60068-2-6        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz   |
| Electrical characteristics SinCos output                |   |
| <b>Output circuit</b>                                   | <b>SinCos U = 1 Vpp</b> <b>SinCos U = 1 Vpp</b>   |
| <b>Power supply</b>                                     | 5 V DC (±5 %)      10 ... 30 V DC   |
| <b>Power consumption with inverted signal</b> (no load) | typ. 65 mA      typ. 65 mA<br>max. 110 mA      max. 110 mA  |
| <b>-3 dB frequency</b>                                  | ≤180 kHz      ≤180 kHz  |
| <b>Signal level</b>                                     | channels A/B      1 Vpp (±20 %)      1 Vpp (±20 %)<br>channel 0      0.1 ... 1.2 V      0.1 ... 1.2 V |
| <b>Short circuit proof outputs</b> 4)                   | yes      yes  |
| <b>Reverse polarity protection of the power supply</b>  | no      yes   |
| <b>UL approval</b>                                      | file 224618   |
| <b>CE compliant</b> acc. to                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |

| Electrical characteristics                             |   |  |                               |
|--|---|--|-------------------------------|
| Output circuit   | RS422 (TTL compatible)  | Push-pull  | Push-pull (7272 compatible)   |
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   | 10 ... 30 V DC                                   | 5 ... 30 V DC                 |
| <b>Power consumption</b> (no load)                     | without inverted signal –<br>with inverted signal typ. 40 mA/max. 90 mA | typ. 55 mA/max. 125 mA<br>typ. 80 mA/max. 150 mA | –<br>typ. 50 mA/max. 100 mA   |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA  | max. +/- 30 mA                                   | max. +/- 20 mA                |
| <b>Pulse frequency</b>                                 | max. 300 kHz  | max. 300 kHz                                     | max. 300 kHz                  |
| <b>Signal level</b>                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V                                       | min. +V - 3.0 V<br>max. 2.5 V                    | min. +V - 2.0 V<br>max. 0.5 V |
| <b>Rising edge time t<sub>r</sub></b>                  | max. 200 ns   | max. 1 µs  | max. 1 µs                     |
| <b>Falling edge time t<sub>f</sub></b>                 | max. 200 ns   | max. 1 µs  | max. 1 µs                     |
| <b>Short circuit proof outputs</b> 4)                  | yes 5)  | yes  | yes                           |
| <b>Reverse polarity protection of the power supply</b> | no, 10 ... 30 V DC: yes   | yes  | no                            |
| <b>UL approval</b>                                     | file 224618   |  |                               |
| <b>CE compliant</b> acc. to                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU                   |  |                               |

1) Short term (app. 15 min. range) up to 3500 min<sup>-1</sup>.

2) Depending on shaft diameter.

3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].

4) If power supply correctly applied.

5) Only one channel allowed to be shorted-out:  
 at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.  
 at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

# Incremental encoders

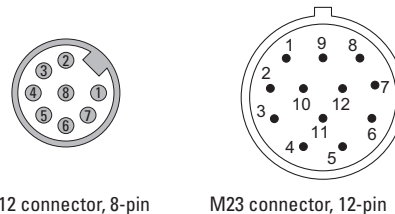
|                                   |                            |                                   |
|-----------------------------------|----------------------------|-----------------------------------|
| <b>Large hollow shaft optical</b> | <b>A020 (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|-----------------------------------|----------------------------|-----------------------------------|

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |        |    |           |    |           |    |           |                  |
|----------------|--------------------|---|-----|----|---------|--------|----|-----------|----|-----------|----|-----------|------------------|
| 1 ... A        | 1, A               | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Cable color:  | WH  | BN | GY PK   | RD BU  | GN | YE        | GY | PK        | BU | RD        | shield           |
| Output circuit | Type of connection | M23 connector, 12-pin   |     |    |         |        |    |           |    |           |    |           |                  |
| 1 ... A        | 2                  | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | 10  | 12 | 11      | 2      | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>1)</sup> |
| Output circuit | Type of connection | M12 connector, 8-pin  |     |    |         |        |    |           |    |           |    |           |                  |
| 1 ... A        | E                  | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | 1   | 2  | -       | -      | 3  | 4         | 5  | 6         | 7  | 8         | PH <sup>1)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base

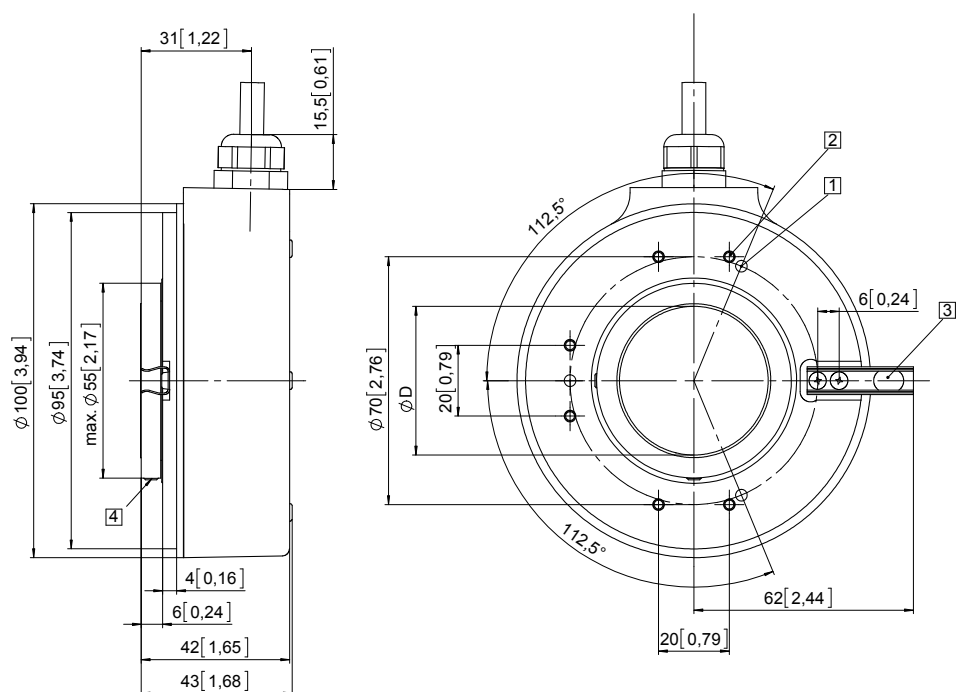


## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 3

- 1) 3 x M4, 7 [0.28] deep
- 2) 6 x M3, 8 [0.31] deep
- 3) Cylindrical pin DIN 6325,  $\phi$  6 [0.24]
- 4) Recommended torque for the clamping ring 1.0 Nm



| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 1"        | H7  |

Typ. insertion depth: 1.5 x D  
up to L hollow shaft max.

1) PH = shield is attached to connector housing.

# Incremental encoders

**Large hollow shaft  
optical**

**A020 (hollow shaft)**

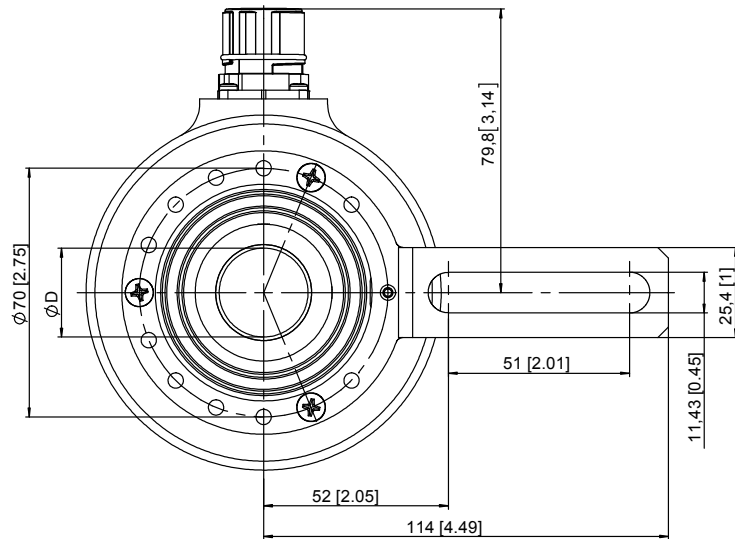
**Push-pull / RS422 / SinCos**

## Dimensions hollow shaft version

Dimensions in mm [inch]

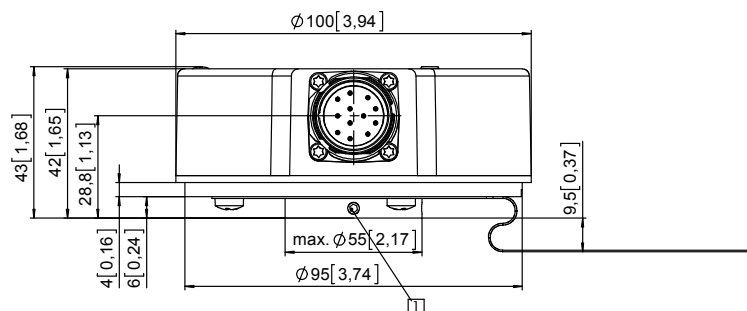
**Flange with torque stop, long  
Flange type 5**

**1** Recommended torque for the clamping ring 1.0 Nm



| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 1"        | H7  |

Typ. insertion depth: 1.5 x D  
up to L hollow shaft max.



# Incremental encoders

|   |                            |                                   |
|---|----------------------------|-----------------------------------|
| <b>Large hollow shaft<br/>robust, optical</b> | <b>A02H (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|---|----------------------------|-----------------------------------|



The Heavy Duty incremental encoder type A02H boasts a high degree of ruggedness in a very compact design.

Its special construction makes it perfect for all applications in very harsh environments.



Incremental encoders

|                       |                       |                          |                           |                      |                |
|-----------------------|-----------------------|--------------------------|---------------------------|----------------------|----------------|
|                       |                       |                          |                           |                      |                |
| High rotational speed | High protection level | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Optical sensor |

### Heavy Duty - robust

- Special shaft connection with interlocked bearings.
- Balanced stainless steel clamping ring.
- Optional isolation inserts available to protect against shaft currents.

### Compact and versatile

- Only 49 mm installation depth.
- With cable connections, M12, M23 or MIL connectors.
- With push-pull, RS422 or SinCos interface.

### Order code Hollow shaft

**8.A02H.XXXX**  
Type      a b c d      e

#### a Flange

- 1 = without mounting aid
- 2 = with spring element, short
- 3 = with spring element, long
- 5 = with torque stop, long
- 6 = with torque stop, short, 4.5" <sup>1)</sup>

#### b Through hollow shaft

- C = ø 20 mm [0.79"]
- 5 = ø 25 mm [0.98"]
- 3 = ø 28 mm [1.10"]
- A = ø 30 mm [1.18"]
- 2 = ø 38 mm [1.50"]
- B = ø 40 mm [1.57"]
- 1 = ø 42 mm [1.65"]
- 4 = ø 1"

- E = ø 5/8" <sup>1)</sup>
- N = ø 1 1/4" <sup>1)</sup>

#### c Output circuit / power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 2 = Push-pull (without inverted signal) / 10 ... 30 V DC
- 5 = Push-pull (with inverted signal) / 5 ... 30 V DC
- 3 = Push-pull (with inverted signal) / 10 ... 30 V DC
- 8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 9 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC
- A = Push-pull (7272 compatible) / 5 ... 30 V DC
- D = RS422 (with inverted signal) / 5 ... 30 V DC <sup>1)</sup>

#### d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- A = radial cable, special length PVC \*)
- 2 = radial M23 connector, 12-pin, without mating connector
- E = radial M12 connector, 8-pin

#### D = MIL connector, 10-pin <sup>1)</sup>

\*) Available special lengths (connection type A):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.A02H.111A.2048.0030 (for cable length 3 m)

#### e Pulse rate

- 50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000 (e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024

#### Optional on request

- other pulse rates on request
- Ex 2/22 <sup>2)</sup>

1) US version.

2) For the cable connection type, cable material PUR.

# Incremental encoders

|   |                            |                                   |
|---|----------------------------|-----------------------------------|
| <b>Large hollow shaft<br/>robust, optical</b> | <b>A02H (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|---|----------------------------|-----------------------------------|

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

**Cylindrical pin, long**  
for flange with spring element  
(flange type 2 + 3)

with fixing thread

|  |                         |
|--|-------------------------|
|  | <b>8.0010.4700.0003</b> |
|--|-------------------------|

**Tether arm, flexible**

|  |   |   |
|--|---|---|
|  | 70 mm [2.76"]<br>100 mm [3.94"]<br>150 mm [5.91"] | <b>8.0010.40S0.0000</b><br><b>8.0010.40T0.0000</b><br><b>8.0010.40U0.0000</b> |
|--|---|---|

| Tether arm     | L1                          | L2                          |
|----------------|-----------------------------|-----------------------------|
| 70 mm [2.76"]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.94"] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91"] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

1 Socket screw M2.5 x 6 [0.24]  
 2 Lock washer

**Torque stop, short**

|  |                         |
|--|-------------------------|
|  | <b>8.0010.4T00.0000</b> |
|--|-------------------------|

1 Curved spring element  
 2 Hexagonal nut 3/8 - 16 UNC  
 3 Washer (isolating)  
 4 Hexagonal screw 3/8 16 UNC x 1"  
 5 Washer D10.4 x 15 x 15

**Stator coupling**

|  |                         |
|--|-------------------------|
|  | <b>8.0010.40V0.0000</b> |
|--|-------------------------|



# Incremental encoders

| Large hollow shaft<br>robust, optical   |  | A02H (hollow shaft)   | Push-pull / RS422 / SinCos   |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
|---|--|---|--|-------------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|------|-------------------------|------|-------------------------|------|-------------------------|----|-------------------------|--------|--|
| <b>Mounting accessory for hollow shaft encoders</b>   |  |   | Order no.  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Protective cover</b>   |  | For applications with a very high degree of pollution, Kübler now offers a protective cover for <ul style="list-style-type: none"> <li>Improved reliability</li> <li>Extension of the service life of the encoder</li> </ul> Scope of delivery: <ul style="list-style-type: none"> <li>Protective cover</li> <li>Torque stop (8.0010.4T00.0000)</li> <li>3 screws for fixing to the encoder</li> </ul>  | <b>8.0010.40Y0.0001</b>  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Tapered shaft mounting kit</b><br>for A02H with hollow shaft, $\varnothing$ 38 mm [1.50"]  |  | For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling. An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.           Included in the set: <ul style="list-style-type: none"> <li>Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length</li> <li>Isolation insert</li> <li>Allen screw for central fixing</li> </ul> | <b>8.0010.4028.0000</b>  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Isolation insert for hollow shaft, <math>\varnothing</math> 38 mm [1.50"]</b><br>Temperature range -40°C ... +115°C [-40°F ... +239°F]   |  |   | <table border="0"> <tr><td><math>\varnothing</math> D1:</td><td><b>8.0010.4091.0000</b></td></tr> <tr><td>12 mm [0.47"]</td><td><b>8.0010.4027.0000</b></td></tr> <tr><td>14 mm [0.55"]</td><td><b>8.0010.4038.0000</b></td></tr> <tr><td>15 mm [0.59"]</td><td><b>8.0010.4019.0000</b></td></tr> <tr><td>16 mm [0.63"]</td><td><b>8.0010.4080.0000</b></td></tr> <tr><td>18 mm [0.71"]</td><td><b>8.0010.4011.0000</b></td></tr> <tr><td>20 mm [0.79"]</td><td><b>8.0010.4012.0000</b></td></tr> <tr><td>25 mm [0.98"]</td><td><b>8.0010.4016.0000</b></td></tr> <tr><td>30 mm [1.18"]</td><td><b>8.0010.4015.0000</b></td></tr> <tr><td>32 mm [1.26"]</td><td><b>8.0010.4013.0000</b></td></tr> <tr><td>1/2"</td><td><b>8.0010.4070.0000</b></td></tr> <tr><td>5/8"</td><td><b>8.0010.4090.0000</b></td></tr> <tr><td>3/4"</td><td><b>8.0010.4050.0000</b></td></tr> <tr><td>1"</td><td><b>8.0010.4060.0000</b></td></tr> <tr><td>1 1/4"</td><td></td></tr> </table> | $\varnothing$ D1: | <b>8.0010.4091.0000</b> | 12 mm [0.47"] | <b>8.0010.4027.0000</b> | 14 mm [0.55"] | <b>8.0010.4038.0000</b> | 15 mm [0.59"] | <b>8.0010.4019.0000</b> | 16 mm [0.63"] | <b>8.0010.4080.0000</b> | 18 mm [0.71"] | <b>8.0010.4011.0000</b> | 20 mm [0.79"] | <b>8.0010.4012.0000</b> | 25 mm [0.98"] | <b>8.0010.4016.0000</b> | 30 mm [1.18"] | <b>8.0010.4015.0000</b> | 32 mm [1.26"] | <b>8.0010.4013.0000</b> | 1/2" | <b>8.0010.4070.0000</b> | 5/8" | <b>8.0010.4090.0000</b> | 3/4" | <b>8.0010.4050.0000</b> | 1" | <b>8.0010.4060.0000</b> | 1 1/4" |  |
| $\varnothing$ D1:   | <b>8.0010.4091.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 12 mm [0.47"]   | <b>8.0010.4027.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 14 mm [0.55"]   | <b>8.0010.4038.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 15 mm [0.59"]   | <b>8.0010.4019.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 16 mm [0.63"]   | <b>8.0010.4080.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 18 mm [0.71"]   | <b>8.0010.4011.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 20 mm [0.79"]   | <b>8.0010.4012.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 25 mm [0.98"]   | <b>8.0010.4016.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 30 mm [1.18"]   | <b>8.0010.4015.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 32 mm [1.26"]   | <b>8.0010.4013.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 1/2"  | <b>8.0010.4070.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 5/8"  | <b>8.0010.4090.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 3/4"  | <b>8.0010.4050.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 1"  | <b>8.0010.4060.0000</b>  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| 1 1/4"  |  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <p>Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. For more details please call our technical hotline (+49 7720 3903 952) or send us an email (info@kuebler.com)</p> |  |   |  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Isolation insert for hollow shaft, <math>\varnothing</math> 42 mm [1.65"]</b>  | <p>external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"]</p> <p>external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]</p>              |   | <p><b>8.0010.4017.0000</b></p> <p><b>8.0010.4029.0000</b></p>  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Connection technology</b>  |  |   | Order no.  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Cordset, pre-assembled</b>   | <p>M12 female connector with coupling nut, 8-pin<br/>2 m [6.56'] PVC cable</p> <p>M23 female connector with coupling nut, 12-pin<br/>2 m [6.56'] PVC cable</p> |   | <p><b>05.00.6041.8211.002M</b></p> <p><b>8.0000.6201.0002</b></p>  |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |
| <b>Connector, self-assembly (straight)</b>  | <p>M12 female connector with coupling nut, 8-pin</p> <p>M23 female connector with coupling nut, 12-pin</p>   |   | <p><b>05.CMB 8181-0</b></p> <p><b>8.0000.5012.0000</b></p>   |                   |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |               |                         |      |                         |      |                         |      |                         |    |                         |        |  |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

# Incremental encoders

|   |                            |                                   |
|---|----------------------------|-----------------------------------|
| <b>Large hollow shaft<br/>robust, optical</b> | <b>A02H (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|---|----------------------------|-----------------------------------|

## Technical data

| Mechanical characteristics                             |   |
|--|---|
| <b>Maximum speed</b>                                   | 6000 min <sup>-1</sup> 1)<br>at 60°C [140°F]<br>2500 min <sup>-1</sup> 1) |
| <b>Mass moment of inertia</b>                          | < 220 x 10 <sup>-6</sup> kgm <sup>2</sup> 2)                              |
| <b>Starting torque with sealing<br/>at 20°C [68°F]</b> | < 0.2 Nm  |
| <b>Load capacity of shaft</b>                          | radial 200 N<br>axial 100 N   |
| <b>Weight</b>  | approx. 0.8 kg [28.22 oz]   |
| <b>Protection acc. to EN 60529</b>                     | IP65  |
| <b>Working temperature range</b>                       | -40°C 3) ... +80°C [-40°F 3) ... +176°F]                                  |
| <b>Materials</b>                                       | shaft stainless steel,<br>bore tolerance H7                               |
| <b>Shock resistance acc. to EN 60068-2-27</b>          | 2000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b>       | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                                     |

| Electrical characteristics SinCos output                    |   |  |
|---|---|--|
| <b>Output circuit</b>                                       | <b>SinCos U = 1 Vpp</b>                               | <b>SinCos U = 1 Vpp</b>  |
| <b>Power supply</b>   | 5 V DC (±5 %)   | 10 ... 30 V DC   |
| <b>Power consumption with<br/>inverted signal (no load)</b> | typ. 65 mA<br>max. 110 mA                             | typ. 65 mA<br>max. 110 mA  |
| <b>-3 dB frequency</b>                                      | < 180 kHz   | < 180 kHz  |
| <b>Signal level</b>   | channels A/B<br>channel 0                             | 1 Vpp (±20 %)<br>0.1 ... 1.2 V<br>1 Vpp (±20 %)<br>0.1 ... 1.2 V |
| <b>Short circuit proof outputs 4)</b>                       | yes   | yes  |
| <b>Reverse polarity protection<br/>of the power supply</b>  | no  | yes  |
| <b>UL approval</b>  | file 224618   |  |
| <b>GL approval</b>  | letter of conformity No. 74130                        |  |
| <b>CE compliant acc. to</b>                                 | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |  |

## Electrical characteristics RS422 / Push-pull

|  | <b>RS422 (TTL compatible)</b>                         | <b>Push-pull</b>            | <b>Push-pull (7272 compatible)</b> |
|--|---|-----------------------------|------------------------------------|
| <b>Output circuit</b>                                      |   |                             |                                    |
| <b>Power supply</b>  | 5 V DC (±5 %)<br>5 ... 30 V DC<br>10 ... 30 V DC      | 10 ... 30 V DC              | 5 ... 30 V DC                      |
| <b>Power consumption (no load)</b>                         |   |                             |                                    |
| without inverted signal                                    | –   | typ. 55 mA/max. 125 mA      | –                                  |
| with inverted signal                                       | typ. 40 mA/max. 90 mA                                 | typ. 80 mA/max. 150 mA      | typ. 50 mA/max. 100 mA             |
| <b>Permissible load / channel</b>                          | max. +/- 20 mA  | max. +/- 30 mA              | max. +/- 20 mA                     |
| <b>Pulse frequency</b>                                     | max. 300 kHz  | max. 300 kHz                | max. 300 kHz 5)                    |
| <b>Signal level</b>  | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V – 3 V<br>max. 2.5 V | min. +V – 2.0 V<br>max. 0.5 V      |
| <b>Rising edge time t<sub>r</sub></b>                      | max. 200 ns   | max. 1 μs                   | max. 1 μs                          |
| <b>Falling edge time t<sub>f</sub></b>                     | max. 200 ns   | max. 1 μs                   | max. 1 μs                          |
| <b>Short circuit proof outputs 4)</b>                      | yes   | yes                         | yes                                |
| <b>Reverse polarity protection of the<br/>power supply</b> | no, 10 ... 30 V DC: yes                               | yes                         | no                                 |
| <b>UL approval</b>   | file 224618   |                             |                                    |
| <b>GL approval</b>   | letter of conformity No. 74130                        |                             |                                    |
| <b>CE compliant acc. to</b>                                | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                             |                                    |

1) During the run-in-phase of approx. 2 hours, reduce the limits for working temperature<sub>max</sub> or speed max by 1/3.

2) Depending on shaft diameter.

3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].

4) If power supply correctly applied.

5) Max. recommended cable length 30 m [98.43'].

# Incremental encoders

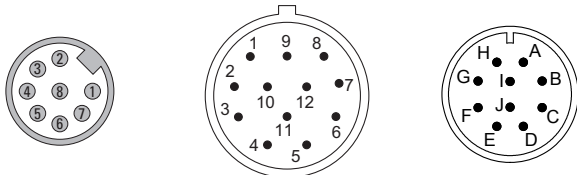
|   |                            |                                   |
|---|----------------------------|-----------------------------------|
| <b>Large hollow shaft<br/>robust, optical</b> | <b>A02H (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|---|----------------------------|-----------------------------------|

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |        |    |           |    |           |    |           |                  |
|----------------|--------------------|---|-----|----|---------|--------|----|-----------|----|-----------|----|-----------|------------------|
| 1 ... D        | 1, A               | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Cable color:  | WH  | BN | GY PK   | RD BU  | GN | YE        | GY | PK        | BU | RD        | shield           |
|                |                    | <b>M23 connector, 12-pin</b>                                      |     |    |         |        |    |           |    |           |    |           |                  |
| 1 ... D        | 2                  | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | 10  | 12 | 11      | 2      | 5  | 6         | 8  | 1         | 3  | 4         | PH <sup>1)</sup> |
|                |                    | <b>M12 connector, 8-pin</b>                                       |     |    |         |        |    |           |    |           |    |           |                  |
| 1 ... D        | E                  | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | 1   | 2  |         |        | 3  | 4         | 5  | 6         | 7  | 8         | PH <sup>1)</sup> |
|                |                    | <b>MIL connector, 10-pin</b>                                      |     |    |         |        |    |           |    |           |    |           |                  |
| 1 ... D        | D                  | Signal:   | 0 V | +V | 0 Vsens | +Vsens | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$          |
|                |                    | Pin:  | F   | D  |         |        | A  | G         | B  | H         | C  | I         | J                |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

## Top view of mating side, male contact base



M12 connector, 8-pin      M23 connector, 12-pin      MIL connector, 10-pin

1) PH = shield is attached to connector housing.

# Incremental encoders

**Large hollow shaft  
robust, optical**

**A02H (hollow shaft)**

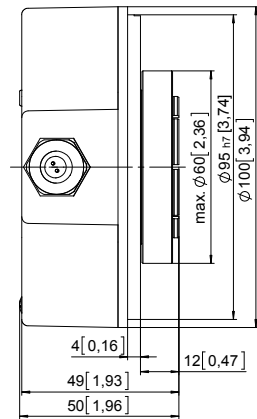
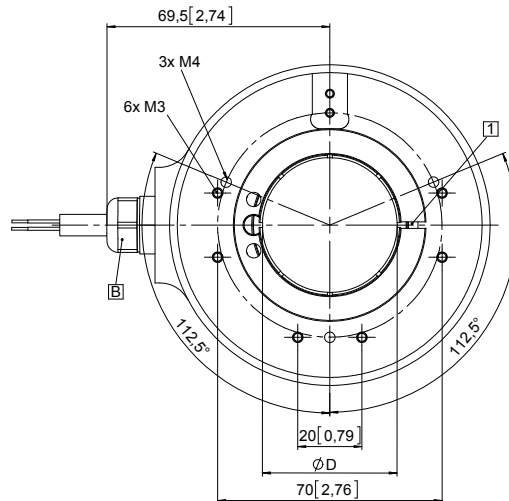
**Push-pull / RS422 / SinCos**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange without mounting aid Flange type 1

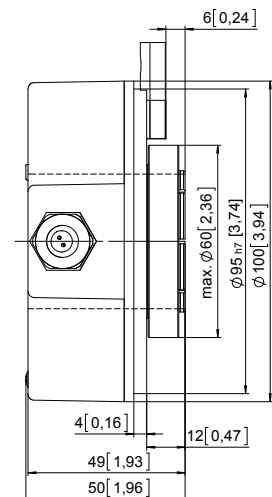
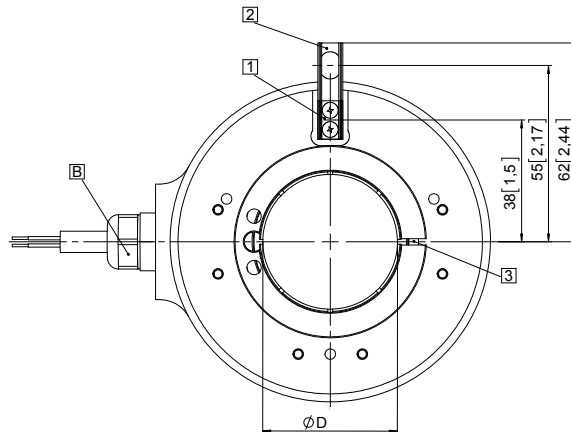
- 1 Recommended torque for the clamping ring 1.0 Nm
- B Cable version



| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |
| 1 1/4"    | H7  |

### Flange with spring element Flange type 2 and 3

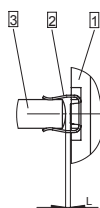
- 1 Spring element, short (flange type 2)
- 2 Spring element, long (flange type 3)
- 3 Recommended torque for the clamping ring  
flange type 2: 1.0 Nm  
flange type 3: 2.0 Nm
- B Cable version



| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |
| 1 1/4"    | H7  |

### Mounting using the spring element, short

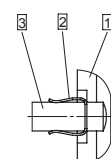
When mounting the encoder, ensure that dimension L is larger than the maximum axial play of the drive in the direction of the arrow.  
Danger of mechanical seizure!



- 1 Flange
- 2 Spring element, short
- 3 Cylindrical pin

### Mounting using the spring element, long

Cylindrical pin fed through the bore of the spring



- 1 Flange
- 2 Spring element, long
- 3 Cylindrical pin

# Incremental encoders

|   |                            |                                   |
|---|----------------------------|-----------------------------------|
| <b>Large hollow shaft<br/>robust, optical</b> | <b>A02H (hollow shaft)</b> | <b>Push-pull / RS422 / SinCos</b> |
|---|----------------------------|-----------------------------------|

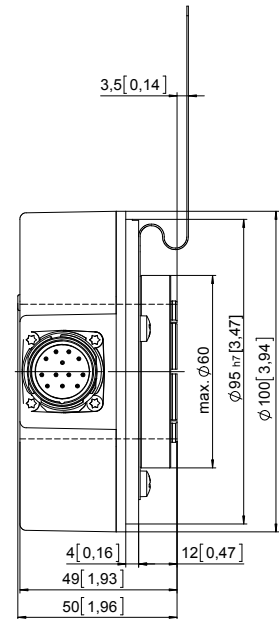
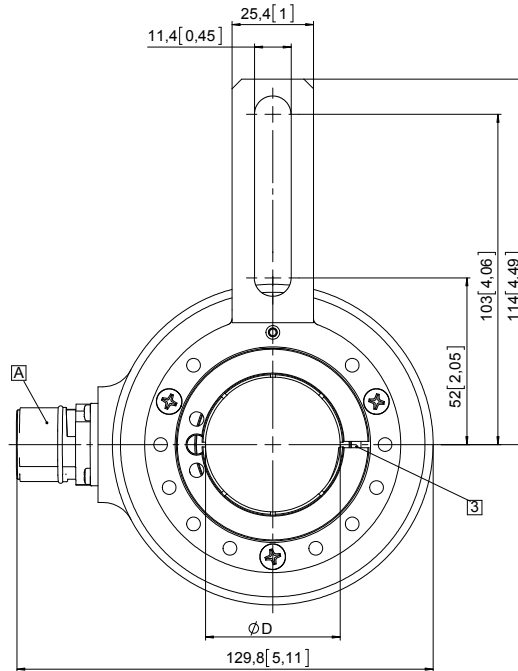
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with torque stop, long Flange type 5

- ③ Recommended torque for the clamping ring 2.0 Nm
- Ⓐ Plug version

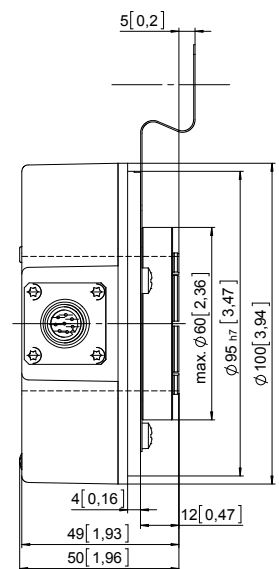
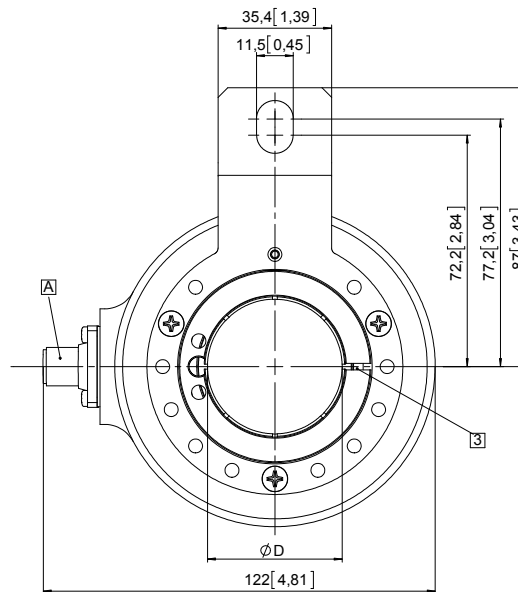
| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |
| 1 1/4"    | H7  |



### Flange with torque stop, short 4.5" Flange type 6

- ③ Recommended torque for the clamping ring 2.0 Nm
- Ⓐ Plug version

| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 30 [1.18] | H7  |
| 38 [1.50] | H7  |
| 40 [1.57] | H7  |
| 42 [1.65] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |
| 1 1/4"    | H7  |



Incremental encoders

# Incremental encoders

**Heavy Duty shaft, optical**

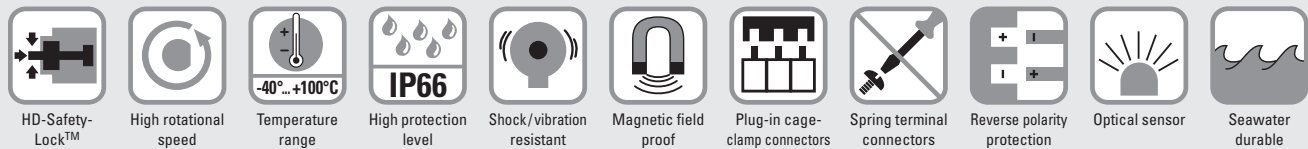
**Sendix Heavy Duty H100 (shaft)**

**Push-pull / RS422 / speed switch**



The Sendix Heavy Duty encoder H100 is an extremely rugged incremental encoder available in 3 versions: encoder with or without speed switch and double encoder.

Thanks to the special HD-Safety-Lock™ construction it is ideally suited for applications in heavy industry, such as steel works and cranes. Resistant materials, wide temperature ranges and a high protection level ensure it remains unaffected by the harshest environmental conditions. Its innovative connection technology enables simple quick installation.



### Suitable for your Heavy Duty application

- HD-Safety-Lock™ bearing construction for an extremely high bearing load capacity of up to 300 N axial and 400 N radial.
- With a temperature range from -40°C up to +100°C, IP66 protection and seawater durable material the encoder is resistant to harsh environmental conditions.
- Feather key shaft slot ensures positive fitting to the application.
- Safe overspeed protection by means of mechanical speed switch.

### Simple quick installation

- Innovative plug-in spring terminal connectors in the terminal box greatly simplify the cable connection and offer a very high level of safety.
- Various connection possibilities thanks to terminal box being rotatable through 180°.
- Large number of resolution and switching speed options available as standard.

### Order code without speed switch

**8.H100 . 1 1 1 X . XXXX**  
Type      a      b      c      d      e

**a** Flange  
1 = Euro RE0444

**b** Shaft (ø x L), with feather key shaft slot  
1 = ø 11 x 30 mm [0.43 x 1.18"]

**c** Version  
1 = incremental encoder

**d** Output circuit / power supply  
1 = RS422 (with inverted signal) / 5 ... 30 V DC  
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

**e** Pulse rate  
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400,  
500, 512, 600, 800, 1000, 1024, 1200, 2000,  
2048, 2500, 3600, 4096, 5000  
(e.g. 100 pulse => 0100)

*Optional on request*  
- other pulse rates  
- Ex 2/22

### Order code with speed switch

**8.H100 . 1 1 2 X . XXXX . XXXX . 1**  
Type      a      b      c      d      e      f      g

**a** Flange  
1 = Euro RE0444

**b** Shaft (ø x L), with feather key shaft slot  
1 = ø 11 x 30 mm [0.43 x 1.18"]

**c** Version  
2 = incremental encoder with mech. speed switch

**d** Output circuit / power supply  
1 = RS422 (with inverted signal) / 5 ... 30 V DC  
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

**e** Pulse rate  
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400,  
500, 512, 600, 800, 1000, 1024, 1200, 2000,  
2048, 2500, 3600, 4096, 5000  
(e.g. 100 pulse => 0100)

**f** Switching speed  
750, 1000, 2000, 3000, 4000

**g** Switching accuracy  
1 = standard (±4 % at 100 rad/s²)

*Optional on request*  
- other pulse rates  
- other switching speeds  
- other switching accuracies  
- Ex 2/22

# Incremental encoders

|  |   |  |                               |                  |                  |   |                  |   |                  |      |   |      |  |  |                  |                  |                  |                  |  |                  |  |                  |
|--|---|--|-------------------------------|------------------|------------------|---|------------------|---|------------------|------|---|------|--|--|------------------|------------------|------------------|------------------|--|------------------|--|------------------|
| <b>Heavy Duty shaft, optical</b>   | <b>Sendix Heavy Duty H100 (shaft)</b>   | <b>Push-pull / RS422 / speed switch</b>  |                               |                  |                  |   |                  |   |                  |      |   |      |  |  |                  |                  |                  |                  |  |                  |  |                  |
| <b>Order code double encoder</b>   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 2px;">8.H100<br/><small>Type</small></td> <td style="width: 5%; padding: 2px;">.</td> <td style="width: 5%; padding: 2px;">1</td> <td style="width: 5%; padding: 2px;">1</td> <td style="width: 5%; padding: 2px;">3</td> <td style="width: 5%; padding: 2px;">X</td> <td style="width: 5%; padding: 2px;">.</td> <td style="width: 20%; padding: 2px;">XXXX</td> <td style="width: 5%; padding: 2px;">.</td> <td style="width: 20%; padding: 2px;">XXXX</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><small>a</small></td> <td style="text-align: center;"><small>b</small></td> <td style="text-align: center;"><small>c</small></td> <td style="text-align: center;"><small>d</small></td> <td></td> <td style="text-align: center;"><small>e</small></td> <td></td> <td style="text-align: center;"><small>f</small></td> </tr> </table> |  | 8.H100<br><small>Type</small> | .                | 1                | 1 | 3                | X | .                | XXXX | . | XXXX |  |  | <small>a</small> | <small>b</small> | <small>c</small> | <small>d</small> |  | <small>e</small> |  | <small>f</small> |
| 8.H100<br><small>Type</small>  | .   | 1  | 1                             | 3                | X                | . | XXXX             | . | XXXX             |      |   |      |  |  |                  |                  |                  |                  |  |                  |  |                  |
|  |   | <small>a</small>   | <small>b</small>              | <small>c</small> | <small>d</small> |   | <small>e</small> |   | <small>f</small> |      |   |      |  |  |                  |                  |                  |                  |  |                  |  |                  |
| <b>a</b> Flange<br>1 = Euro RE0444<br><br><b>b</b> Shaft ( $\varnothing \times L$ ),<br>with feather key shaft slot<br>1 = $\varnothing 11 \times 30$ mm [0.43 x 1.18"]<br><br><b>c</b> Version<br>3 = 2 x incremental encoder | <b>d</b> Output circuit / power supply<br>1 = RS422 (with inverted signal) / 5 ... 30 V DC<br>2 = Push-pull (with inverted signal) / 10 ... 30 V DC<br><br><b>e</b> Pulse rate encoder 1<br>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulse => 0100)   | <b>f</b> Pulse rate encoder 2<br>1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulse => 0100)<br><br><i>Optional on request</i><br>- other pulse rates<br>- Ex 2/22 |                               |                  |                  |   |                  |   |                  |      |   |      |  |  |                  |                  |                  |                  |  |                  |  |                  |

Incremental encoders

| Mounting accessory  | Order no.                             |
|---|---------------------------------------|
| <b>Coupling</b> double loop coupling for shaft 12 mm [0.47"] with feather key shaft slot 4 mm [0.16"]   | <b>8.0000.1L01.1112</b>               |
| Accessories – connecting cable  | Order no.                             |
| <b>Encoder cable</b> PUR-trailing cable, shielded, halogen free, orange<br>4 x 2 x 0.25 mm <sup>2</sup> [AWG 23] + 2 x 1 mm <sup>2</sup> [AWG 17], twisted pair | <b>8.0000.6400.XXXX</b> <sup>1)</sup> |
| <b>Speed switch cable</b> TPE-trailing cable, shielded, halogen free, black – 5 x 0.75 mm <sup>2</sup> [AWG 18]   | <b>8.0000.6600.XXXX</b> <sup>1)</sup> |

| Technical data   |   |
|--|---|
| Mechanical characteristics                               |   |
| <b>Maximum speed</b>                                     | 6000 min <sup>-1</sup>  |
| <b>Starting torque with seal – at 20°C [68°F]</b>        | ~ 2 Ncm   |
| <b>Load capacity of shaft</b>                            | radial 400 N<br>axial 300 N   |
| <b>Weight</b>  | H100 ~ 1.8 kg [63.49 oz]<br>H100 + speed switch ~ 2.7 kg [95.24 oz]   |
| <b>Protection acc. to EN 60529</b>                       | IP66  |
| <b>Working temperature range (surface of housing)</b>    | -40°C ... +100°C<br>[-40°F ... + 212°F]   |
| <b>Materials</b>   | shaft stainless steel<br>housing aluminum die-cast (EN AC-44300), seawater durable coating<br>flange seawater durable aluminum type Al Si Mg Mn (EN AW-6082)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>            | 3000 m/s <sup>2</sup> (1 ms)  |
| <b>Vibration resistance acc. to EN 60068-2-27</b>        | without speed switch 100 m/s <sup>2</sup> , 10 ... 2000 Hz<br>with speed switch, switching speed > 1000 100 m/s <sup>2</sup> , 10 ... 400 Hz<br>with speed switch, switching speed < 1000 50 m/s <sup>2</sup> , 10 ... 400 Hz |
| Electrical characteristics                               |   |
| <b>Output circuit</b>                                    | RS422 (TTL compatible)      Push-pull (HTL) up to 150 m [492.13'] cable length  |
| <b>Power supply</b>                                      | 5 ... 30 V DC      10 ... 30 V DC   |
| <b>Power consumption (no load) with inverted signal</b>  | typ. 40 mA      typ. 50 mA<br>max. 90 mA      max. 100 mA   |
| <b>Permissible load per channel</b>                      | DC max. +/- 20 mA      max. +/- 30 mA<br>peak max. +/- 30 mA      max. +/- 70 mA  |
| <b>Pulse frequency</b>                                   | max. 300 kHz      max. 300 kHz  |
| <b>Pulse frequency with 150 m [492.13'] cable length</b> | max. 300 kHz      max. 80 kHz   |
| <b>Signal level</b>                                      | HIGH min. 2.5 V      min. +V - 2.5 V<br>LOW max. 0.5 V      max. 0.5 V  |
| <b>Rising edge time t<sub>r</sub></b>                    | max. 200 ns      max. 1 µs  |
| <b>Falling edge time t<sub>f</sub></b>                   | max. 200 ns      max. 1 µs  |
| <b>Short circuit proof outputs</b> <sup>2)</sup>         | yes <sup>3)</sup> yes   |
| <b>Reverse polarity protection of the power supply</b>   | yes      yes  |
| <b>CE-compliant acc. to</b>                              | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |

1) XXXX = cable length in meters.  
 2) If power supply +V correctly applied.  
 3) Only one channel allowed to be shorted-out:  
 At +V short circuit to channel or 0 V is permitted.

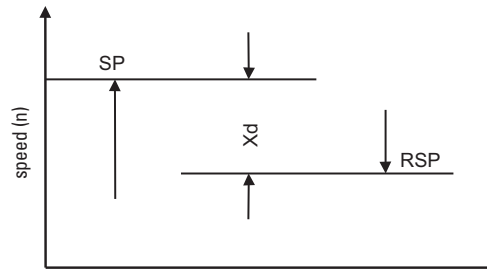
# Incremental encoders

|                                  |                                       |   |
|----------------------------------|---------------------------------------|---|
| <b>Heavy Duty shaft, optical</b> | <b>Sendix Heavy Duty H100 (shaft)</b> | <b>Push-pull / RS422 / speed switch</b> |
|----------------------------------|---------------------------------------|---|

| Speed switch   |  |
|--|--|
| <b>Switching speed (ns)</b>  | 750 ... 4000 min <sup>-1</sup>           |
| <b>Max. rotational speed (mechanical)</b>  | 1.25 x ns                                |
| <b>Switching accuracy</b><br>with acceleration $\alpha = 100 \text{ rad/s}^2$<br>(corresponds $\Delta n = 955 \text{ min}^{-1}/\text{s}$ ) | $\pm 4 \%$ of ns                         |
| <b>Switching difference cw/ccw rotation</b>  | $\sim 3 \%$                              |
| <b>Switching hysteresis (Xd)</b>   | $\sim 40 \%$ up to $80 \%$ of ns         |
| <b>Switching capacity</b>  | 3 A / max. 50 V AC<br>1 A / max. 75 V DC |

(more details see manual)

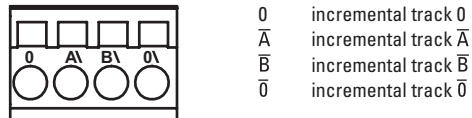
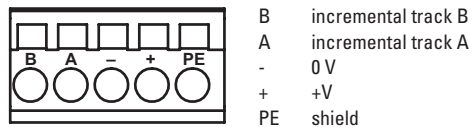
### Definition switching hysteresis (Xd)



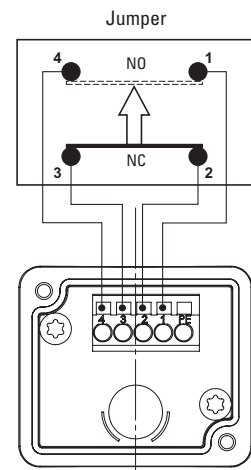
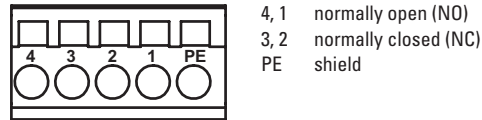
SP = switching point (for switching speed ns)  
RSP = reset point  
Xd = switching difference (hysteresis)

### Terminal assignment terminal connections

#### Incremental encoders



#### Speed switch





# Incremental encoders

**Heavy Duty  
shaft, optical**

**Sendix Heavy Duty H100 (shaft)**

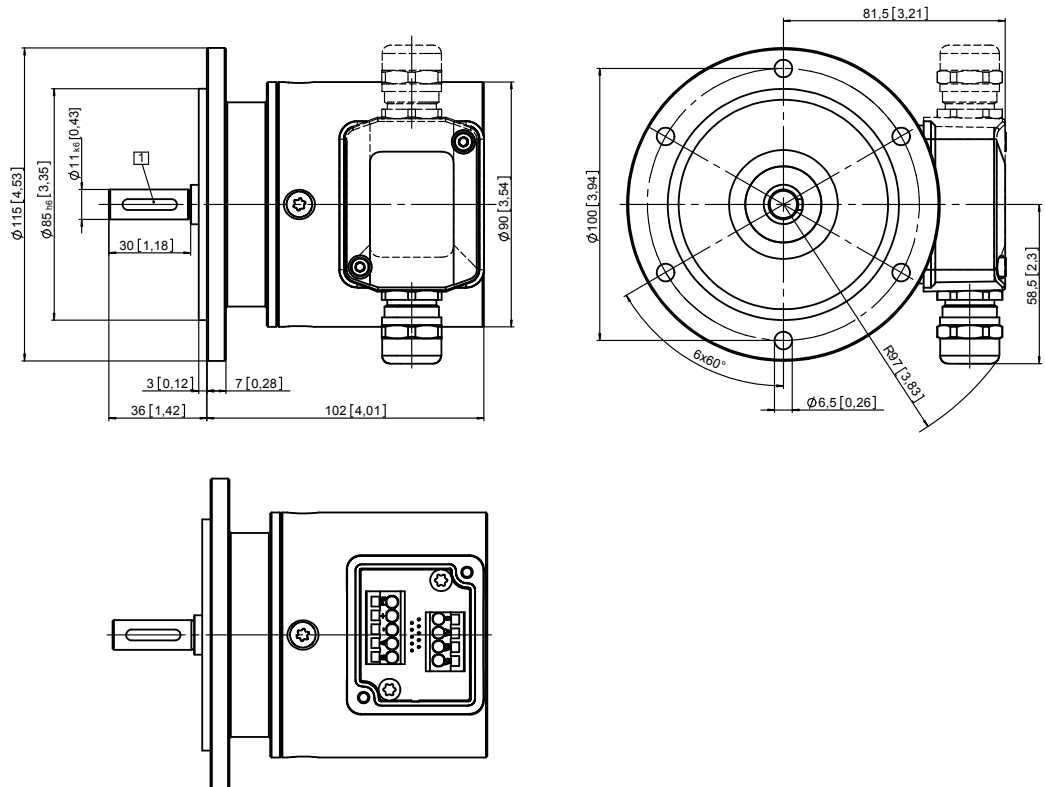
**Push-pull / RS422 / speed switch**

## Dimensions

Dimensions in mm [inch]

### Incremental encoder Version 1

- 1 Feather key acc. to ISO 773  
4 x 4 x 20 [0.16 x 0.16 x 0.79]



Incremental encoders

# Incremental encoders

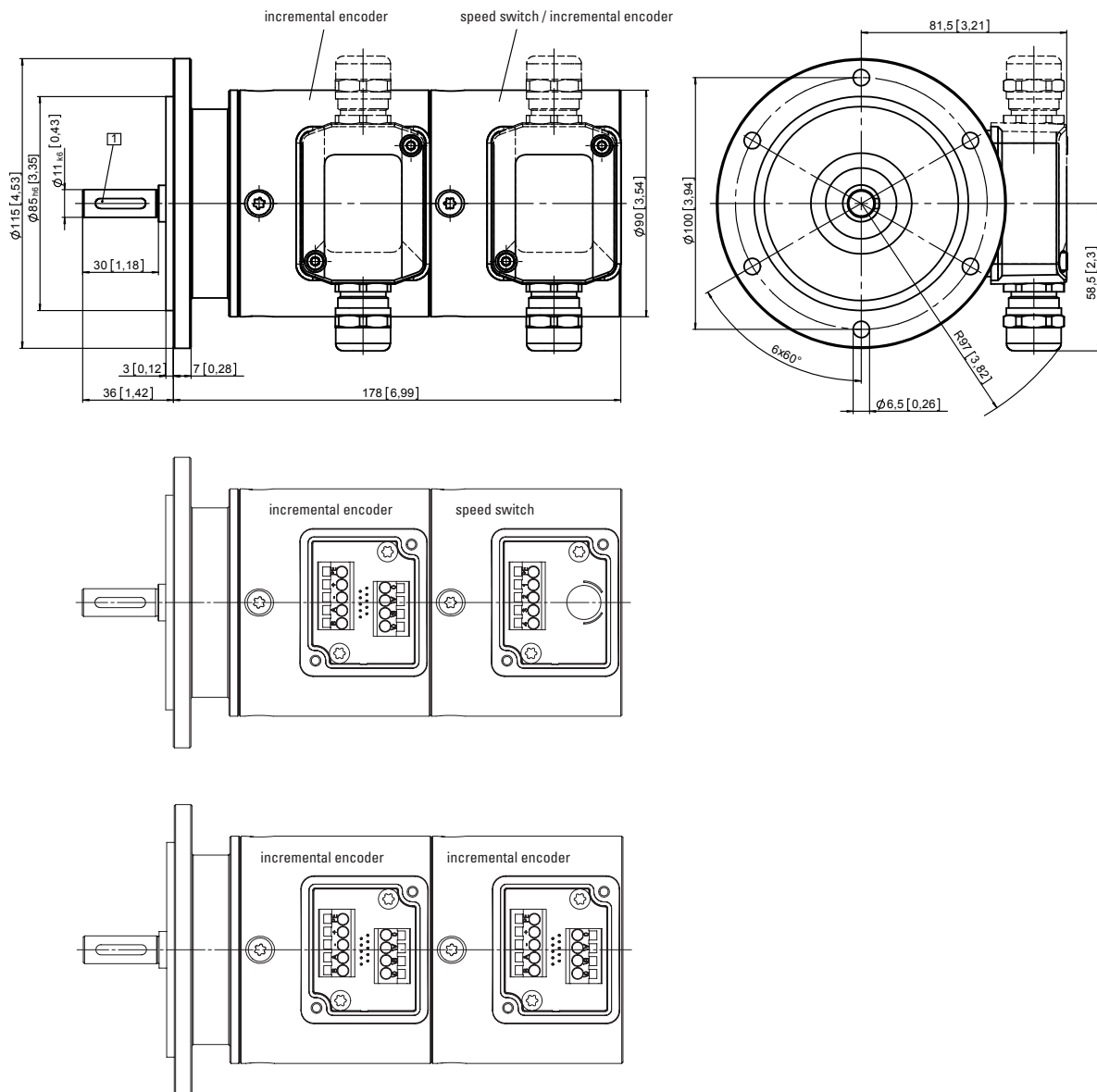
|                                  |                                       |   |
|----------------------------------|---------------------------------------|---|
| <b>Heavy Duty shaft, optical</b> | <b>Sendix Heavy Duty H100 (shaft)</b> | <b>Push-pull / RS422 / speed switch</b> |
|----------------------------------|---------------------------------------|---|

## Dimensions

Dimensions in mm [inch]

**Incremental encoder with mechanical speed switch or 2 x incremental encoder (double encoder) Version 2 or 3**

- 1 Feather key acc. to ISO 773  
4 x 4 x 20 [0.16 x 0.16 x 0.79]



# Incremental encoders

|   |  |  |
|---|--|--|
| <b>Heavy Duty hollow shaft, optical</b> | <b>Sendix Heavy Duty H120 (hollow shaft)</b> | <b>Push-pull / RS422 / optical fiber</b> |
|---|--|--|



The Sendix Heavy Duty H120 were especially developed for large motors and generators. They are highly accurate and extremely robust thanks to HD-Safety-Lock™ – the Heavy Duty hollow shaft design of the latest generation with sturdy bearing construction and integrated bearing isolation. The dual protection of the shaft, the wide temperature range and the high protection level allow for use even under the harshest conditions.

The very large hollow shaft up to 28 mm plus the wide variety of mounting solutions and connection options offer the very highest degree of flexibility during installation.



Incremental encoders

|                 |                          |                              |                                    |                                  |                           |                               |                               |                            |                |                  |
|-----------------|--------------------------|------------------------------|------------------------------------|----------------------------------|---------------------------|-------------------------------|-------------------------------|----------------------------|----------------|------------------|
|                 |                          |                              |                                    |                                  |                           |                               |                               |                            |                |                  |
| HD-Safety-Lock™ | 2.5 kV bearing isolation | Dual protection of the shaft | Temperature range<br>-40°...+100°C | High protection level<br>IP66/67 | Shock/vibration resistant | Terminal box rotatable - 180° | Plug-in cage-clamp connectors | Hollow shaft up to ø 28 mm | Optical sensor | Seawater durable |

## Robust

- Integrated bearing isolation up to 2.5 kV for reliable shaft connection.
- Extremely high resilience as a result of dual protection of the shaft (shielding cover disk and radial shaft seal), protection levels IP66 and IP67 as well as a seawater durable housing.
- High shock (200 g) and vibration (15 g) resistance.
- High level of resistance to interference as a result of optical fiber technology.

## Flexible

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector, terminal box or optical fiber.
- Torque stop on the flange or the cover – allows the device to be rotated as required during mounting.
- Through hollow shaft up to ø 28 mm.

## Order code Hollow shaft version

|        |   |         |   |      |
|--------|---|---------|---|------|
| 8.H120 | . | XXXXX   | . | XXXX |
| Type   |   | a b c d |   | e    |

|  |  |  |
|--|--|--|
| <p><b>a Flange</b></p> <p>1 = without mounting aid<br/>                 2 = with fastening arm 70 mm [2.76"]<sup>1)</sup><br/>                 3 = with fastening arm 100 mm [3.93"]<sup>1)</sup><br/>                 4 = with fastening arm 150 mm [5.91"]<sup>1)</sup><br/>                 5 = with stator coupling, ø 119 mm [4.69"]</p> <p><b>b Through hollow shaft</b></p> <p>2 = ø 16 mm [0.63"]<br/>                 3 = ø 20 mm [0.79"]<br/>                 5 = ø 25 mm [0.98"]<br/>                 7 = ø 28 mm [1.10"]<br/>                 6 = ø 1"<br/> <i>Blind hollow shaft, with central fastening</i><br/>                 insertion depth max. 53 mm [2.09"]<br/>                 A = ø 12 mm [0.47"]<br/>                 B = ø 16 mm [0.63"]<br/> <i>Blind hollow shaft, cone with central fastening</i><br/>                 insertion depth max. 22.5 mm [0.89"]<br/>                 K = ø 17 mm [0.67"], 1 : 10</p> | <p><b>c Output circuit / power supply</b></p> <p>4 = RS422 (with inverted signal) / 5 V DC<br/>                 1 = RS422 (with inverted signal) / 10 ... 30 V DC<br/>                 5 = push-pull (with inverted signal) / 10 ... 30 V DC<br/>                 6 = push-pull (with inverted signal) / 10 ... 30 V DC, power version up to 350 m<br/>                 B = optical fiber + RS422 (with inverted signal) / 5 V DC<sup>2)</sup><br/>                 A = optical fiber + RS422 (with inverted signal) / 10 ... 30 V DC<sup>2)</sup><br/>                 C = optical fiber + push-pull (with inverted signal) / 10 ... 30 V DC<sup>2)</sup></p> <p><b>d Type of connection</b></p> <p>1 = radial cable, 1 m [3.28'] PVC<br/>                 A = radial cable, special length PVC *)<br/>                 2 = radial M12 connector, 8-pin, ccw<br/>                 4 = radial M23 connector, 12-pin, ccw<br/>                 D = radial M23 connector, 12-pin, cw<br/>                 K = terminal box with plug-in spring terminal connectors, rotatable through 180°<br/>                 L = optical fiber connector + radial M23 connector, 12-pin, cw<sup>3)</sup></p> <p>*) Available special lengths (connection type A):<br/>                 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>                 order code expansion .XXXX = length in dm<br/>                 ex.: 8.H120.121A.2048.0030 (for cable length 3 m)</p> | <p><b>e Pulse rate</b></p> <p>50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000<br/>                 (e.g. 360 pulses =&gt; 0360)</p> <p><i>Optional on request</i><br/>                 - other pulse rates<br/>                 - Ex 2/22<sup>4)</sup></p> |
|--|--|--|

1) Enclosed, not mounted.  
 2) Can only be ordered with connection type L.  
 3) Can only be ordered with output circuits A, B or C.  
 4) For the cable connection type, cable material PUR.

# Incremental encoders

| Heavy Duty hollow shaft, optical             | Sendix Heavy Duty H120 (hollow shaft)   | Push-pull / RS422 / optical fiber               |
|--|---|---|
| <b>Connection technology</b>                 |   | Order no.                                       |
| <b>Cordset, pre-assembled</b>                | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable  | <b>05.00.6041.8211.002M</b>                     |
|  | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable <sup>1)</sup>                         | <b>8.0000.6201.0002</b>                         |
| <b>Connector, self-assembly (straight)</b>   | M12 female connector with coupling nut, 8-pin<br>M23 female connector with coupling nut, 12-pin <sup>1)</sup> | <b>05.CMB 8181-0</b><br><b>8.0000.5012.0000</b> |
| <b>Simplex patch cable, ST-ST-multimode</b>  | optical fiber, length 5 m [16.40']  | <b>05.B09-B09-821-0005</b>                      |
| <b>Cable gland for optical fiber version</b> | for achieving protection IP66 and IP67 at the optical fiber connector   | <b>8.0000.5000.0007</b>                         |
| <b>Optical fiber receiver</b>                | HTL / 10 ... 30 V DC, plug-in connector HD-Sub D15  | <b>6.LWLE.51</b>                                |

Further accessories can be found in the Accessories section or in the Accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the Connection Technology section or in the Connection Technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                                   |   |
|--|---|
| Mechanical characteristics                       |   |
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup><br>at 60°C [140°F]<br>3500 min <sup>-1</sup>                           |
| <b>Starting torque – at 20°C [68°F]</b>          | 0.05 Nm   |
| <b>Load capacity of shaft</b>                    | radial 475 N<br>axial 375 N   |
| <b>Weight</b>                                    | 1.6 ... 2.0 kg [56.44 ... 70.55 oz]<br>(depending on version)                                 |
| <b>Protection acc. to EN 60529</b>               | IP66 + IP67   |
| <b>Working temperature range</b>                 | -40°C <sup>2)</sup> ... +100°C <sup>3)</sup><br>[-40°F <sup>3)</sup> ... +212°F <sup>3)</sup> |
| <b>Materials</b>                                 | shaft stainless steel,<br>bore tolerance H7<br>housing, flange seawater durable               |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 150 m/s <sup>2</sup> , 10 ... 2000 Hz   |
| Technical data for optical fiber connection      |   |
| <b>Power consumption per module</b>              | < 2 W   |
| <b>Input level optical fiber transmitter</b>     | 10 ... 30 V DC or RS422   |
| <b>Optical wavelength</b>                        | 850 nm  |
| <b>Optical transmission rate</b>                 | 120 Mbit/s  |
| <b>Optical fiber synchronization display</b>     | LED on the receiver   |
| <b>Optical fiber connection</b>                  | ST connector, ø 9 mm [0.35"]  |
| <b>Glass fiber</b>                               | multimode fiber,<br>50/125 µm, 62.5/125 µm  |
| <b>Optical fiber transmission distance</b>       | max. 2000 m [6561.68']  |

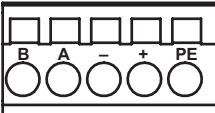
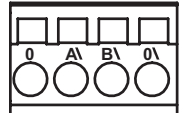
| Electrical characteristics                             |      |   |                 |                           |
|--|------|---|-----------------|---------------------------|
| Output circuit   |      | RS422 (TTL-compatible))                               | Push-pull       | Push-pull (power version) |
| <b>Power supply</b>                                    |      | 5 V DC (±5 %)<br>or 10 ... 30 V DC                    | 10 ... 30 V DC  | 10 ... 30 V DC            |
| <b>Power consumption (no load)</b>                     |      | max. 90 mA  | max. 80 mA      | max. 90 mA                |
| <b>Permissible load per channel</b>                    | DC   | max. +/- 20 mA  | max. +/- 30 mA  | max. +/- 150 mA           |
|  | peak | max. +/- 30 mA  | max. +/- 70 mA  | max. +/- 200 mA           |
| <b>Pulse frequency</b>                                 |      | max. 300 kHz  | max. 300 kHz    | max. 300 kHz              |
| <b>Max. cable length</b>                               |      | 550 m at 100 kHz                                      | 150 m at 80 kHz | 350 m at 100 kHz          |
| <b>Signal level</b>                                    | HIGH | min. 2.5 V  | min. +V - 3.0 V | min. +V - 4.0 V           |
|  | LOW  | max. 0.5 V  | max. 2.5 V      | max. 3.0 V                |
| <b>Rising edge time t<sub>r</sub></b>                  |      | max. 200 ns   | max. 1 µs       | max. 1 µs                 |
| <b>Falling edge time t<sub>f</sub></b>                 |      | max. 200 ns   | max. 1 µs       | max. 1 µs                 |
| <b>Short circuit proof outputs <sup>4)</sup></b>       |      | yes   | yes             | yes                       |
| <b>Reverse polarity protection of the power supply</b> |      | yes   | yes             | yes                       |
| <b>CE compliant acc. to</b>                            |      | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                 |                           |

1) Suitable for connection type 4.  
2) With connector: -40°C [-40°F], with securely installed cable: -30°C [-22°F],  
with flexibly installed cable: -20°C [-4°F].  
3) Measured at the flange.  
4) If power supply correctly applied.

# Incremental encoders

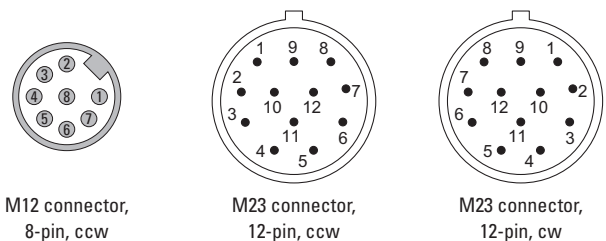
|   |  |  |
|---|--|--|
| <b>Heavy Duty hollow shaft, optical</b> | <b>Sendix Heavy Duty H120 (hollow shaft)</b> | <b>Push-pull / RS422 / optical fiber</b> |
|---|--|--|

## Terminal assignment

| Output circuit      | Type of connection | Cable (isolate unused wires individually before initial start-up) |   |    |         |        |   |           |           |           |           |           |                  |  |
|---------------------|--------------------|---|---|----|---------|--------|---|-----------|-----------|-----------|-----------|-----------|------------------|--|
| 1, 4, 5, 6          | 1, A               | Signal:   | 0 V   | +V | 0 Vsens | +Vsens | A   | $\bar{A}$ | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |  |
|                     |                    | Cable color:  | WH  | BN | GY PK   | RD BU  | GN  | YE        | GY        | PK        | BU        | RD        | Shield           |  |
|                     |                    |   |   |    |         |        |   |           |           |           |           |           |                  |  |
| Output circuit      | Type of connection | M12 connector, 8-pin  |   |    |         |        |   |           |           |           |           |           |                  |  |
| 1, 4, 5, 6          | 2                  | Signal:   | 0 V   | +V | 0 Vsens | +Vsens | A   | $\bar{A}$ | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |  |
|                     |                    | Pin:  | 1   | 2  | -       | -      | 3   | 4         | 5         | 6         | 7         | 8         | PH <sup>2)</sup> |  |
|                     |                    |   |   |    |         |        |   |           |           |           |           |           |                  |  |
| Output circuit      | Type of connection | M23 connector, 12-pin   |   |    |         |        |   |           |           |           |           |           |                  |  |
| 1, 4, 5, 6, A, B, C | 4, D, L            | Signal:   | 0 V   | +V | 0 Vsens | +Vsens | A   | $\bar{A}$ | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |  |
|                     |                    | Pin:  | 10  | 12 | 11      | 2      | 5   | 6         | 8         | 1         | 3         | 4         | PH <sup>2)</sup> |  |
|                     |                    |   |   |    |         |        |   |           |           |           |           |           |                  |  |
| Output circuit      | Type of connection | Terminal connections  |   |    |         |        |   |           |           |           |           |           |                  |  |
| 1, 4, 5, 6          | K                  | Signal:   | B   | A  | 0 V     | +V     | $\perp$   | 0         | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ |           |                  |  |
|                     |                    | Pin:  | B   | A  | -       | +      | PE  | 0         | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ |           |                  |  |
|                     |                    |   |  |    |         |        |  |           |           |           |           |           |                  |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.  
 2) PH = shield is attached to connector housing.

Incremental encoders

# Incremental encoders

## Heavy Duty hollow shaft, optical

## Sendix Heavy Duty H120 (hollow shaft)

## Push-pull / RS422 / optical fiber

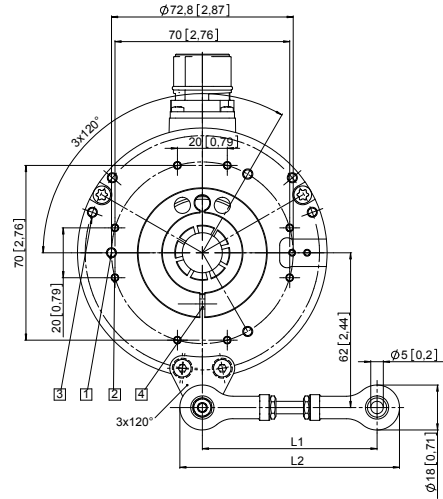
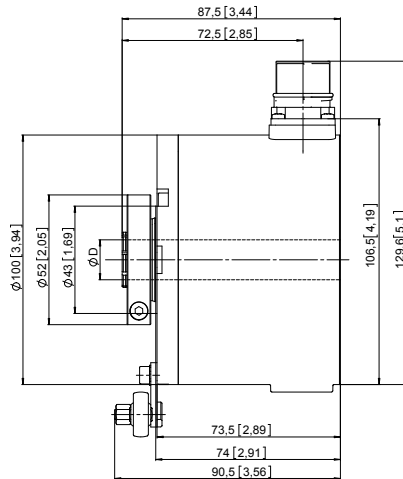
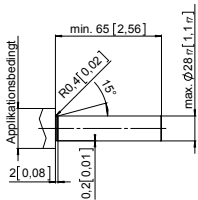
### Dimensions

Dimensions in mm [inch]

#### Flange with fastening arm Through hollow shaft

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm

#### Shaft connection to the application



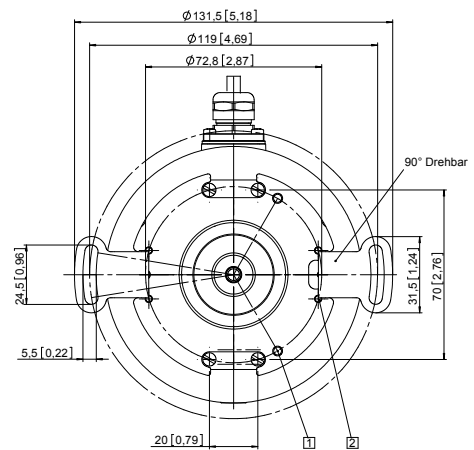
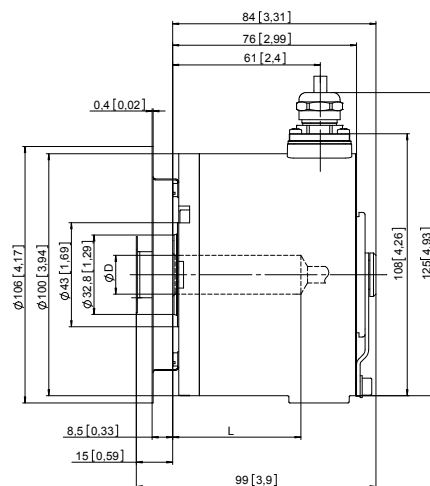
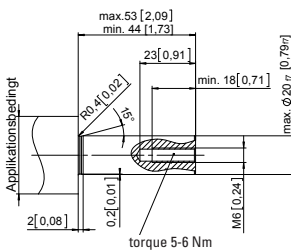
| D         | Fit |
|-----------|-----|
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 1"        | H7  |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

#### Flange with stator coupling, Ø 119 [4.69] Blind hollow shaft with central fastening

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep

#### Shaft connection to the application



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | H7  | 53 [2.09] |
| 16 [0.63] | H7  | 53 [2.09] |

L = insertion depth blind hollow shaft

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.

# Incremental encoders

|   |  |  |
|---|--|--|
| <b>Heavy Duty hollow shaft, optical</b> | <b>Sendix Heavy Duty H120 (hollow shaft)</b> | <b>Push-pull / RS422 / optical fiber</b> |
|---|--|--|

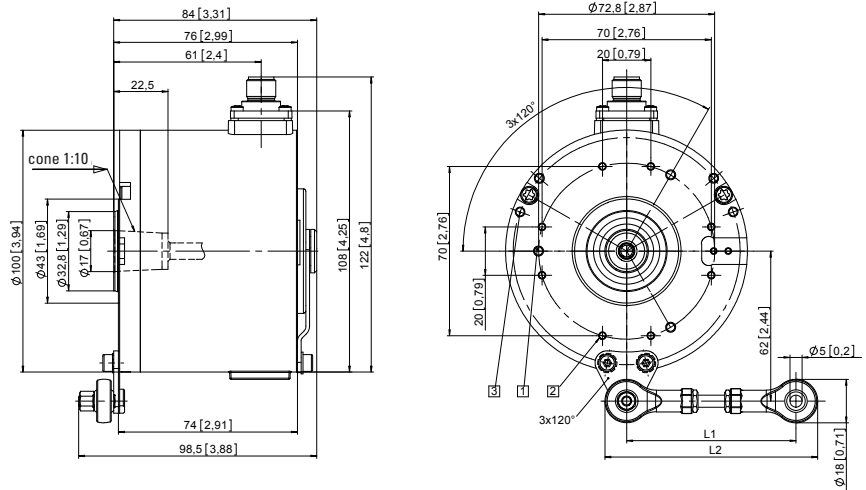
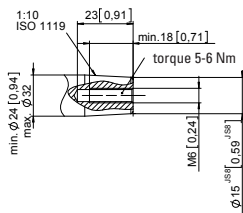
## Dimensions

Dimensions in mm [inch]

**Flange with fastening arm**  
**Blind hollow shaft with central fastening,**  
**cone,  $\phi$  17 [0.67], 1 : 10**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4

Shaft connection to the application

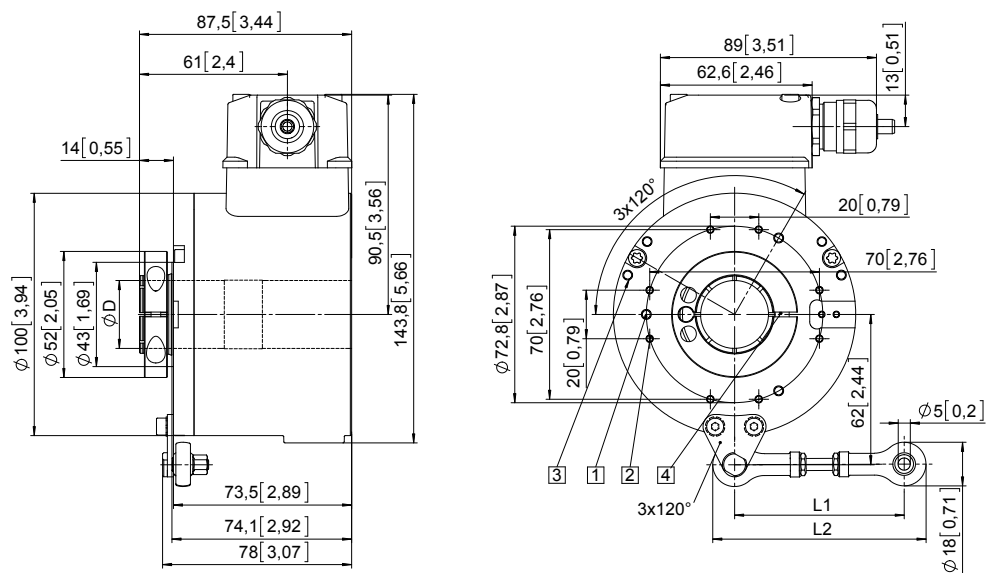
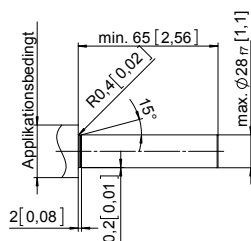


| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

**Flange with fastening arm**  
**Through hollow shaft and**  
**terminal box (hollow shaft type K)**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm

Shaft connection to the application



| D         | Fit |
|-----------|-----|
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 1"        | H7  |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.

Incremental encoders

# Incremental encoders

**Heavy Duty  
hollow shaft, optical**

**Sendix Heavy Duty H120 (hollow shaft)**

**Push-pull / RS422 / optical fiber**

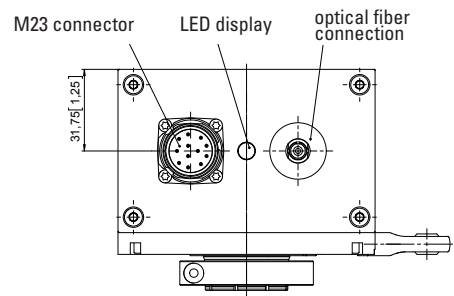
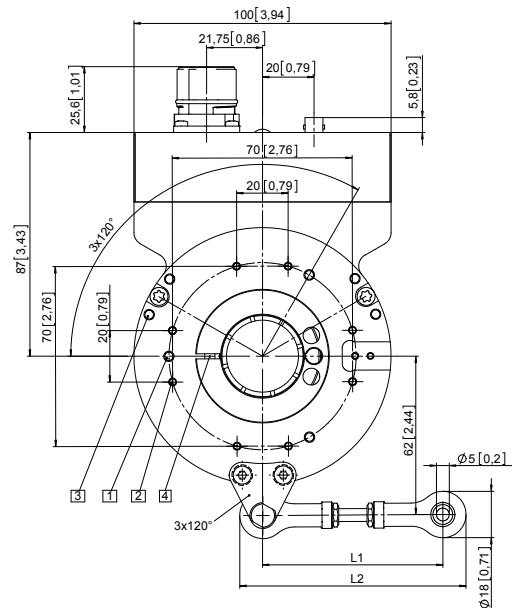
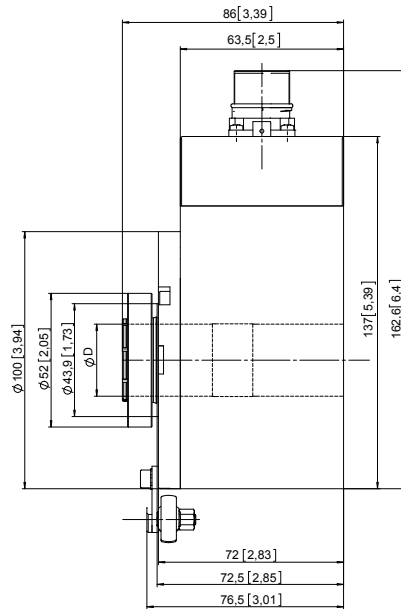
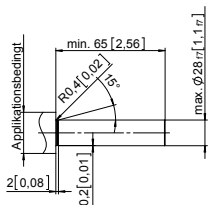
## Dimensions

Dimensions in mm [inch]

**Flange with fastening arm  
Through hollow shaft and  
optical fiber connection  
(type of connection L)**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm

Shaft connection to the application



| D         | Fit |
|-----------|-----|
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 1"        | H7  |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.





## Incremental encoders

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# Absolute encoders - singleturn

| Series                          | Type   | Interface   | Page  |             |
|---------------------------------|--|---|---|-------------|
| <b>Miniature, magnetic</b>      | 2450 / 2470 (shaft / hollow shaft)   | SSI   | <b>160</b>                                  |             |
| <b>Compact, magnetic</b>        | Sendix 3651 / 3671 (shaft / hollow shaft)  | Analog  | <b>163</b>                                  |             |
|                                 | Sendix M3658 / M3678 (shaft / hollow shaft)  | CANopen   | <b>168</b>                                  |             |
|                                 | Sendix M3658 / M3678 (shaft / hollow shaft)  | SAE J1939   | <b>173</b>                                  |             |
| <b>Compact, optical</b>         | Sendix F3653 / F3673 (shaft / hollow shaft)  | SSI / BiSS<br>+ incremental   | <b>178</b>                                  |             |
|                                 | Sendix F3658 / F3678 (shaft / hollow shaft)  | CANopen   | <b>184</b>                                  |             |
| <b>Standard, optical</b>        | 5850 / 5870 (shaft / hollow shaft)   | Parallel, analog  | <b>189</b>                                  |             |
|                                 | 5852 / 5872 (shaft / hollow shaft)   | Parallel, highspeed   | <b>194</b>                                  |             |
|                                 | Sendix 5853 / 5873 (shaft / hollow shaft)  | SSI / BiSS<br>+ incremental   | <b>198</b>                                  |             |
|                                 | Motor-Line  | Sendix 5873 (tapered shaft)   | SSI / BiSS<br>+ incremental                 | <b>206</b>  |
|                                 | SIL2/PLd   | Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow s.)                                    | SSI / BiSS + SinCos                         | <b>210</b>  |
|                                 | SIL3/PLe   | Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow s.)                                    | SSI / BiSS + SinCos                         | <b>217</b>  |
|                                 |  | Sendix 5858 / 5878 (shaft / hollow shaft)   | PROFIBUS DP                                 | <b>224</b>  |
|                                 |  | Sendix 5858 / 5878 (shaft / hollow shaft)   | CANopen                                     | <b>229</b>  |
|                                 |  | Sendix 5858 / 5878 (shaft / hollow shaft)   | EtherCAT                                    | <b>237</b>  |
|                                 |  | Sendix 5858 / 5878 (shaft / hollow shaft)   | PROFINET IO                                 | <b>242</b>  |
|                                 |  |  | Sendix F5858 / F5878 (shaft / hollow shaft) | EtherNet/IP |
|                                 | Stainless steel  | 5876 (hollow shaft)   | SSI, parallel                               | <b>252</b>  |
|                                 | <b>Standard, optical</b>   | Sendix 7053 / 7073 (shaft / hollow shaft)   | SSI / BiSS                                  | <b>256</b>  |
| <b>ATEX / IECEx – zone 1/21</b> | SIL2/PLd   | Sendix SIL 7053FS2 (shaft)  | SSI / BiSS + SinCos                         | <b>261</b>  |
|                                 | SIL3/PLe   | Sendix SIL 7053FS3 (shaft)  | SSI / BiSS + SinCos                         | <b>265</b>  |
|                                 | Sendix 7058 / 7078 (shaft / hollow shaft)  | PROFIBUS DP   | <b>269</b>                                  |             |
|                                 | Sendix 7058 / 7078 (shaft / hollow shaft)  | CANopen   | <b>274</b>                                  |             |
|                                 | <b>Standard, optical</b>   | Sendix 7153 / 7173 (shaft / hollow shaft)   | SSI / BiSS                                  | <b>279</b>  |
| <b>ATEX / IECEx – mining</b>    | Sendix 7158 / 7178 (shaft / hollow shaft)  | PROFIBUS DP   | <b>284</b>                                  |             |
|                                 | Sendix 7158 / 7178 (shaft / hollow shaft)  | CANopen   | <b>288</b>                                  |             |

# Absolute encoders - singleturn

**Miniature magnetic**

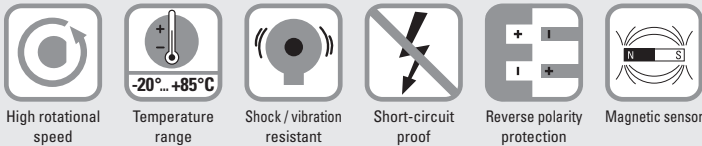
**2450 / 2470 (shaft / hollow shaft)**

**SSI**



The absolute singleturn encoders 2450 and 2470 with SSI interface and magnetic sensor technology are the specialists when space is tight.

Because of their high 12 bit resolution with 4096 different positions for 360° they offer exceptional repeat accuracy.



## Minimal space requirement

- The outer diameter measures 24 mm; the shaft diameter up to max. 6 mm.
- Flexible connection with radial or axial cable outlet.

## Durable and accurate

- Long service life and freedom from wear due to non-contact measuring system.
- Wide temperature range from -20°C up to +85°C.
- High 12 bit resolution with 4096 different positions for 360°.

## Order code Shaft version

**8.2450** . **XX1X** . **G121**  
Type      a b c d e

- |  |   |  |   |
|--|---|--|---|
| <p><b>a Flange</b><br/>1 = ø 24 mm [0.94"]<br/>3 = ø 28 mm [1.10"]<br/>2 = ø 30 mm [1.18"]</p> | <p><b>b Shaft (ø x L)</b><br/>1 = ø 4 x 10 mm [0.16 x 0.39"]<br/>3 = ø 5 x 10 mm [0.20 x 0.39"], with flat<br/>2 = ø 6 x 10 mm [0.24 x 0.39"]</p> | <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PVC<br/>A = axial cable, special length PVC *)<br/>2 = radial cable, 2 m [6.56'] PVC<br/>B = radial cable, special length PVC *)</p>                       | <p><b>e Gray-code</b><br/>12 bit resolution</p> |
| <p><b>c Interface / power supply</b><br/>1 = SSI / 5 V DC</p>                                  |   | <p>*) Available special lengths (connection types A, B):<br/>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.2450.111A.G121.0030 (for cable length 3 m)</p> |   |

## Order code Hollow shaft

**8.2470** . **1X1X** . **G121**  
Type      a b c d e

- |   |   |  |   |
|---|---|--|---|
| <p><b>a Flange</b><br/>1 = ø 24 mm [0.94"]</p>                | <p><b>b Blind hollow shaft</b><br/>(insertion depth max. 14 mm [0.55"])<br/>1 = ø 4 mm [0.16"]<br/>2 = ø 6 mm [0.24"]</p> | <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PVC<br/>A = axial cable, special length PVC *)<br/>2 = radial cable, 2 m [6.56'] PVC<br/>B = radial cable, special length PVC *)</p>                       | <p><b>e Gray-code</b><br/>12 bit resolution</p> |
| <p><b>c Interface / power supply</b><br/>1 = SSI / 5 V DC</p> |   | <p>*) Available special lengths (connection types A, B):<br/>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.2470.111A.G121.0030 (for cable length 3 m)</p> |   |

# Absolute encoders - singleturn

|                           |   |            |
|---------------------------|---|------------|
| <b>Miniature magnetic</b> | <b>2450 / 2470 (shaft / hollow shaft)</b> | <b>SSI</b> |
|---------------------------|---|------------|

|  |   |                         |
|--|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b> |   | Order no.               |
| <b>Coupling</b>                              | bellows coupling $\varnothing$ 15 mm [0.59"] for shaft 4 mm [0.16"] | <b>8.0000.1202.0404</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |                      |   | Electrical characteristics                             |   |
|--|----------------------|---|--|---|
| <b>Maximum speed</b>                             |                      | 12000 min <sup>-1</sup>                         | <b>Power supply</b>                                    | 5 (+0.4) V DC <sup>1)</sup>                           |
| <b>Mass moment of inertia</b>                    |                      | approx. 0.1 x 10 <sup>-6</sup> kgm <sup>2</sup> | <b>Power consumption (no load)</b>                     | < 40 mA   |
| <b>Starting torque - at 20°C [68°F]</b>          |                      | < 0.01 Nm                                       | <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Shaft load capacity</b>                       | radial               | 10 N  | <b>Short circuit proof output</b>                      | yes <sup>2)</sup>                                     |
|  | axial                | 20 N  | <b>Measuring range</b>                                 | 360°  |
| <b>Weight</b>                                    |                      | approx. 0.06 kg [2.11 oz]                       | <b>Linearity, 25°C [77°F]</b>                          | < 1.5°  |
| <b>Protection acc. to EN 60529</b>               | housing side         | IP65 (IP67 on request)                          | <b>Repeat accuracy</b>                                 | ≤ 0.4°  |
|  | flange side          | IP50 (IP67 on request)                          | <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |
| <b>Working temperature range</b>                 |                      | -20°C ... +85°C [-4°F ... +185°F]               | <b>SSI interface</b>                                   |   |
| <b>Material</b>                                  | shaft / hollow shaft | stainless steel                                 | <b>Output driver</b>                                   | RS485   |
|  | clamping ring        | MS58  | <b>Permissible load / channel</b>                      | typ. 60 Ohm (acc. to RS485)                           |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                      | 1000 m/s <sup>2</sup> , 6 ms                    | <b>Resolution</b>                                      | 12 bit  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                      | 100 m/s <sup>2</sup> , 55 ... 2000 Hz           | <b>Code</b>  | gray  |
|  |                      |   | <b>SSI clock speed</b>                                 | 100 kHz ... 750 kHz                                   |
|  |                      |   | <b>Monoflop time</b>                                   | typ. / max. 16 μs / 20 μs                             |
|  |                      |   | <b>Data refresh rate</b>                               | typ. 100 μs   |

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |
|-----------|--------------------|---|-----|----|----|----|----|----|
| 2         | 1, 2, A, B         | Signal:   | 0 V | +V | C+ | C- | D+ | D- |
|           |                    | Cable color:  | WH  | BN | GN | YE | GY | PK |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 C+, C-: Clock signal  
 D+, D-: Data signal

1) The power supply at the encoder input must not be less than 4.75 V DC (5 V DC - 5 %).  
 2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

**Miniature magnetic**

**2450 / 2470 (shaft / hollow shaft)**

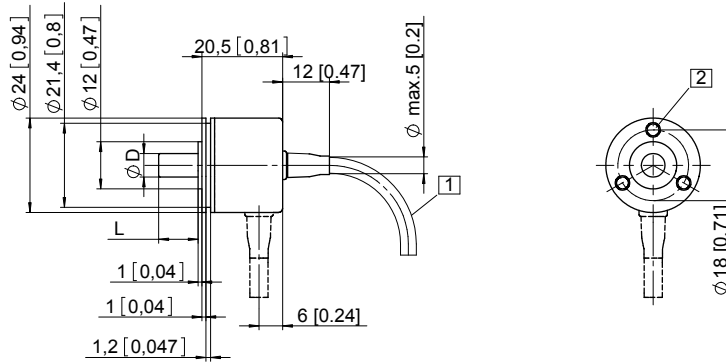
**SSI**

## Dimensions shaft version

Dimensions in mm [inch]

### Flange type 1, $\varnothing$ 24 [0.94]

- 1 min. R50 [1.97]
- 2 3 x M3, 4 [0.16] deep

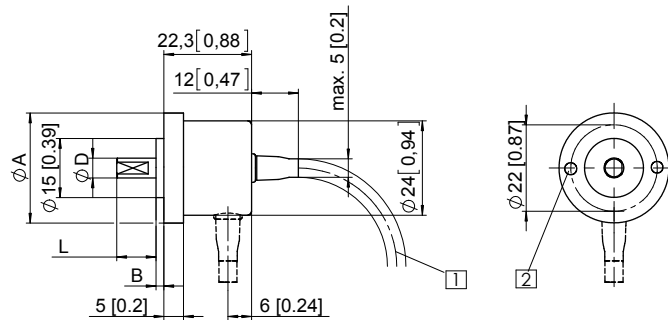


| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |
| 1/4"     | f7  | 10 [0.39] |

### Flange type 2, $\varnothing$ 30 [1.18]

### Flange type 3, $\varnothing$ 28 [1.10]

- 1 min. R50 [1.97]
- 2 2 x M3, 4 [0.16] deep



| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | f7  | 10 [0.39] |
| 5 [0.20] | f7  | 10 [0.39] |
| 6 [0.24] | f7  | 10 [0.39] |
| 1/4"     | f7  | 10 [0.39] |

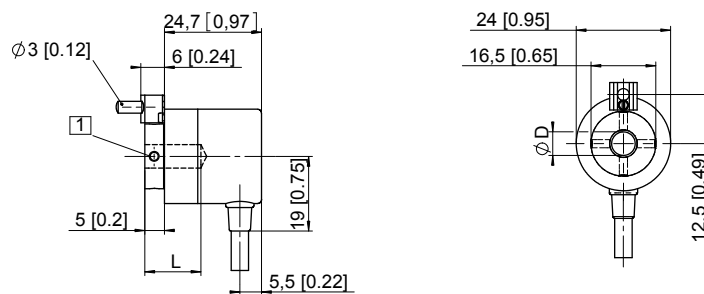
| Flange type | A                       | B        |
|-------------|-------------------------|----------|
| 2           | $\varnothing$ 30 [1.18] | 3 [0.12] |
| 3           | $\varnothing$ 28 [1.10] | 2 [0.08] |

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange type 1, $\varnothing$ 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



| D        | Fit | L         |
|----------|-----|-----------|
| 4 [0.16] | H7  | 14 [0.55] |
| 6 [0.24] | H7  | 14 [0.55] |
| 1/4"     | H7  | 14 [0.55] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

|                         |  |               |
|-------------------------|--|---------------|
| <b>Compact magnetic</b> | <b>Sendix 3651 / 3671 (shaft / hollow shaft)</b> | <b>Analog</b> |
|-------------------------|--|---------------|



Thanks to their different interfaces and measurement ranges, the Sendix 3651 and Sendix 3671 singleturn encoders with analog interface, in shaft and hollow shaft versions, are particularly flexible in use. A green and a red LED, acting as reference point and fault indicators, ensure easy installation and troubleshooting.

Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix are suitable even for demanding outdoor applications.

These encoders have an **e1**-approval from the German Federal Motor Transport Authority.



Absolute encoders singleturn

|                  |                       |                                    |                             |                          |                             |                     |                             |                 |   |
|------------------|-----------------------|------------------------------------|-----------------------------|--------------------------|-----------------------------|---------------------|-----------------------------|-----------------|---|
|                  |                       |                                    |                             |                          |                             |                     |                             |                 |   |
| Safety-Lockplus™ | High rotational speed | Temperature range<br>-40°... +85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor | Surface protection salt spray-tested optional |

## Safe operation

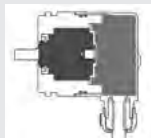
- Non-contact measuring system for long-life non-wear applications.
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness.
- High shock and vibration resistance for an exceptional robustness.

## Compact and powerful

- Outer diameter of only 36 mm.
- The hollow shaft version is fitted with a blind hole with a diameter of up to 10 mm. It can be mounted as required with either a torque stop pin or a stator coupling.
- 360° with 12 bit resolution (4096 positions).
- For use in 12 V or 24 V vehicle electrical systems.

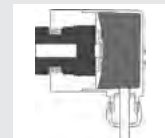
## Safety-Lockplus™

IP69k protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.



## Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



## Order code

### Shaft version

**8.3651** . 2 X X X . X X X X

Type                      a   b   c   d                      e   f   g   h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

2 = synchro flange, ø 36 mm [1.42"]

#### b Shaft (ø x L), with flat

3 = ø 6 x 12.5 mm [0.24 x 0.49"]  
6 = ø 8 x 12.5 mm [0.32 x 0.49"]  
5 = ø 1/4" x 12.5 mm [0.49"]

#### c Output circuit <sup>1)</sup>

3 = current output  
4 = voltage output

#### d Type of connection

1 = axial cable, 1 m [3.28'] PUR  
A = axial cable, special length PUR \*)  
2 = radial cable, 1 m [3.28'] PUR  
B = radial cable, special length PUR \*)  
3 = axial M12 connector, 5-pin  
4 = radial M12 connector, 5-pin

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.3651.233A.1311.0030 (for cable length 3 m)

#### e Measuring range

1 = 1 x 360°  
2 = 1 x 180°  
3 = 1 x 90°  
4 = 1 x 45°

#### f Interface / power supply

3 = 4 ... 20 mA / 10 ... 30 V DC  
4 = 0 ... 10 V / 15 ... 30 V DC  
5 = 0 ... 5 V / 10 ... 30 V DC

#### g Option 1

1 = count direction cw <sup>2)</sup>  
2 = count direction ccw <sup>3)</sup>

#### h Option 2

1 = IP67  
2 = IP69k

#### Optional on request

- Ex 2/22 (only for type of connection 3 + 4)
- surface protection salt spray tested

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

2) cw = Increasing code values when shaft turning clockwise (cw). Top view on shaft.

3) ccw = Increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.



# Absolute encoders - singleturn

|                         |  |               |
|-------------------------|--|---------------|
| <b>Compact magnetic</b> | <b>Sendix 3651 / 3671 (shaft / hollow shaft)</b> | <b>Analog</b> |
|-------------------------|--|---------------|

|  |   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |  |
|--|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|--|
| <b>Order code</b><br><b>Hollow shaft</b>   | <b>8.3671</b><br>Type   | <table border="1" style="font-size: 8px; border-collapse: collapse;"> <tr> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">a</td><td style="text-align: center;">b</td><td style="text-align: center;">c</td><td style="text-align: center;">d</td> <td style="text-align: center;">e</td><td style="text-align: center;">f</td><td style="text-align: center;">g</td><td style="text-align: center;">h</td> </tr> </table> | X | X | X | X | X | X | X | X | a | b | c | d | e | f | g | h | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px; width: 40px; float: right;">10 by 10</div> <div style="clear: both;"></div> <table style="width: 100%; font-size: 8px;"> <tr> <td style="width: 33%; vertical-align: top;"> <p><b>a</b> Flange<br/>2 = with spring element, long<br/><u>5 = with stator coupling, ø 46 mm [1.81"]</u></p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 18 mm [0.71"])<br/><u>2 = ø 6 mm [0.24"]</u><br/>4 = ø 8 mm [0.32"]<br/>6 = ø 10 mm [0.39"]<br/>3 = ø 1/4"</p> <p><b>c</b> Output circuit <sup>1)</sup><br/><u>3 = current output</u><br/><u>4 = voltage output</u></p> </td> <td style="width: 33%; vertical-align: top;"> <p><b>d</b> Type of connection<br/>1 = axial cable, 1 m [3.28'] PUR<br/>A = axial cable, special length PUR *)<br/><u>2 = radial cable, 1 m [3.28'] PUR</u><br/>B = radial cable, special length PUR *)<br/>3 = axial M12 connector, 5-pin<br/>4 = radial M12 connector, 5-pin<br/><br/>*) Available special lengths (connection types A, B):<br/>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.3671.523A.1311.0030 (for cable length 3 m)</p> <p><b>e</b> Measuring range<br/><u>1 = 1 x 360°</u><br/>2 = 1 x 180°<br/>3 = 1 x 90°<br/>4 = 1 x 45°</p> </td> <td style="width: 33%; vertical-align: top;"> <p><b>f</b> Interface / power supply<br/><u>3 = 4 ... 20 mA / 10 ... 30 V DC</u><br/><u>4 = 0 ... 10 V / 15 ... 30 V DC</u><br/>5 = 0 ... 5 V / 10 ... 30 V DC</p> <p><b>g</b> Option 1<br/><u>1 = count direction cw <sup>2)</sup></u><br/>2 = count direction ccw <sup>3)</sup></p> <p><b>h</b> Option 2<br/><u>1 = IP67</u><br/>2 = IP69k</p> <p style="text-align: center;"><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 (only for type of connection 3 + 4)</li> <li>- surface protection salt spray tested</li> </ul> </td> </tr> </table> | <p><b>a</b> Flange<br/>2 = with spring element, long<br/><u>5 = with stator coupling, ø 46 mm [1.81"]</u></p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 18 mm [0.71"])<br/><u>2 = ø 6 mm [0.24"]</u><br/>4 = ø 8 mm [0.32"]<br/>6 = ø 10 mm [0.39"]<br/>3 = ø 1/4"</p> <p><b>c</b> Output circuit <sup>1)</sup><br/><u>3 = current output</u><br/><u>4 = voltage output</u></p> | <p><b>d</b> Type of connection<br/>1 = axial cable, 1 m [3.28'] PUR<br/>A = axial cable, special length PUR *)<br/><u>2 = radial cable, 1 m [3.28'] PUR</u><br/>B = radial cable, special length PUR *)<br/>3 = axial M12 connector, 5-pin<br/>4 = radial M12 connector, 5-pin<br/><br/>*) Available special lengths (connection types A, B):<br/>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.3671.523A.1311.0030 (for cable length 3 m)</p> <p><b>e</b> Measuring range<br/><u>1 = 1 x 360°</u><br/>2 = 1 x 180°<br/>3 = 1 x 90°<br/>4 = 1 x 45°</p> | <p><b>f</b> Interface / power supply<br/><u>3 = 4 ... 20 mA / 10 ... 30 V DC</u><br/><u>4 = 0 ... 10 V / 15 ... 30 V DC</u><br/>5 = 0 ... 5 V / 10 ... 30 V DC</p> <p><b>g</b> Option 1<br/><u>1 = count direction cw <sup>2)</sup></u><br/>2 = count direction ccw <sup>3)</sup></p> <p><b>h</b> Option 2<br/><u>1 = IP67</u><br/>2 = IP69k</p> <p style="text-align: center;"><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 (only for type of connection 3 + 4)</li> <li>- surface protection salt spray tested</li> </ul> |
| X  | X   | X  | X | X | X | X | X |   |   |   |   |   |   |   |   |   |   |   |   |  |   |  |
| a  | b   | c  | d | e | f | g | h |   |   |   |   |   |   |   |   |   |   |   |   |  |   |  |
| <p><b>a</b> Flange<br/>2 = with spring element, long<br/><u>5 = with stator coupling, ø 46 mm [1.81"]</u></p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 18 mm [0.71"])<br/><u>2 = ø 6 mm [0.24"]</u><br/>4 = ø 8 mm [0.32"]<br/>6 = ø 10 mm [0.39"]<br/>3 = ø 1/4"</p> <p><b>c</b> Output circuit <sup>1)</sup><br/><u>3 = current output</u><br/><u>4 = voltage output</u></p> | <p><b>d</b> Type of connection<br/>1 = axial cable, 1 m [3.28'] PUR<br/>A = axial cable, special length PUR *)<br/><u>2 = radial cable, 1 m [3.28'] PUR</u><br/>B = radial cable, special length PUR *)<br/>3 = axial M12 connector, 5-pin<br/>4 = radial M12 connector, 5-pin<br/><br/>*) Available special lengths (connection types A, B):<br/>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.3671.523A.1311.0030 (for cable length 3 m)</p> <p><b>e</b> Measuring range<br/><u>1 = 1 x 360°</u><br/>2 = 1 x 180°<br/>3 = 1 x 90°<br/>4 = 1 x 45°</p> | <p><b>f</b> Interface / power supply<br/><u>3 = 4 ... 20 mA / 10 ... 30 V DC</u><br/><u>4 = 0 ... 10 V / 15 ... 30 V DC</u><br/>5 = 0 ... 5 V / 10 ... 30 V DC</p> <p><b>g</b> Option 1<br/><u>1 = count direction cw <sup>2)</sup></u><br/>2 = count direction ccw <sup>3)</sup></p> <p><b>h</b> Option 2<br/><u>1 = IP67</u><br/>2 = IP69k</p> <p style="text-align: center;"><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 (only for type of connection 3 + 4)</li> <li>- surface protection salt spray tested</li> </ul>   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |  |

| Mounting accessory for shaft encoders | Order no. |
|---------------------------------------|-----------|
|---------------------------------------|-----------|

|                 |   |  |                         |
|-----------------|---|--|-------------------------|
| <b>Coupling</b> | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"] |  | <b>8.0000.1102.0606</b> |
|-----------------|---|--|-------------------------|

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

|   |                    |  |                         |
|---|--------------------|--|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 2) | with fixing thread |  | <b>8.0010.4700.0000</b> |
|---|--------------------|--|-------------------------|

| Connection technology | Order no. |
|-----------------------|-----------|
|-----------------------|-----------|

|  |  |  |                             |
|--|--|--|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable |  | <b>05.00.6081.2211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 5-pin                          |  | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data |
|----------------|
|----------------|

| Mechanical characteristics            |   |
|---------------------------------------|---|
| <b>Maximum speed</b>                  | 6000 min <sup>-1</sup>  |
| <b>Starting torque at 20°C [68°F]</b> | < 0.06 Nm   |
| <b>Shaft load capacity</b>            | radial 40 N<br>axial 20 N   |
| <b>Weight</b>                         | approx. 0.2 kg [7.06 oz]  |
| <b>Protection acc. to EN 60529</b>    | IP67 / IP69k  |
| <b>Working temperature range</b>      | -40°C ... +85°C [-40°F ... +185°F]  |
| <b>Materials</b>                      | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PUR |

|  |   |
|--|---|
| <b>Shock resistance acc. to EN 60068-2-27</b>              | 5000 m/s <sup>2</sup> , 6 ms              |
| <b>Vibration resistance acc. to EN 60068-2-6</b>           | 300 m/s <sup>2</sup> , 10 ... 2000 Hz     |
| <b>Permanent shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 2 ms              |
| <b>Vibration (broad-band random) acc. to EN 60068-2-64</b> | 5 ... 2500 Hz, 100 m/s <sup>2</sup> - rms |

| General electrical characteristics |  |
|------------------------------------|--|
| <b>e1 compliant acc. to</b>        | EU guideline 2009/19/EC<br>(acc. to EN 55025,<br>ISO 11452 and ISO 7637) |
| <b>CE compliant acc. to</b>        | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU                    |

1) Output circuit "3" only in conjunction with interface "3",  
output circuit "4" only in conjunction with interface "4" or "5".

2) cw = increasing code values when shaft turning clockwise (cw). Top view on shaft.  
3) ccw = increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.



# Absolute encoders - singleturn

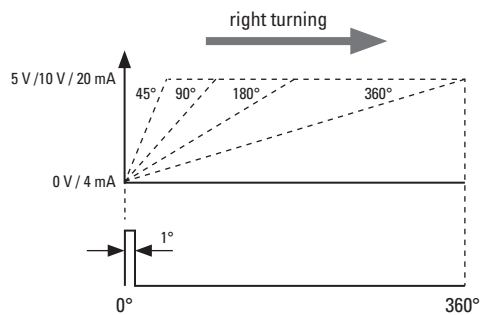
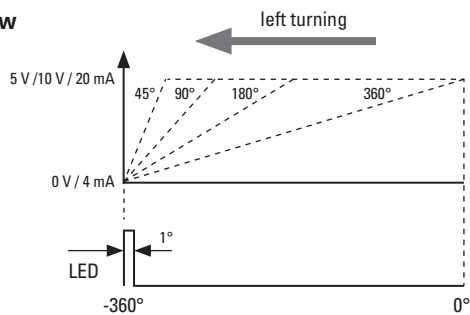
| Compact magnetic   |   | Sendix 3651 / 3671 (shaft / hollow shaft)   | Analog |
|--|---|---|--------|
| <b>Electrical characteristics current interface 4 ... 20 mA</b>  |   |   |        |
| <b>Sensor</b>  |   |   |        |
| Power supply   | 10 ... 30 V DC  |   |        |
| Current consumption (no load)  | max. 38 mA  |   |        |
| Reverse polarity protection of the power supply  | yes   |   |        |
| Measuring range  | 45°, 90°, 180° or 360°  |   |        |
| Resolution   | 12 bit  |   |        |
| Absolute accuracy, 25°C [77°F]   | ±1°   |   |        |
| Repeat accuracy, 25°C [77°F]   | ±0.2°   |   |        |
| Status LED   | red   | break in current loop, input load too high. |        |
|  | green   | reference point display turns ON            |        |
|  |   | at cw: betw. 0° and 1°                      |        |
|  |   | at ccw: betw. 0° and -1°                    |        |
| <b>Current loop Output load</b>  |   |   |        |
|  | max. 200 Ohm at 10 V DC   |   |        |
|  | max. 900 Ohm at 24 V DC   |   |        |
| <b>Setting time</b>  |   |   |        |
|  | < 1 ms  |   |        |
|  | $R_{load} = 400 \text{ Ohm}, 25^\circ\text{C [77}^\circ\text{F]}$   |   |        |
| <b>Short-circuit proof outputs</b>   |   |   |        |
| When the power supply is correctly applied. But not output to +V. Power supply and sensor output signal are not galvanically isolated. |   |   |        |
| <b>Electrical characteristics voltage interface</b>  |   |   |        |
| <b>Sensor</b>  |   |   |        |
| Power supply   | output 0 ... 5 V  | 10 ... 30 V DC                              |        |
|  | output 0 ... 10 V   | 15 ... 30 V DC                              |        |
| Current consumption (no load)  | max. 35 mA  |   |        |
| Reverse polarity protection of the power supply  | yes   |   |        |
| Measuring range  | 45°, 90°, 180° or 360°  |   |        |
| Resolution   | 12 bit  |   |        |
| Linearity, 25°C [77°F]   | ±1°   |   |        |
| Repeat accuracy, 25°C [77°F]   | ±0.2°   |   |        |
| <b>Voltage output</b>  |   |   |        |
| Current output   | max. 10 mA  |   |        |
| Setting time   | < 1 ms  |   |        |
|  | $R_{load} \geq 1 \text{ KOhm}, 25^\circ\text{C [77}^\circ\text{F]}$ |   |        |
| <b>Short-circuit proof outputs</b>   |   |   |        |
| When the power supply is correctly applied. But not output to +V. Power supply and sensor output signal are not galvanically isolated. |   |   |        |
| <b>Status LED (green)</b>  |   |   |        |
| Status LED   | green   | reference point display turns ON            |        |
|  |   | at cw: betw. 0° and 1°                      |        |
|  |   | at ccw: betw. 0° and -1°                    |        |

Absolute encoders singleturn

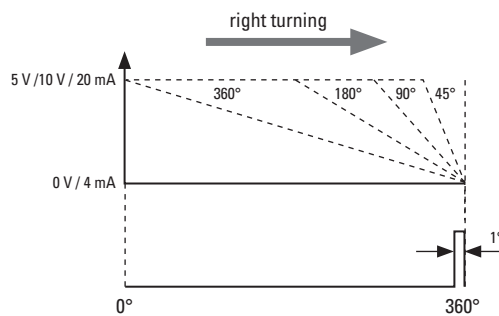
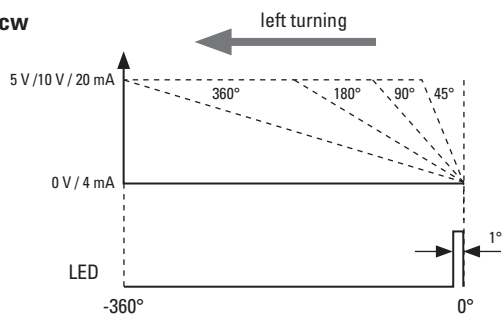
## Example (output signal profile)

Measurement range 45° / 90° / 180° / 360°

### Version cw



### Version ccw



# Absolute encoders - singleturn

**Compact magnetic**

**Sendix 3651 / 3671 (shaft / hollow shaft)**

**Analog**

## Terminal assignment

| Interface      | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |
|----------------|--------------------|---|-----|----|----|----|
| 3<br>(current) | 1, 2, A, B         | Signal:   | 0 V | +V | +I | -I |
|                |                    | Cable color:  | WH  | BN | GN | YE |

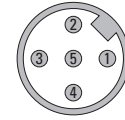
| Interface      | Type of connection | M12 connector, 5-pin |     |    |    |    |
|----------------|--------------------|----------------------|-----|----|----|----|
| 3<br>(current) | 3, 4               | Signal:              | 0 V | +V | +I | -I |
|                |                    | Pin:                 | 3   | 2  | 4  | 5  |

| Interface         | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |
|-------------------|--------------------|---|-----|----|----|----|
| 4, 5<br>(voltage) | 1, 2, A, B         | Signal:   | 0 V | +V | +U | -U |
|                   |                    | Cable color:  | WH  | BN | GN | YE |

| Interface         | Type of connection | M12 connector, 5-pin |     |    |    |    |
|-------------------|--------------------|----------------------|-----|----|----|----|
| 4, 5<br>(voltage) | 3, 4               | Signal:              | 0 V | +V | +U | -U |
|                   |                    | Pin:                 | 3   | 2  | 4  | 5  |

+V : Encoder power supply +V DC  
 0 V : Encoder power supply ground GND (0 V)  
 +U / -U : Voltage + / voltage -  
 +I / -I : Current + / current -

Top view of mating side, male contact base



M12 connector, 5-pin

## Dimensions shaft version

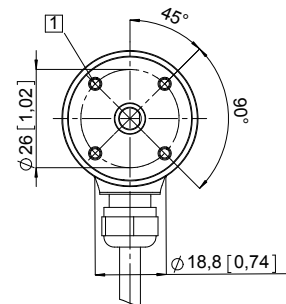
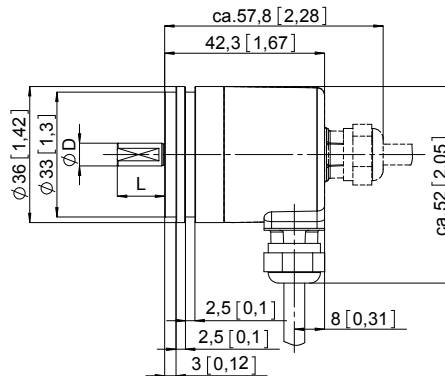
Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 36 [1.42]

#### Flange type 2

(drawing with cable)

1 4 x M3, 6 [0.24] deep



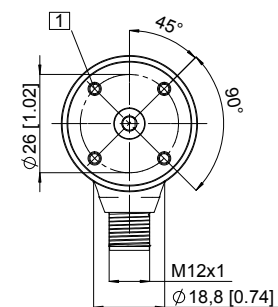
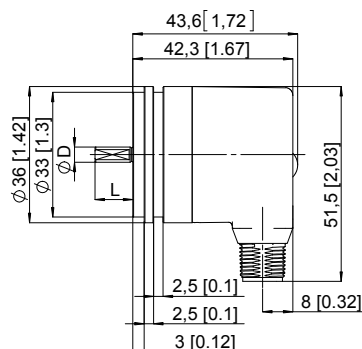
| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

### Synchro flange, $\varnothing$ 36 [1.42]

#### Flange type 2

(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

# Absolute encoders - singleturn

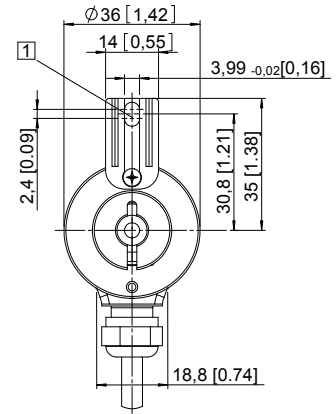
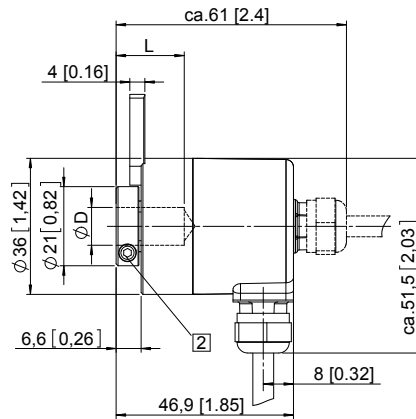
|                         |  |               |
|-------------------------|--|---------------|
| <b>Compact magnetic</b> | <b>Sendix 3651 / 3671 (shaft / hollow shaft)</b> | <b>Analog</b> |
|-------------------------|--|---------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm



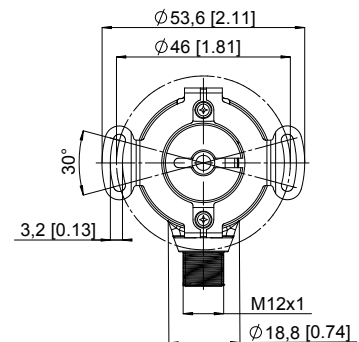
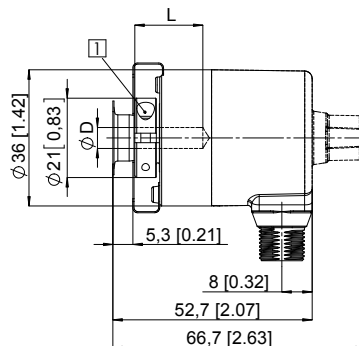
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft

### Flange with stator coupling, $\varnothing$ 46 [1.81]

#### Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft

# Absolute encoders - singleturn

**Compact magnetic**

**Sendix M3658 / M3678 (shaft / hollow shaft) CANopen**



The Sendix M3658 and Sendix M3678 absolute encoders - singleturn with CANopen interface and magnetic sensor technology boast a resolution of 14 bits.

With a protection rating of up to IP69k, these encoders are resistant to shock and to extreme fluctuations in temperature, making them ideal for use in the most demanding outdoor applications.



**CANopen**



Safety-Lockplus™



High rotational speed



Temperature range  
-40°...+85°C



High protection level



High shaft load capacity



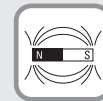
Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



Surface protection salt spray-tested optional

## Robust technology

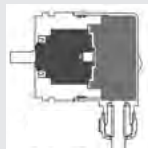
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lockplus™ design.
- Resistant die-cast-housing and protection up to IP69k.

## Versatile applications

- CANopen encoder profile DS406 V3.2.
- Fast determination of the operating status via two-color LED.
- With M12 connector or cable connection.

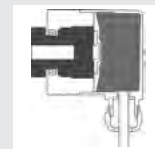
## Safety-Lockplus™

IP69k protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.



## Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



## Order code shaft version

**8.M3658** . **2XCX** . **21 1X**  
Type                      a   b   c   d                      e   f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

2 = synchro flange, ø 36 mm [1.42"]

### b Shaft (ø x L), with flat

3 = ø 6 x 12.5 mm [0.24 x 0.49"]  
6 = ø 8 x 12.5 mm [0.32 x 0.49"]  
5 = ø 1/4" x 12.5 mm [0.49"]

### c Interface / power supply

C = CANopen DS301 V4.02 / 8 ... 30 V DC

### d Type of connection

2 = radial cable, 1 m [3.28] PUR  
B = radial cable, special length PUR \*)  
4 = radial M12 connector, 5-pin

\*) Available special lengths (connection types B):  
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.M3658.23CB.2111.0030 (for cable length 3 m)

### e Fieldbus profile

21 = CANopen encoder profil DS406 V3.2

### f Protection

1 = IP67  
2 = IP69k

### Optional on request

- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

|   |                                       |  |                  |                  |                  |                  |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
|---|---------------------------------------|--|------------------|------------------|------------------|------------------|-----------|----------|----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--|
| <b>Order code hollow shaft</b>  | <b>8.M3678</b><br><small>Type</small> | <table border="1" style="font-size: small; text-align: center;"> <tr> <td><b>X</b></td><td><b>X</b></td><td><b>C</b></td><td><b>X</b></td><td><b>21</b></td><td><b>1</b></td><td><b>X</b></td> </tr> <tr> <td><small>a</small></td><td><small>b</small></td><td><small>c</small></td><td><small>d</small></td><td><small>e</small></td><td><small>f</small></td><td><small>i</small></td> </tr> </table> | <b>X</b>         | <b>X</b>         | <b>C</b>         | <b>X</b>         | <b>21</b> | <b>1</b> | <b>X</b> | <small>a</small> | <small>b</small> | <small>c</small> | <small>d</small> | <small>e</small> | <small>f</small> | <small>i</small> | If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |
| <b>X</b>  | <b>X</b>                              | <b>C</b>   | <b>X</b>         | <b>21</b>        | <b>1</b>         | <b>X</b>         |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
| <small>a</small>  | <small>b</small>                      | <small>c</small>   | <small>d</small> | <small>e</small> | <small>f</small> | <small>i</small> |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
| <b>a Flange</b><br>2 = with spring element, long<br><u>5 = with stator coupling, ø 46 mm [1.81"]</u>  |                                       | <b>d Type of connection</b><br>2 = radial cable, 1 m [3.28] PUR<br>B = radial cable, special length PUR *)<br><u>4 = radial M12 connector, 5-pin</u>   |                  |                  |                  |                  |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 18 mm [0.71"])<br><u>2 = ø 6 mm [0.24"]</u><br><u>4 = ø 8 mm [0.32"]</u><br>6 = ø 10 mm [0.39"]<br>3 = ø 1/4"  |                                       | <b>e Fieldbus profile</b><br><u>21 = CANopen encoder profil DS406 V3.2</u>   |                  |                  |                  |                  |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
| <b>c Interface / power supply</b><br><u>C = CANopen DS301 V4.02 / 8 ... 30 V DC</u>   |                                       | <b>f Protection</b><br><u>1 = IP67</u><br>2 = IP69k<br><br><i>Optional on request</i><br>- Ex 2/22 (only for type of connection 4)<br>- surface protection salt spray tested   |                  |                  |                  |                  |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |
| <b>*) Available special lengths (connection type B):</b><br>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21"]<br>order code expansion .XXXX = length in dm<br>ex.: 8.M3678.52CB.2111.0030 (for cable length 3 m) |                                       |  |                  |                  |                  |                  |           |          |          |                  |                  |                  |                  |                  |                  |                  |  |

| Mounting accessory for shaft encoders  | Order no.                   |
|--|-----------------------------|
| <b>Coupling</b><br>bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                               | <b>8.0000.1102.0606</b>     |
| Mounting accessory for hollow shaft encoders   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 2)                        | <b>8.0010.4700.0000</b>     |
|  |                             |
| Connection technology  | Order no.                   |
| <b>Cordset, pre-assembled</b><br>M12 female connector with coupling nut, 5-pin<br>5 m [16.40'] PVC cable | <b>05.00.6091.A211.005M</b> |
| <b>Connector, self-assembly (straight)</b><br>M12 female connector with coupling nut, 5-pin              | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |   |
|--|---|
| Mechanical characteristics                                 |   |
| <b>Maximum speed</b>                                       | 6000 min <sup>-1</sup>  |
| <b>Starting torque at 20°C [68°F]</b>                      | < 0.06 Nm   |
| <b>Shaft load capacity</b>                                 | radial 40 N<br>axial 20 N   |
| <b>Weight</b>  | approx. 0.2 kg [7.06 oz]  |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>             | IP67 / IP69k  |
| <b>Working temperature range</b>                           | -40°C ... +85°C [-40°F ... +185°F]  |
| <b>Materials</b>   | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PUR |
| <b>Shock resistance acc. to EN 60068-2-27</b>              | 5000 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b>           | 300 m/s <sup>2</sup> , 10 ... 2000 Hz   |
| <b>Permanent shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 2 ms  |
| <b>Vibration (broad-band random) acc. to EN 60068-2-64</b> | 5 ... 2500 Hz, 100 m/s <sup>2</sup> - rms   |
| Electrical characteristics                                 |   |
| <b>Power supply</b>  | 8 ... 30 V DC   |
| <b>Current consumption (no load)</b>                       | max. 25 mA  |
| <b>Reverse polarity protection of the power supply</b>     | yes   |
| <b>Measuring range</b>                                     | 360°  |
| <b>Absolute accuracy, 25°C [77°F]</b>                      | ±1°   |
| <b>Repeat accuracy, 25°C [77°F]</b>                        | ±0.2°   |
| <b>Data refresh rate</b>                                   | 400 µs  |
| <b>CE compliant acc. to</b>                                | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |
| Diagnostic LED (two-color, red/green)                      |   |
| <b>LED ON or blinking</b>                                  | red error display<br>green status display   |

# Absolute encoders - singleturn

**Compact magnetic**

**Sendix M3658 / M3678 (shaft / hollow shaft)**

**CANopen**

| Interface characteristics CANopen |   |
|-----------------------------------|---|
| <b>Resolution</b>                 | 1 ... 16384 (14 bit), scalable default: 16384 (14 bit)                                |
| <b>Code</b>                       | binary  |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B        |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0 |

|                     |   |
|---------------------|---|
| <b>Baud rate</b>    | 10 ... 1000 kbit/s software configurable  |
| <b>Node address</b> | 1 ... 127 software configurable   |
| <b>Termination</b>  | software configurable   |
| <b>LSS protocol</b> | CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object |

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2.

In addition, device specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two color LED located on the back indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics.

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality:

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 sending PDO's.
- Node address, baud rate and CAN bus / programmable termination.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific memory - 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

## LSS protocol profile DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

## CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length  $L_u$ .

$L_u < 5 \text{ m [16.40']}$  cable length for 125 Kbit.

$L_u < 2 \text{ m [6.56']}$  cable length for 250 Kbit.

$L_u < 1 \text{ m [3.28']}$  cable length for 1 Mbit.

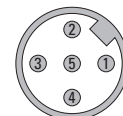
When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/encoder must not exceed 70 cm.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
| C         | 2, B               | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Cable color:  | BN | WH  | GY      | GN    | YE    |
| Interface | Type of connection | M12 connector, 5-pin  |    |     |         |       |       |
| C         | 4                  | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Pin:  | 2  | 3   | 1       | 4     | 5     |

## Top view of mating side, male contact base



M12 connector, 5-pin

# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

## Dimensions shaft version

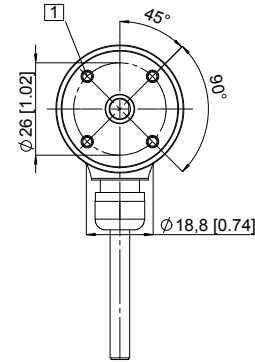
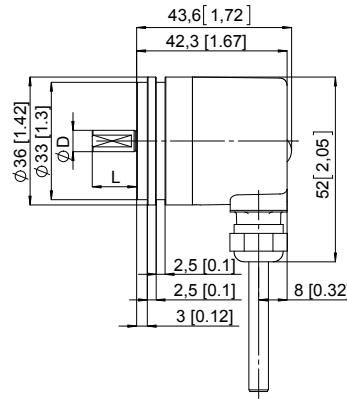
Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 36 [1.42]

#### Flange type 2

(drawing with cable)

1 4 x M3, 6 [0.24] deep



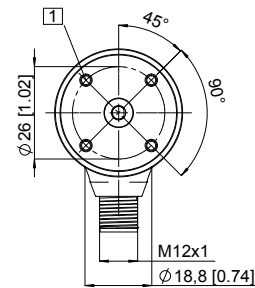
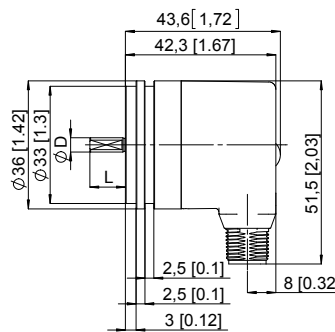
| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

### Synchro flange, $\varnothing$ 36 [1.42]

#### Flange type 2

(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

# Absolute encoders - singleturn

**Compact magnetic**

**Sendix M3658 / M3678 (shaft / hollow shaft)**

**CANopen**

## Dimensions hollow shaft version

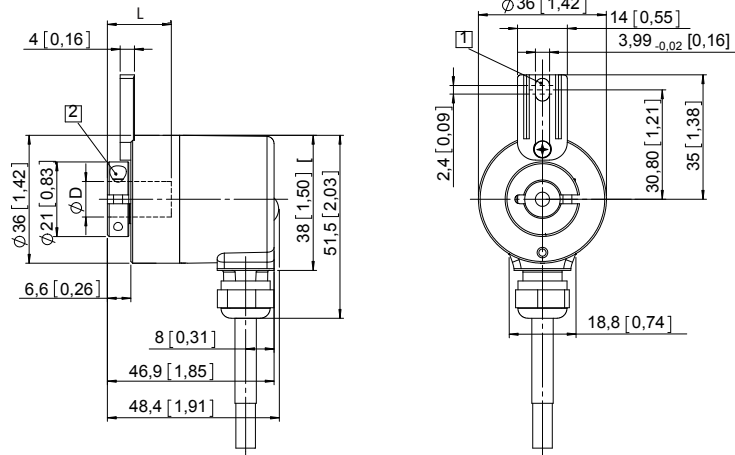
Dimensions in mm [inch]

### Flange with spring element, long Flange type 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft

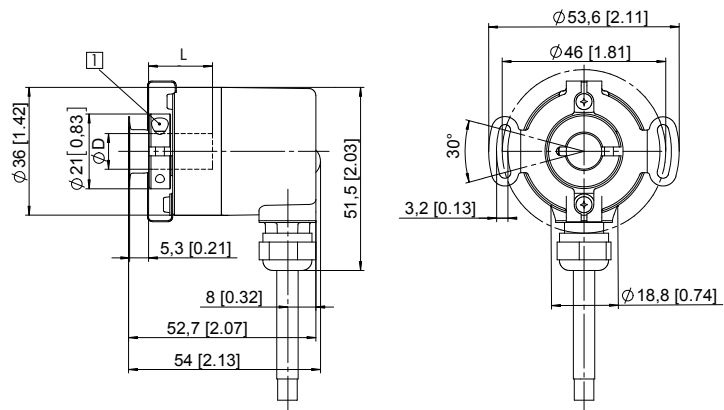


### Flange with stator coupling, $\varnothing$ 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft





# Absolute encoders - singleturn

|                         |  |                  |
|-------------------------|--|------------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>SAE J1939</b> |
|-------------------------|--|------------------|



The absolute Sendix encoders M3658 and M3678 with SAE J1939 interface support all common requirements of the special protocol for utility vehicles and make a considerable contribution to the comprehensive system diagnostics or to fast fault localization.

The encoders offer fast, error-free start-up with no need to set switches; the encoder address is assigned automatically via Address Claiming (ACL).



**SAE J1939**

Absolute encoders singleturn

|                  |                       |                   |                       |                          |                             |                     |                             |                 |   |
|------------------|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|---------------------|-----------------------------|-----------------|---|
|                  |                       |                   |                       |                          |                             |                     |                             |                 |   |
| Safety-Lockplus™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor | Surface protection salt spray-tested optional |

### Robust technology

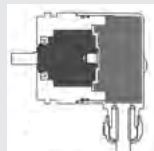
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lockplus™ Design.
- Resistant die cast housing and protection up to IP69k.

### Versatile applications

- Up-to-the-minute fieldbus performance in the application: SAE J1939 with CAN-highspeed to ISO 11898.
- Fast determination of the operating status via two-color LED.
- Fast, error-free start up with no need to set switches; with automatic address claiming (ACL).

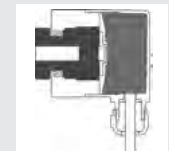
### Safety-Lockplus™

IP69k protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.



### Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



|                                   |   |  |   |   |                              |   |   |   |  |  |
|-----------------------------------|---|--|---|---|------------------------------|---|---|---|--|--|
| <b>Order code</b>                 | <b>8.M3658</b>  | <b>. 2 X C X . 32 1 X</b>  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |   |                              |   |   |   |  |  |
| <b>Shaft version</b>              | Type  | <table border="1" style="font-size: x-small;"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> <td style="text-align: center;">f</td> </tr> </table> | a   | b   | c                            | d | e | f |  |  |
| a                                 | b   | c  | d   | e   | f                            |   |   |   |  |  |
| <b>a</b> Flange                   | <u>2</u> = synchro flange, ø 36 mm [1.42"]  | <b>c</b> Interface / Power supply  | <u>C</u> = CAN Highspeed / 8 ... 30 V DC  | <b>e</b> Fieldbus profile   | <u>32</u> = J1939            |   |   |   |  |  |
| <b>b</b> Shaft (ø x L), with flat | <u>3</u> = ø 6 x 12.5 mm [0.24 x 0.49"]<br>6 = ø 8 x 12.5 mm [0.32 x 0.49"]<br>5 = ø 1/4" x 12.5 mm [0.49"] | <b>d</b> Type of connection  | 2 = radial cable, 1 m [3.28] PUR<br>B = radial cable, special length PUR *)<br><u>4</u> = radial M12 connector, 5-pin   | <b>f</b> Protection   | <u>1</u> = IP67<br>2 = IP69k |   |   |   |  |  |
|                                   |   | *) Available special lengths (connection type B):<br>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.M3658.23CB.3211.0030 (for cable length 3 m)   |   | <i>Optional on request</i><br>- Ex 2/22 (only for type of connection 4)<br>- surface protection salt spray tested |                              |   |   |   |  |  |

# Absolute encoders - singleturn

|                         |  |                  |
|-------------------------|--|------------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>SAE J1939</b> |
|-------------------------|--|------------------|

|  |   |   |  |  |
|--|---|---|--|--|
| <b>Order code</b><br>Hollow shaft  | <b>8.M3678</b><br>Type  | <b>.XXCX.321X</b><br>a b c d e f  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>a Flange</b>  | <b>c Interface / Power supply</b>   | <b>e Fieldbus profile</b>   |  |  |
| 2 = with spring element, long<br><u>5 = with stator coupling, ø 46 mm [1.81"]</u>  | <b>C = CAN Highspeed / 8 ... 30 V DC</b>  | <b>32 = J1939</b>   |  |  |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 18 mm [0.71"])  | <b>d Type of connection</b>   | <b>f Protection</b>   |  |  |
| 2 = ø 6 mm [0.24"]<br><u>4 = ø 8 mm [0.32"]</u><br>6 = ø 10 mm [0.39"]<br>3 = ø 1/4"   | 2 = radial cable, 1 m [3.28] PUR<br>B = radial cable, special length PUR *)<br><b>4 = radial M12 connector, 5-pin</b> | <b>1 = IP67</b><br>2 = IP69k  |  |  |
| *) Available special lengths (connection type B):<br>2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.M3678.52CB.3211.0030 (for cable length 3 m) |   | <i>Optional on request</i><br>- Ex 2/22 (only for type of connection 4)<br>- surface protection salt spray tested |  |  |

| Mounting accessory for shaft encoders             | Order no.   |
|---|---|
| <b>Coupling</b>                                   | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                 |
| <b>8.0000.1102.0606</b>                           |   |
| Mounting accessory for hollow shaft encoders      | Order no.   |
| <b>Cylindrical pin, long</b>                      | Dimensions in mm [inch]   |
| for flange with spring element<br>(flange type 2) | with fixing thread  |
| <b>8.0010.4700.0000</b>                           |   |
| Connection technology                             | Order no.   |
| <b>Cordset, pre-assembled</b>                     | M12 female connector with coupling nut, 5-pin<br>5 m [16.40'] PVC cable |
| <b>05.00.6091.A211.005M</b>                       |   |
| <b>Connector, self-assembly (straight)</b>        | M12 female connector with coupling nut, 5-pin                           |
| <b>8.0000.5116.0000</b>                           |   |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                                 |   | Electrical characteristics                             |   |
|--|---|--|---|
| <b>Maximum speed</b>                                       | 6000 min <sup>-1</sup>  | <b>Power supply</b>                                    | 8 ... 30 V DC   |
| <b>Starting torque at 20°C [68°F]</b>                      | < 0.06 Nm   | <b>Current consumption (no load)</b>                   | max. 25 mA  |
| <b>Shaft load capacity</b>                                 | radial 40 N<br>axial 20 N   | <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Weight</b>  | approx. 0.2 kg [7.06 oz]  | <b>Measuring range</b>                                 | 360°  |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>             | IP67 / IP69k  | <b>Absolute accuracy, 25°C [77°F]</b>                  | ±1°   |
| <b>Working temperature range</b>                           | -40°C ... +85°C [-40°F ... +185°F]  | <b>Repeat accuracy, 25°C [77°F]</b>                    | ±0.2°   |
| <b>Materials</b>   | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PUR | <b>Data refresh rate</b>                               | 400 µs  |
| <b>Shock resistance acc. to EN 60068-2-27</b>              | 5000 m/s <sup>2</sup> , 6 ms  | <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |
| <b>Vibration resistance acc. to EN 60068-2-6</b>           | 300 m/s <sup>2</sup> , 10 ... 2000 Hz   | <b>Diagnostic LED (two-color, red/green)</b>           |   |
| <b>Permanent shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 2 ms  | <b>LED ON or blinking</b>                              | red error display<br>green status display             |
| <b>Vibration (broad-band random) acc. to EN 60068-2-64</b> | 5 ... 2500 Hz, 100 m/s <sup>2</sup> - rms   |  |   |

# Absolute encoders - singleturn

|                         |  |                  |
|-------------------------|--|------------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>SAE J1939</b> |
|-------------------------|--|------------------|

| Interface characteristics CANopen |  |
|-----------------------------------|--|
| <b>Resolution</b>                 | 1 ... 16384 (14 bit), scalable<br>default: 16384 (14 bit)                            |
| <b>Code</b>                       | binary   |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                   | SAE J1939  |
| <b>Node address</b>               | 1 ... 255<br>via address claiming  |
| <b>Baud rate</b>                  | 250 kbit/s   |
| <b>Termination</b>                | software configurable  |

### General information concerning SAE J1939

The protocol J1939 originates from the international Society of Automotive Engineers (SAE) and operates on the physical layer with high speed CAN as per ISO11898. The application emphasis lies in the area of the power train and chassis of commercial vehicles. It serves to transfer diagnostic data (for example, motor speed, position, temperature) and control information. Type series M3658 and M3678 encoders support the total functionality of J1939.

This protocol is a multimaster system with decentralized network management that does not involve channel-based communication.

It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as parameters (signals) and combined on 4 memory pages (data pages) into parameter groups (PGs). Each parameter group can be identified via a unique number, the parameter group number (PGN). Independently of this, each signal is assigned a unique SPN (suspect parameter number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore the parameter groups are optimized to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol. If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (broadcast announce message) and CDMT (connection mode data transfer). With BAM TP the transfer of data occurs as a broadcast.

### Encoder implementation SAE J1939

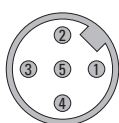
- PGNs that are adaptable to the customer's application.
- Resolution of address conflicts -> Address Claiming (ACL).
- Continuous checking whether control addresses have been assigned twice within a network.
- Change of control device addresses during run-time.
- Unique identification of a control device with the help of a name that is unique worldwide. This name serves to identify the functionality of a control device in the network.
- Predefined PGs for position, speed and alarm.
- 250 kbit/s, 29 bit identifier.
- Watchdog controlled device.

A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
| C         | 2, B               | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Cable color:  | BN | WH  | GY      | GN    | YE    |
| Interface | Type of connection | M12 connector, 5-pin  |    |     |         |       |       |
| C         | 4                  | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Pin:  | 2  | 3   | 1       | 4     | 5     |

### Top view of mating side, male contact base



M12 connector, 5-pin

# Absolute encoders - singleturn

**Compact magnetic**

**Sendix M3658 / M3678 (shaft / hollow shaft)**

**SAE J1939**

## Dimensions shaft version

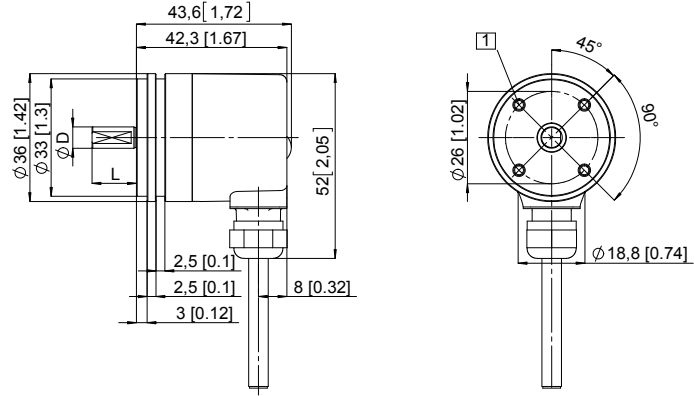
Dimensions in mm [inch]

### Synchro flange, ø 36 [1.42]

#### Flange type 2

(drawing with cable)

1 4 x M3, 6 [0.24] deep



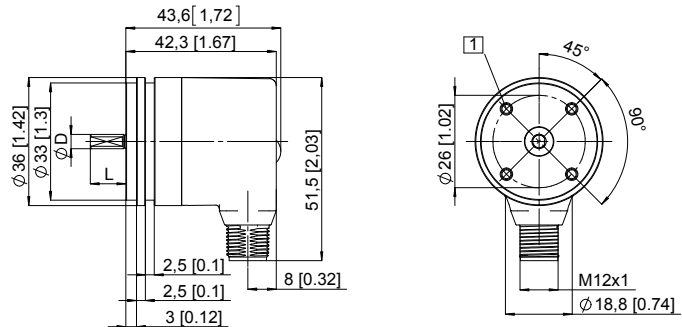
| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

### Synchro flange, ø 36 [1.42]

#### Flange type 2

(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



| D        | Fit | L           |
|----------|-----|-------------|
| 6 [0.24] | h7  | 12.5 [0.49] |
| 8 [0.32] | h7  | 12.5 [0.49] |
| 1/4"     | h7  | 12.5 [0.49] |

# Absolute encoders - singleturn

|                         |  |                  |
|-------------------------|--|------------------|
| <b>Compact magnetic</b> | <b>Sendix M3658 / M3678 (shaft / hollow shaft)</b> | <b>SAE J1939</b> |
|-------------------------|--|------------------|

## Dimensions hollow shaft version

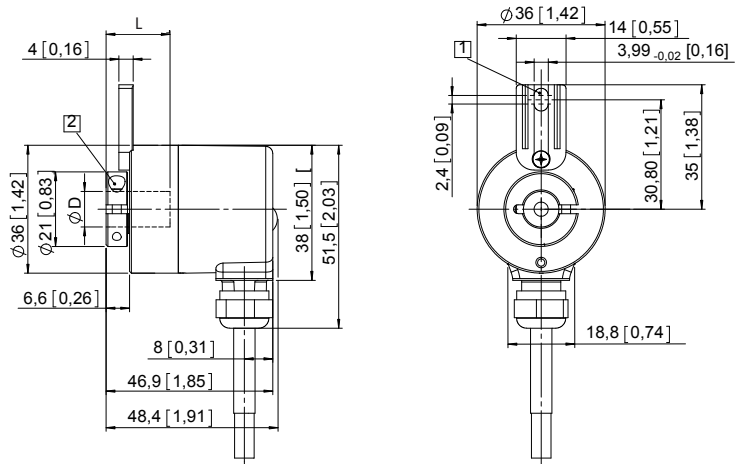
Dimensions in mm [inch]

### Flange with spring element, long Flange type 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft

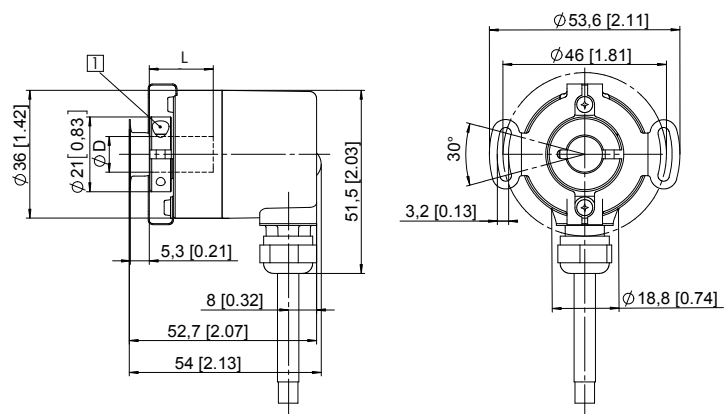


### Flange with stator coupling, $\varnothing$ 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | H7  | 18 [0.71] |
| 8 [0.32]  | H7  | 18 [0.71] |
| 10 [0.39] | H7  | 18 [0.71] |
| 1/4"      | H7  | 18 [0.71] |

L = insertion depth blind hollow shaft



# Absolute encoders - singleturn

Compact optical

Sendix F3653 / F3673 (shaft / hollow shaft)

SSI / BiSS + incremental



The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.



Safety-Lock™



Temperature range  
-40°...+90°C



High protection level  
IP



High shaft load capacity



Shock / vibration resistant



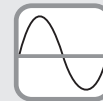
Magnetic field proof



Short-circuit proof



Reverse polarity protection



SinCos



Intelligent Scan Technology™



Surface protection salt spray-tested optional

## Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 17 bits and 100 % magnetic field insensitiveness.

## Optimized performance

- High-precision with a data refresh rate of the position value  $\leq 1\mu\text{s}$ .
- High-resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code  
Shaft version

8.F3653 . XXXX . XX 12  
Type                      a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = clamping flange, IP67,  $\varnothing$  36 mm [1.42"]
- 3 = clamping flange, IP65,  $\varnothing$  36 mm [1.42"]
- 2 = synchro flange, IP67,  $\varnothing$  36 mm [1.42"]
- 4 = synchro flange, IP65,  $\varnothing$  36 mm [1.42"]

### b Shaft ( $\varnothing$ x L), with flat

- 1 =  $\varnothing$  6 x 12.5 mm [0.24 x 0.49"]
- 3 =  $\varnothing$  8 x 15 mm [0.32 x 0.59"]
- 5 =  $\varnothing$  10 x 20 mm [0.39 x 0.79"]
- 2 =  $\varnothing$  1/4" x 12.5 mm [0.49"]
- 4 =  $\varnothing$  3/8" x 5/8"

### c Interface / power supply

- 1 = SSI, BiSS / 5 V DC
- 2 = SSI, BiSS / 10 ... 30 V DC
- 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
- 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
- 5 = SSI, BiSS / 5 V DC, with sensor output
- 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
- 7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
- 8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

### d Type of connection

- 1 = tangential cable, 1 m [3.28] PUR
- 3 = tangential cable, 5 m [16.40] PUR
- F = tangential cable, special length PUR \*)
- 8 = axial M12 connector, 8-pin <sup>1)</sup>

\*) Available special lengths (connection type F):  
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.F3653.432F.G312.0030 (for cable length 3 m)

### e Code

- B = SSI, binary
- C = BiSS, binary
- G = SSI, gray

### f Resolution

- A = 10 bit
- 2 = 12 bit
- 3 = 13 bit
- 4 = 14 bit
- 7 = 17 bit

Optional on request

- surface protection salt spray tested
- other resolutions

1) Only with output circuits 1 and 2.

# Absolute encoders - singleturn

|                        |  |                                 |
|------------------------|--|---------------------------------|
| <b>Compact optical</b> | <b>Sendix F3653 / F3673 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|------------------------|--|---------------------------------|

|                     |                |   |  |  |
|---------------------|----------------|---|--|--|
| <b>Order code</b>   | <b>8.F3673</b> | <b>.XXXXX.XX12</b>                                    | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>Hollow shaft</b> | Type           | <b>a</b> <b>b</b> <b>c</b> <b>d</b> <b>e</b> <b>f</b> |  |  |

|  |  |   |
|--|--|---|
| <p><b>a Flange</b></p> <p>1 = with spring element, short, IP65<br/>         3 = with spring element, long, IP65<br/> <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u></p> <p><b>b Through hollow shaft</b></p> <p>1 = ø 6 mm [0.24"]<br/>         3 = ø 8 mm [0.32"]<br/>         2 = ø 1/4"<br/> <i>Blind hollow shaft</i><br/> <i>(insertion depth max. 14.5 mm [0.57"])</i><br/> <u>4 = ø 10 mm [0.39"]</u></p> | <p><b>c Interface / power supply</b></p> <p>1 = SSI, BiSS / 5 V DC<br/> <u>2 = SSI, BiSS / 10 ... 30 V DC</u><br/>         3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/>         4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC<br/>         5 = SSI, BiSS / 5 V DC, with sensor output<br/>         6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output<br/>         7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC<br/>         8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC</p> <p><b>d Type of connection</b></p> <p><u>1 = tangential cable, 1 m [3.28] PUR</u><br/>         3 = tangential cable, 5 m [16.40] PUR<br/>         F = tangential cable, special length PUR *)<br/>         8 = axial M12 connector, 8-pin <sup>1)</sup></p> <p>*) Available special lengths (connection type F):<br/>         2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']<br/>         order code expansion .XXXX = length in dm<br/>         ex.: 8.F3673.242F.G312.0030 (for cable length 3 m)</p> | <p><b>e Code</b></p> <p>B = SSI, binary<br/>         C = BiSS, binary<br/> <u>G = SSI, gray</u></p> <p><b>f Resolution</b></p> <p>A = 10 bit<br/>         2 = 12 bit<br/> <u>3 = 13 bit</u><br/>         4 = 14 bit<br/>         7 = 17 bit</p> <p style="text-align: right; font-size: x-small;"><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- surface protection</li> <li>  salt spray tested</li> <li>- other resolutions</li> </ul> |
|--|--|---|

Absolute encoders singleturn

| Mounting accessory for shaft encoders   | Order no.                   |
|---|-----------------------------|
| <b>Coupling</b><br>bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                              | <b>8.0000.1102.0606</b>     |
| Mounting accessory for hollow shaft encoders  | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 3)                   | <b>8.0010.4700.0000</b>     |
|   |                             |
| Connection technology   | Order no.                   |
| <b>Cordset, pre-assembled</b><br>M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PUR cable | <b>05.00.6051.8211.002M</b> |
| <b>Connector, self-assembly (straight)</b><br>M12 female connector with coupling nut, 8-pin             | <b>05.CMB 8181-0</b>        |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |   |
|--|---|
| Mechanical characteristics   |   |
| <b>Maximum speed</b>   |   |
| shaft version without shaft seal (IP65)<br>or blind hollow shaft version | 12000 min <sup>-1</sup><br>10000 min <sup>-1</sup> (continuous)                               |
| shaft version with shaft seal (IP67)<br>or hollow shaft version          | 10000 min <sup>-1</sup><br>8000 min <sup>-1</sup> (continuous)                                |
| <b>Starting torque at 20°C [68°F]</b>                                    |   |
| without shaft seal   | < 0.007 Nm  |
| with shaft seal (IP67)   | < 0.01 Nm   |
| <b>Shaft load capacity</b>   |   |
| radial   | 40 N  |
| axial  | 20 N  |
| <b>Weight</b>  | approx. 0.2 kg [7.06 oz]  |
| Protection and Materials   |   |
| <b>Protection</b>  | housing side IP67<br>acc. to EN 60529 shaft side IP65 (solid shaft version opt. IP67)         |
| <b>Working temperature range</b>   | -40°C ... +90°C [-40°F ... +194°F]  |
| <b>Materials</b>   | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PUR |
| <b>Shock resistance</b> acc. to EN 60068-2-27                            | 2500 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance</b> acc. to EN 60068-2-6                         | 100 m/s <sup>2</sup> , 55 ... 2000 Hz   |

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"].

# Absolute encoders - singleturn

| Compact optical   | Sendix F3653 / F3673 (shaft / hollow shaft)   | SSI / BiSS + incremental            |
|---|---|-------------------------------------|
| <b>Electrical characteristics</b>   |   |                                     |
| <b>Power supply</b>   | 5 V DC ( $\pm 5\%$ ) or 10 ... 30 V DC  |                                     |
| <b>Current consumption</b> (no load)  | 5 V DC  | max. 60 mA                          |
|   | 10 ... 30 V DC  | max. 30 mA                          |
| <b>Reverse polarity protection of the power supply</b>  | yes (only with 10 ... 30 V DC)  |                                     |
| <b>Short-circuit proof outputs</b>  | yes <sup>1)</sup>   |                                     |
| <b>UL approval</b>  | file 224618   |                                     |
| <b>CE compliant</b> acc. to   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |                                     |
| <b>SSI interface</b>  |   |                                     |
| <b>Output driver</b>  | RS485 transceiver type  |                                     |
| <b>Permissible load / channel</b>   | max. +/- 30 mA  |                                     |
| <b>Signal level</b>   | HIGH  | typ. 3.8 V                          |
|   | LOW with $I_{Load} = 20\text{ mA}$  | typ. 1.3 V                          |
| <b>Resolution</b>   | 10 ... 17 bit   |                                     |
| <b>Code</b>   | binary or gray  |                                     |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz  |                                     |
| <b>Data refresh rate</b>  | resolution $\leq 14$ bit  | $\leq 1\ \mu\text{s}$               |
|   | resolution $\geq 15$ bit  | 4 $\mu\text{s}$                     |
| <b>Monoflop time</b>  | $\leq 15\ \mu\text{s}$  |                                     |
| <b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.   |   |                                     |
| <b>BiSS interface</b>   |   |                                     |
| <b>Resolution</b>   | 10 ... 17 bit   |                                     |
| <b>Code</b>   | binary  |                                     |
| <b>BiSS clock rate</b>  | 50 kHz ... 10 MHz   |                                     |
| <b>Max. update rate</b>   | $< 10\ \mu\text{s}$ , depends on the clock rate and the data length   |                                     |
| <b>Data refresh rate</b>  | $\leq 1\ \mu\text{s}$   |                                     |
| <b>Note:</b>  | <ul style="list-style-type: none"> <li>- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>- CRC data verification</li> </ul> |                                     |
| <b>Status output</b>  |   |                                     |
| <b>Output driver</b>  | open collector, internal pull up resistor 22 kOhm   |                                     |
| <b>Permissible load</b>   | max. 20 mA  |                                     |
| <b>Signal level</b>   | HIGH  | +V                                  |
|   | LOW   | $< 1\text{ V}$                      |
| <b>Active</b>   | LOW   |                                     |
| The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).  |   |                                     |
| An active status output (LOW) displays:<br>LED fault (failure or ageing) – over-temperature – undervoltage<br>In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.  |   |                                     |
| <b>Incremental outputs (A/B)</b>  |   |                                     |
|   | <b>SinCos</b>   | <b>RS422 TTL compatible</b>         |
| <b>Max. frequency</b> -3dB  | 400 kHz   | 400 kHz                             |
| <b>Signal level</b>   | 1 Vpp ( $\pm 20\%$ )  | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>  | yes <sup>1)</sup>   |                                     |
| <b>Pulse rate</b>   | 2048 ppr  | 2048 ppr                            |
| <b>SET input</b>  |   |                                     |
| <b>Input</b>  | active HIGH   |                                     |
| <b>Input type</b>   | comparator  |                                     |
| <b>Signal level</b>   | HIGH  | min. 60 % of +V, max: +V            |
|   | LOW   | max. 30 % of +V                     |
| <b>Input current</b>  | $< 0.5\text{ mA}$   |                                     |
| <b>Min. pulse duration</b> (SET)  | 10 ms   |                                     |
| <b>Input delay</b>  | 1 ms  |                                     |
| <b>New position data readable after</b>   | 1 ms  |                                     |
| <b>Internal processing time</b>   | 200 ms  |                                     |
| The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. |   |                                     |
| The SET function should be carried out whilst the encoder is at rest.   |   |                                     |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |   |                                     |
| <b>DIR input</b>  |   |                                     |
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.   |   |                                     |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |   |                                     |
| <b>Response time</b> (DIR input)  | 1 ms  |                                     |
| <b>Power-ON</b>   |   |                                     |
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read.  |   |                                     |
| Hot plugging of the encoder should be avoided.  |   |                                     |

<sup>1)</sup> Short circuit proof to 0 V or to output when power supply correctly applied.



# Absolute encoders - singleturn

|                        |  |                                 |
|------------------------|--|---------------------------------|
| <b>Compact optical</b> | <b>Sendix F3653 / F3673 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|------------------------|--|---------------------------------|

## Terminal assignment

| Interface | Type of connection | Features                   | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|-----------|--------------------|----------------------------|---|-----|----|----|----|----|----|---------------------|--------------------|---------------------|--------------------|--------|-----------|--------|
| 1, 2      | 1, 3, F            | SET, DIR, Status           | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | Stat                | ⊥                  |        |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | VT                  | shield             |        |           |        |
| 1, 2      | 8                  | SET, DIR                   | M12 connector, 8-pin  |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | ⊥                   |                    |        |           |        |
|           |                    |                            | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7                   | 8                  | PH                  |                    |        |           |        |
| 3, 4      | 1, 3, F            | SET, DIR, 2048 SinCos      | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | A                   | $\bar{A}$          | B      | $\bar{B}$ | ⊥      |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | BK                  | VT                 | GY-PK  | RD-BU     | shield |
| 5         | 1, 3, F            | SET, DIR, Sensor output    | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | 0 V <sub>sens</sub> | +V <sub>sens</sub> | ⊥      |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | VT                  | RD-BU              | shield |           |        |
| 6         | 1, 3, F            | 2048 SinCos, Sensor output | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | 0 V <sub>sens</sub> | +V <sub>sens</sub> | A                   | $\bar{A}$          | B      | $\bar{B}$ | ⊥      |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | BK                  | VT                 | GY-PK  | RD-BU     | shield |
| 7, 8      | 1, 3, F            | 2048 incr. RS422           | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A                   | $\bar{A}$          | B                   | $\bar{B}$          | ⊥      |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BK                  | VT                 | GY-PK               | RD-BU              | shield |           |        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

# Absolute encoders - singleturn

**Compact optical**

**Sendix F3653 / F3673 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

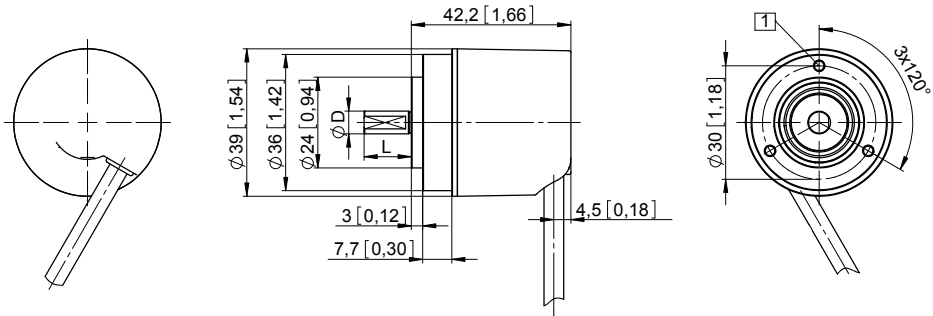
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep



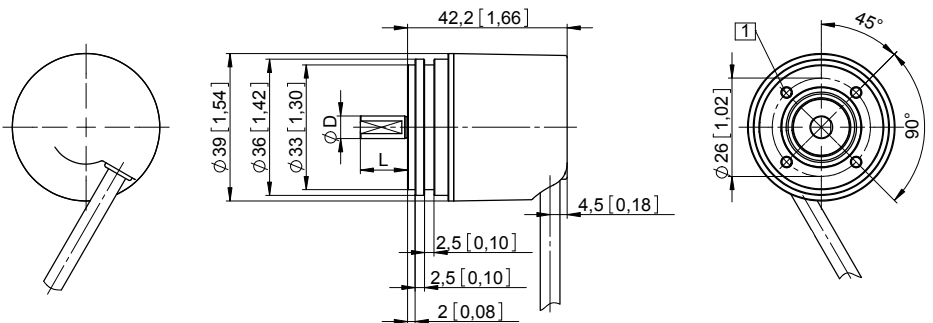
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

### Synchro flange, $\varnothing$ 36 [1.42]

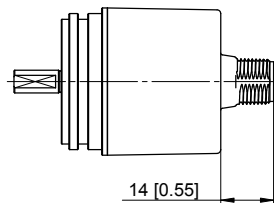
Flange type 2 and 4

(drawing with cable)

1 4 x M3, 6 [0.24] deep



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |



Drawing with M12 connector and type of connection 8

# Absolute encoders - singleturn

|                        |  |                                 |
|------------------------|--|---------------------------------|
| <b>Compact optical</b> | <b>Sendix F3653 / F3673 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|------------------------|--|---------------------------------|

## Dimensions hollow shaft version

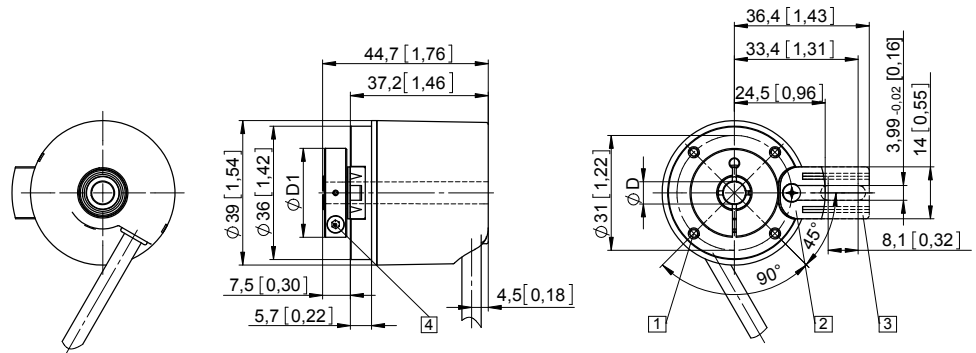
Dimensions in mm [inch]

### Flange with spring element

#### Flange type 1 and 3

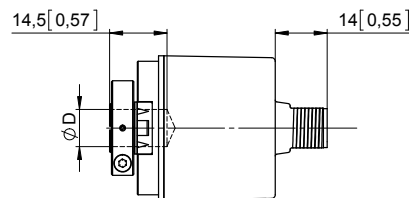
(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.2] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



| D            | Fit | D1          |
|--------------|-----|-------------|
| 6 [0.24]     | H7  | 24 [0.94]   |
| 8 [0.32]     | H7  | 25.5 [1.00] |
| 10 [0.39] *) | H7  | 25.5 [1.00] |
| 1/4"         | H7  | 24 [0.94]   |

\*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

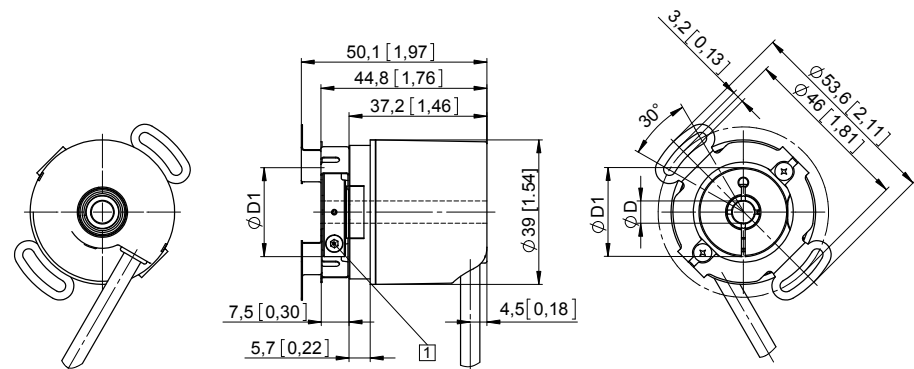


**Through hollow shaft for D =  $\varnothing$  10**  
drawing with M12 connector and type of connection 8

### Flange with stator coupling, $\varnothing$ 46 [1.81"]

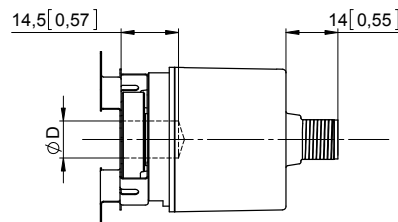
#### Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



| D            | Fit | D1          |
|--------------|-----|-------------|
| 6 [0.24]     | H7  | 24 [0.94]   |
| 8 [0.32]     | H7  | 25.5 [1.00] |
| 10 [0.39] *) | H7  | 25.5 [1.00] |
| 1/4"         | H7  | 24 [0.94]   |

\*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]



**Through hollow shaft for D =  $\varnothing$  10**  
drawing with M12 connector and type of connection 8

# Absolute encoders - singleturn

**Compact optical**

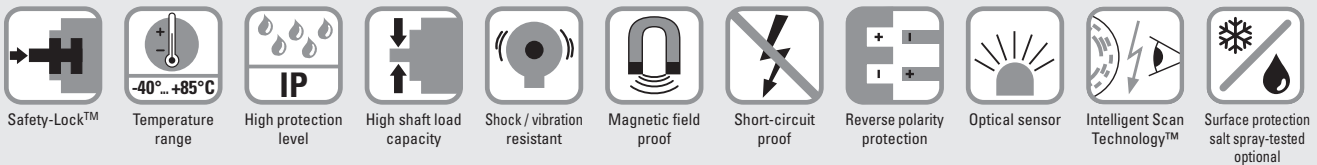
**Sendix F3658 / F3678 (shaft / hollow shaft)**

**CANopen**



The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and CANopen interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 16 bits.



## Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 16 bits and 100 % magnetic field insensitiveness.

## Up-to-the-minute fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.

### Order code Shaft version

**8.F3658** . XX 2 X . 21 1 2  
Type                      a    b    c    d                      e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Uts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP67, ø 36 mm [1.42"]
- 3 = clamping flange, IP65, ø 36 mm [1.42"]
- 2 = synchro flange, IP67, ø 36 mm [1.42"]
- 4 = synchro flange, IP65, ø 36 mm [1.42"]**

#### b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
- 3 = ø 8 x 15 mm [0.32 x 0.49"]**
- 5 = ø 10 x 20 mm [0.39 x 0.79"]
- 2 = ø 1/4" x 12.5 mm [0.49"]
- 4 = ø 3/8" x 5/8"

#### c Interface / power supply

- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC**

#### d Type of connection

- 1 = tangential cable, 1 m [3.28'] PUR**
- 3 = tangential cable, 5 m [16.40'] PUR
- F = tangential cable, special length PUR \*)

\*) Available special lengths (connection type F):  
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.F3658.432F.2112.0030 (for cable length 3 m)

#### e Fieldbus profile

- 21 = CANopen encoder profile DS406 V3.2**

#### Optional on request

- surface protection salt spray tested

### Order code Hollow shaft

**8.F3678** . XX 2 X . 21 1 2  
Type                      a    b    c    d                      e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Uts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = with spring element, short, IP65
- 3 = with spring element, long, IP65
- 2 = with stator coupling, IP65, ø 46 mm [1.81"]**

#### b Blind hollow shaft

- (insertion depth max. 14.5 mm [0.57"])
- 5 = ø 6 mm [0.24"]
- 7 = ø 8 mm [0.32"]
- 4 = ø 10 mm [0.39"]**
- 6 = ø 1/4"

#### c Interface / power supply

- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC**

#### d Type of connection

- 1 = tangential cable, 1 m [3.28'] PUR**
- 3 = tangential cable, 5 m [16.40'] PUR
- F = tangential cable, special length PUR \*)

\*) Available special lengths (connection type F):  
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.F3678.242F.2112.0030 (for cable length 3 m)

#### e Fieldbus profile

- 21 = CANopen encoder profile DS406 V3.2**

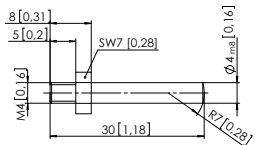
#### Optional on request

- surface protection salt spray tested

# Absolute encoders - singleturn

|                        |  |                |
|------------------------|--|----------------|
| <b>Compact optical</b> | <b>Sendix F3658 / F3678 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|------------------------|--|----------------|

| Mounting accessory for shaft encoders |   | Order no.               |
|---------------------------------------|---|-------------------------|
| <b>Coupling</b>                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"] | <b>8.0000.1102.0808</b> |

| Mounting accessory for hollow shaft encoders  |   | Order no.               |
|---|---|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 3) | with fixing thread<br> | <b>8.0010.4700.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics  |                      |   |
|---|----------------------|---|
| <b>Maximum speed</b>  |                      |   |
| shaft version without shaft seal (IP65) or blind hollow shaft version |                      | 12000 min <sup>-1</sup><br>10000 min <sup>-1</sup> (continuous) |
| shaft version with shaft seal (IP67)                                  |                      | 10000 min <sup>-1</sup><br>8000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque at 20°C [68°F]</b>                                 |                      |   |
| without shaft seal  |                      | < 0.007 Nm  |
| with shaft seal (IP67)  |                      | < 0.01 Nm   |
| <b>Shaft load capacity</b>  | radial               | 40 N  |
|   | axial                | 20 N  |
| <b>Weight</b>   |                      | approx. 0.2 kg [7.06 oz]  |
| <b>Protection acc. to EN 60529</b>                                    | housing side         | IP67  |
|   | shaft side           | IP65 (solid shaft version opt. IP67)                            |
| <b>Working temperature range</b>                                      |                      | -40°C ... +85°C [-40°F ... +185°F]                              |
| <b>Materials</b>  | shaft / hollow shaft | stainless steel   |
|   | flange               | aluminum  |
|   | housing              | zinc die-cast   |
|   | cable                | PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>                         |                      | 2500 m/s <sup>2</sup> , 6 ms                                    |
| <b>Vibration resistance acc. to EN 60068-2-6</b>                      |                      | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                           |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                   | max. 80 mA  |
| <b>Reverse polarity protection of the power supply</b> | ja  |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics CANopen |   |
|-----------------------------------|---|
| <b>Resolution</b>                 | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)  |
| <b>Code</b>                       | binary  |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B  |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0   |
| <b>Baud rate</b>                  | 10 ... 1000 kbit/s<br>software configurable   |
| <b>Node address</b>               | 1 ... 127<br>software configurable  |
| <b>Termination</b>                | software configurable   |
| <b>LSS protocol</b>               | CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object |

| Diagnostic LED (two-color, red/green) |   |
|---------------------------------------|---|
| <b>LED ON or blinking</b>             | red error display<br>green status display |

# Absolute encoders - singleturn

**Compact optical**

**Sendix F3658 / F3678 (shaft / hollow shaft)**

**CANopen**

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (Power on to operational), 3 sending PDO's.
- Node address, baud rate and CANbus / Programmable termination.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status – 1 LED two colors.
- Customer-specific memory 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

## LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

## CANbus connection

The CANopen encoders are equipped with a Bus trunk line in various lengths and can be terminated in the device. The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

**Lu** < 5 m [16.40'] cable length for 125 Kbit

**Lu** < 2 m [6.56'] cable length for 250 Kbit

**Lu** < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/ encoder must not exceed 70 cm.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
|           |                    | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
| 2         | 1, 3, F            | Cable color:  | BN | WH  | GY      | GN    | YE    |

# Absolute encoders - singleturn

|                        |  |                |
|------------------------|--|----------------|
| <b>Compact optical</b> | <b>Sendix F3658 / F3678 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|------------------------|--|----------------|

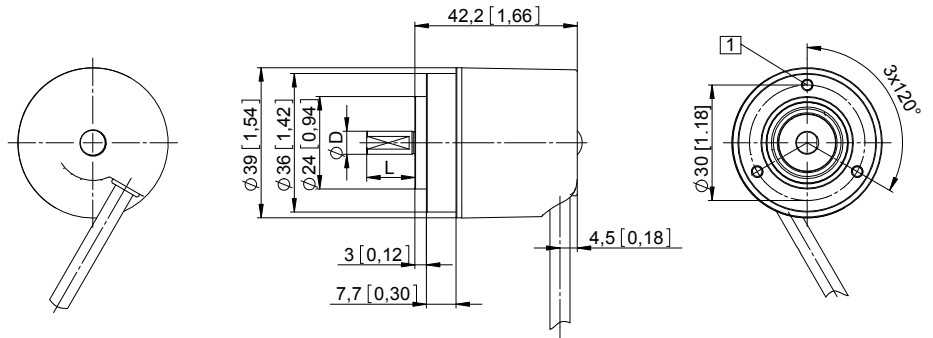
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 36 [1.42] Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

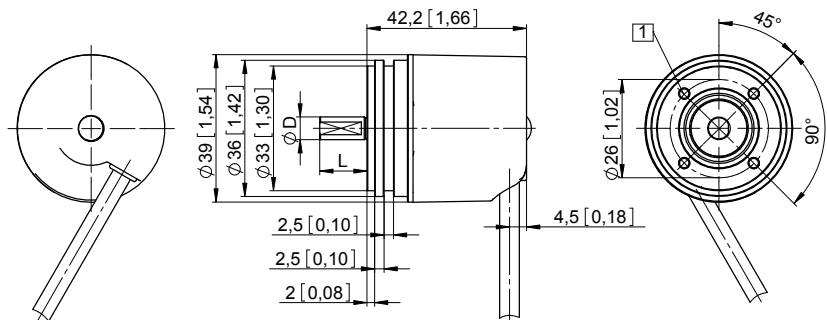
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |



### Synchro flange, $\varnothing$ 36 [1.42] Flange type 2 and 4

1 4 x M3, 6 [0.24] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |



# Absolute encoders - singleturn

**Compact optical**

**Sendix F3658 / F3678 (shaft / hollow shaft)**

**CANopen**

## Dimensions hollow shaft version

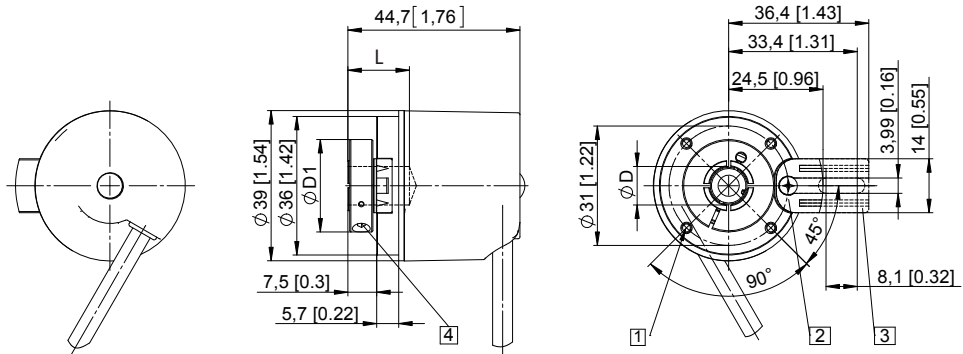
Dimensions in mm [inch]

### Flange with spring element

#### Flange type 1 and 3

(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.2] deep
- 2 Slot spring element, short recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Slot spring element, long recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



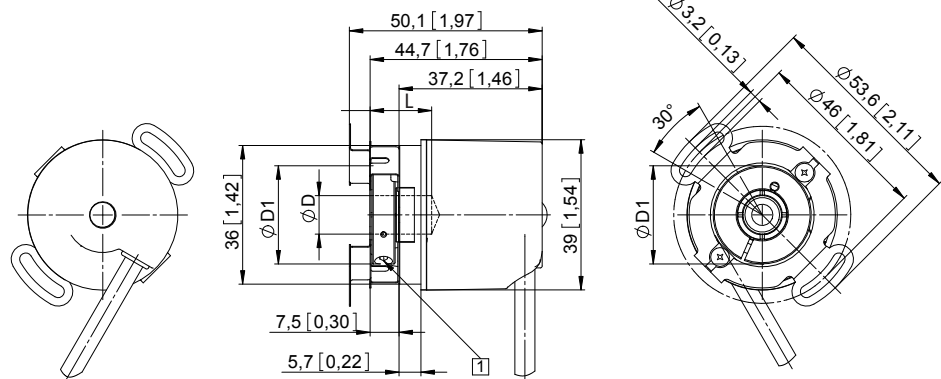
| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 14.5 [0.57] | 24 [0.94]   |
| 8 [0.32]  | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 10 [0.39] | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 1/4"      | H7  | 14.5 [0.57] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 46 [1.81"]

#### Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 14.5 [0.57] | 24 [0.94]   |
| 8 [0.32]  | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 10 [0.39] | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 1/4"      | H7  | 14.5 [0.57] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft



# Absolute encoders - singleturn

|                         |   |                          |
|-------------------------|---|--------------------------|
| <b>Standard optical</b> | <b>5850 / 5870 (shaft / hollow shaft)</b> | <b>Parallel / analog</b> |
|-------------------------|---|--------------------------|



The singleturn encoders 5850 and 5870 with parallel or analog interface and optical sensor technology feature a refresh rate of the position data of 1.6 kHz.

With the parallel output a resolution of max. 14 bit can be achieved – with the analog output the 4 ... 20 mA signals can achieve a resolution of 13 bits.



|                       |                   |                       |                          |                             |                      |                |
|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|----------------|
|                       |                   |                       |                          |                             |                      |                |
| High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Optical sensor |

### Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector.
- Gray code, binary code or BCD code.

### Robust

- High shock resistance.
- Temperature range from -20°C up to +85°C.
- Protection rating up to max. IP66.

Absolute encoders  
singleturn

**Order code**      **8.5850** . **XXXXX** . **XXX**X  
**Shaft version**      Type      a b c d      e f

- |   |   |   |
|---|---|---|
| <p><b>a Flange</b></p> <p>1 = clamping flange, ø 58 mm [2.28"]<br/>         2 = synchro flange, ø 58 mm [2.28"]</p> <p><b>b Shaft (ø x L), with flat</b></p> <p>1 = 6 x 10 mm [0.24 x 0.39"]<br/>         2 = 10 x 20 mm [0.39 x 0.79"]</p> | <p><b>c Interface / power supply</b></p> <p>3 = parallel / 5 V DC<br/>         4 = parallel / 10 ... 30 V DC<br/>         7 = 4 ... 20 mA / 5 V DC<br/>         8 = 4 ... 20 mA / 10 ... 30 V DC</p> <p><b>d Type of connection</b></p> <p>1 = axial cable, 1 m [3.28'] PVC<br/>         2 = radial cable, 1 m [3.28'] PVC<br/>         3 = axial M23 connector, without mating connector<br/>         5 = radial M23 connector, without mating connector</p> | <p><b>e Code type and division</b></p> <p>G13 = 13 bit (for interface 7 and 8, 4 ... 20 mA)<br/>         see table 1 (for interface 3 and 4, parallel)</p> <p><b>f Options</b></p> <p>2 = SET <sup>1)</sup> and V/R<br/>         3 = SET and Latch <sup>1)</sup><br/>         4 = V/R <sup>1)</sup> and Latch</p> |
|---|---|---|

**Order code**      **8.5870** . **XXXXX** . **XXX**X  
**Hollow shaft**      Type      a b c d      e f

- |   |  |  |
|---|--|--|
| <p><b>a Flange</b></p> <p>1 = hollow shaft with spring element, short<br/>         2 = blind hollow shaft with spring element, short<br/>         3 = hollow shaft with stator coupling, ø 65 mm [2.56"]<br/>         4 = blind hollow shaft with stator coupling, ø 65 mm [2.56"]</p> <p><b>b Hollow shaft</b><br/> <i>(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])</i></p> <p>6 = ø 10 mm [0.39"]<br/>         8 = ø 12 mm [0.47"]</p> | <p><b>c Interface / power supply</b></p> <p>3 = parallel / 5 V DC<br/>         4 = parallel / 10 ... 30 V DC</p> <p><b>d Type of connection</b></p> <p>1 = radial cable, 1 m [3.28'] PVC<br/>         2 = radial M23 connector, without mating connector</p> | <p><b>e Code type and division</b></p> <p>see table 1 (for interface 3 and 4, parallel)</p> <p><b>f Options</b></p> <p>2 = SET <sup>1)</sup> and V/R<br/>         3 = SET and Latch <sup>1)</sup><br/>         4 = V/R <sup>1)</sup> and Latch</p> |
|---|--|--|

1) For parallel version, 14 bit and 17-pin connector.

# Absolute encoders - singleturn

|                         |   |                          |
|-------------------------|---|--------------------------|
| <b>Standard optical</b> | <b>5850 / 5870 (shaft / hollow shaft)</b> | <b>Parallel / analog</b> |
|-------------------------|---|--------------------------|

| Table 1: Code type and divisions for encoders with parallel output |     |     |     |     |     |      |                |      |      | Interface and power supply, version 3 or 4 (parallel) |      |      |      |      |      |                |      |      |                |                 |
|--|-----|-----|-----|-----|-----|------|----------------|------|------|---|------|------|------|------|------|----------------|------|------|----------------|-----------------|
| Division   | 250 | 360 | 500 | 720 | 900 | 1000 | 1024<br>10 bit | 1250 | 1440 | 1800  | 2000 | 2500 | 2880 | 3600 | 4000 | 4096<br>12 bit | 5000 | 7200 | 8192<br>13 bit | 16384<br>14 bit |
| <b>Order code Gray/Gray-Excess</b>                                 | E02 | E03 | E05 | E07 | E09 | E01  | G10            | E12  | E14  | E18   | E20  | E25  | E28  | E36  | E40  | G12            | E50  | E72  | G13            | G14             |
| <b>Order code Binary</b>   | B02 | B03 | B05 | B07 | B09 | B01  | B10            | BA2  | BA1  | B18   | B20  | B25  | B28  | B36  | B40  | B12            | B50  | B72  | B13            | B14             |
| <b>Order code BCD</b>  | D02 | D03 | D05 | D07 | D09 | D01  | D10            | DA2  | DA1  | D18   | D20  |      |      |      |      |                |      |      |                |                 |

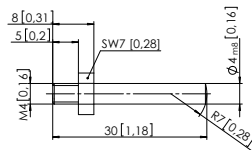
| Mounting accessory for shaft encoders | Order no. |
|---------------------------------------|-----------|
|---------------------------------------|-----------|

|                 |  |                         |
|-----------------|--|-------------------------|
| <b>Coupling</b> | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                 | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

|                              |                    |                         |
|------------------------------|--------------------|-------------------------|
| <b>Cylindrical pin, long</b> | with fixing thread | <b>8.0010.4700.0000</b> |
|------------------------------|--------------------|-------------------------|

for flange with spring element  
(flange type 1 + 2)



| Connection technology | Order no. |
|-----------------------|-----------|
|-----------------------|-----------|

|                               |   |                              |
|-------------------------------|---|------------------------------|
| <b>Cordset, pre-assembled</b> | M23 female connector with coupling nut for analog interface, 12-pin<br>2 m [6.56'] PVC cable    | <b>8.0000.6901.0002.0031</b> |
|                               | M23 female connector with coupling nut, for parallel interface, 17-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6741.0002</b>      |

|  |   |                         |
|--|---|-------------------------|
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut for analog interface, 12-pin   | <b>8.0000.5012.0000</b> |
|  | M23 female connector with coupling nut for parallel interface, 17-pin | <b>8.0000.5042.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics            |                           |   |
|---------------------------------------|---------------------------|---|
| <b>Maximum speed</b>                  | shaft version             | 12000 min <sup>-1</sup>                         |
|                                       | hollow shaft version      | 6000 min <sup>-1</sup> 1)                       |
| <b>Mass moment of inertia</b>         | shaft version             | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup> |
|                                       | hollow shaft version      | approx. 6 x 10 <sup>-6</sup> kgm <sup>2</sup>   |
| <b>Starting torque at 20°C [68°F]</b> | shaft version             | < 0.01 Nm                                       |
|                                       | hollow shaft version      | < 0.05 Nm                                       |
| <b>Load capacity of shaft</b>         | radial                    | 80 N  |
|                                       | axial                     | 40 N  |
| <b>Weight</b>                         | approx. 0.4 kg [14.11 oz] |   |

|   |  |                 |
|---|--|-----------------|
| <b>Protection</b> acc. to EN 60529            | shaft version                                    | IP65            |
|   | hollow shaft version                             | IP66            |
| <b>Working temperature range</b>              | -20°C ... +85°C 2) 3)<br>[-4°F ... +185°F] 2) 3) |                 |
| <b>Material</b>                               | shaft / hollow shaft                             | stainless steel |
| <b>Shock resistance</b> acc. EN 60068-2-27    | 2500 m/s <sup>2</sup> , 6 ms                     |                 |
| <b>Vibration resistance</b> acc. EN 60068-2-6 | 100 m/s <sup>2</sup> , 10 ... 2000 Hz            |                 |

1) For continuous operation max. 1500 min<sup>-1</sup>.  
2) 80°C [176°F] for shaft version and cable connection.  
3) 70°C [158°F] for hollow shaft version and cable connection.

# Absolute encoders - singleturn

|                         |   |                          |
|-------------------------|---|--------------------------|
| <b>Standard optical</b> | <b>5850 / 5870 (shaft / hollow shaft)</b> | <b>Parallel / analog</b> |
|-------------------------|---|--------------------------|

| Electrical characteristics parallel interface          |  |                                    |
|--|--|------------------------------------|
| <b>Power supply (+V)</b>                               | 5 V DC (±5 %)  | 10 ... 30 V DC                     |
| <b>Output driver</b>                                   | Push-pull  | Push-pull                          |
| <b>Power consumption (no load)</b>                     | typ. 109 mA<br>max. 169 mA   | 109 mA<br>169 mA                   |
| <b>Permissible load / channel</b>                      | max. +/- 10 mA   | max. +/- 10 mA                     |
| <b>Refresh rate of the position data</b>               | 1600/s   | 1600/s                             |
| <b>Signal level</b>                                    | HIGH min. 3.4 V<br>LOW (I <sub>Load</sub> = 10 mA) max. 1.5 V<br>LOW (I <sub>Load</sub> = 1 mA) max. 0.3 V | min. +V - 2.8 V<br>max. 1.8 V<br>- |
| <b>Rising edge time t<sub>r</sub> (without cable)</b>  | max. 0.2 μs  | max. 1 μs                          |
| <b>Falling edge time t<sub>f</sub> (without cable)</b> | max. 0.2 μs  | max. 1 μs                          |
| <b>Short circuit proof outputs</b>                     | no   | no                                 |
| <b>Reverse polarity protection of the power supply</b> | no   | yes                                |
| <b>UL approval</b>                                     | file 224618  |                                    |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |                                    |

| Electrical characteristics voltage interface 4 ... 20 mA           |   |                |
|--|---|----------------|
| (only shaft version)   |   |                |
| <b>Sensor</b>  |   |                |
| <b>Interface type</b>  | 4 ... 20 mA   | 4 ... 20 mA    |
| <b>Power supply (+V)</b>   | 10 ... 30 V DC  | 5 V DC         |
| <b>Power consumption (no load)</b>                                 | typ. 70 mA<br>max. 84 mA  | 70 mA<br>84 mA |
| <b>Current loop</b>  |   |                |
| <b>Power supply (+V)</b>   | 10 ... 30 V DC  |                |
| <b>Analog signal</b>   | 4 ... 20 mA   |                |
| <b>Max. input resistance of the input circuit</b>                  | 200 Ohm (U <sub>s</sub> = 10 V), 1 kOhm (U <sub>s</sub> = 30 V) |                |
| <b>Measuring range</b>   | 0 ... 360°  |                |
| <b>Max. error, 25°C [77°F]</b>                                     | 0.2°  |                |
| <b>Resolution</b>  | 13 bit  |                |
| <b>Setting time</b>  | max. 2 ms   |                |
| <b>Temperature coefficient</b>                                     | 0.1°/10 K   |                |
| <b>Current with scan error</b>                                     | ≤ 3.5 mA  |                |
| <b>Sensor component and current loop are galvanically isolated</b> |   |                |
| <b>UL-certified</b>  | file 224618   |                |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU           |                |

Absolute encoders singleturn

## Control inputs

### Switching levels of the control inputs

|                        |                             |                    |
|------------------------|-----------------------------|--------------------|
| <b>Power supply</b>    | 5 V DC                      | 10 ... 30 V DC     |
| <b>Switching level</b> | LOW ≤ 1.7 V<br>HIGH ≥ 3.4 V | ≤ 4.5 V<br>≥ 8.7 V |

### Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly decreasing code values. The same applies to models with current interfaces. When the shaft rotates clockwise, the output delivers increasing current values, and decreasing values when it rotates counter-clockwise. As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is: for 5 V DC power supply, 0.4 ms  
for 10 ... 30 V DC power supply, 2 ms

### SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the new zero position in the encoder.

For models equipped with a current interface, the analog output (4 ... 20 mA) will be set accordingly to the value 4 mA.

Note : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is: for 5 V DC power supply, 0.4 ms  
for 10 ... 30 V DC power supply, 2 ms

### LATCH input

This input is used to "freeze" the current position value. The position value will be statically available on the parallel output as long as this input remains active (HIGH).

The response time is: for 5 V DC power supply, 140 μs,  
for 10 ... 30 V DC power supply, 200 μs

# Absolute encoders - singleturn

|                         |   |                          |
|-------------------------|---|--------------------------|
| <b>Standard optical</b> | <b>5850 / 5870 (shaft / hollow shaft)</b> | <b>Parallel / analog</b> |
|-------------------------|---|--------------------------|

## Terminal assignment

max. 13 bit, max. 2 options

| Interface          | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |       |   |
|--------------------|--------------------|---|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|---|
|                    |                    | Signal  | 0 V | +V | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | ST/VR | VR/LH | ⊥ |
| 3, 4<br>(parallel) | 5850: 1, 2         |   |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |       |   |
|                    | 5870: 1            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY | RD | WH | BN | WH | YE    | WH    |   |

14 bit, max. 2 options

| Interface          | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |       |    |    |
|--------------------|--------------------|---|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|----|----|
|                    |                    | Signal  | 0 V | +V | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | ST/VR | VR/LH | 14 | ⊥  |
| 3, 4<br>(parallel) | 5850: 1, 2         |   |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |       |    |    |
|                    | 5870: 1            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY | RD | WH | BN | WH | YE    | WH    | GY | BN |

max. 13 bit, max. 2 options

| Interface          | Type of connection | M23 connector, 17-pin |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |       |       |   |
|--------------------|--------------------|-----------------------|-----|----|---|---|---|---|---|---|---|----|----|----|----|----|----|-------|-------|---|
|                    |                    | Signal                | 0 V | +V | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8  | 9  | 10 | 11 | 12 | 13 | ST/VR | VR/LH | ⊥ |
| 3, 4<br>(parallel) | 5850: 3, 5         |                       |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |       |       |   |
|                    | 5870: 2            | Pin:                  | 1   | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16    | 17    |   |

14 bit, max. 1 option

| Interface          | Type of connection | M23 connector, 17-pin |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |          |    |   |
|--------------------|--------------------|-----------------------|-----|----|---|---|---|---|---|---|---|----|----|----|----|----|----|----------|----|---|
|                    |                    | Signal                | 0 V | +V | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8  | 9  | 10 | 11 | 12 | 13 | ST/VR/LH | 14 | ⊥ |
| 3, 4<br>(parallel) | 5850: 3, 5         |                       |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |          |    |   |
|                    | 5870: 2            | Pin:                  | 1   | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16       | 17 |   |

13 bit

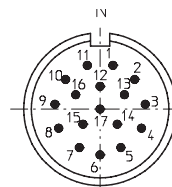
| Interface             | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |
|-----------------------|--------------------|---|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|
|                       |                    | Signal  | 0 V | +V | -  | -  | +I | -I | ST | VR |    |    |    |    |    |    |  |  |  |  |
| 7, 8<br>(4 ... 20 mA) | 5850: 1, 2         |   |     |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |
|                       |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY | PK | RD | BU |  |  |  |  |

13 bit

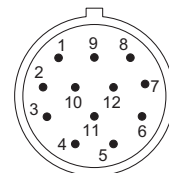
| Interface             | Type of connection | M23 connector, 12-pin |     |    |   |   |    |    |    |    |   |    |    |    |    |  |
|-----------------------|--------------------|-----------------------|-----|----|---|---|----|----|----|----|---|----|----|----|----|--|
|                       |                    | Signal                | 0 V | +V | - | - | +I | -I | ST | VR |   |    |    |    | ⊥  |  |
| 7, 8<br>(4 ... 20 mA) | 5850: 3, 5         |                       |     |    |   |   |    |    |    |    |   |    |    |    |    |  |
|                       |                    | Pin:                  | 1   | 2  | 3 | 4 | 5  | 6  | 7  | 8  | 9 | 10 | 11 | 12 | PH |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 etc.
- ST: SET input
- Parallel: The current position value is stored as new zero position.
- 4 ... 20 mA: measured value set to 4 mA
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- +I: Current loop input
- I: Current loop output
- LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base:



M23 connector, 17-pin (parallel)



M12 connector, 12-pin (4 ... 20 mA)

# Absolute encoders - singleturn

|                         |   |                          |
|-------------------------|---|--------------------------|
| <b>Standard optical</b> | <b>5850 / 5870 (shaft / hollow shaft)</b> | <b>Parallel / analog</b> |
|-------------------------|---|--------------------------|

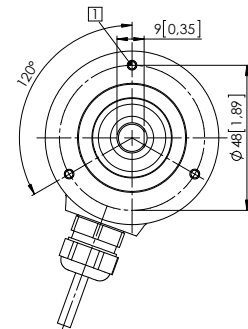
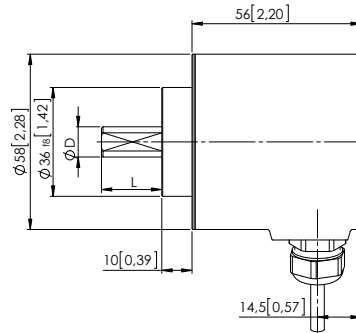
## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange,  $\varnothing$  58 [2.28]**  
with shaft,  $\varnothing$  10 [0.39]  
**Flange type 1**

- 1 3 x M3, 5 [0.20] deep

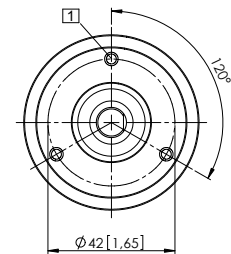
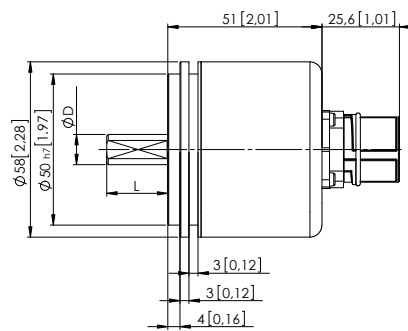
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h8  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |



**Synchro flange,  $\varnothing$  58 [2.28]**  
with shaft,  $\varnothing$  6 [0.24]  
**Flange type 2**

- 1 3 x M4, 10 [0.39] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h8  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |



## Dimensions hollow shaft version

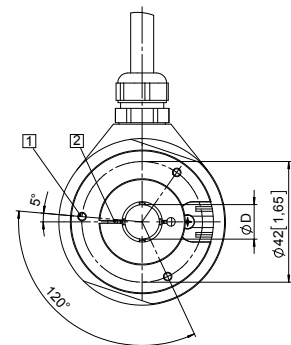
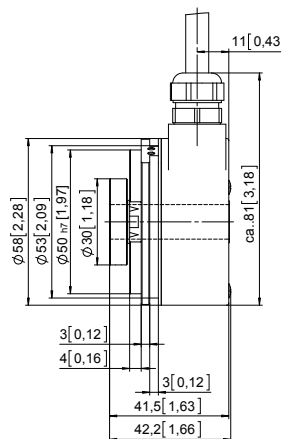
Dimensions in mm [inch]

**Flange with spring element, short**  
**Flange type 1 and 2**

- 1 3 x M3, 5 [0.20] deep
- 2 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Insertion depth blind hollow shaft with flange 2:  
max. 30 mm [1.18"]

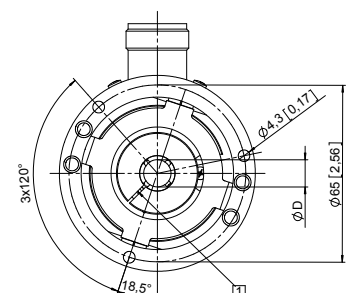
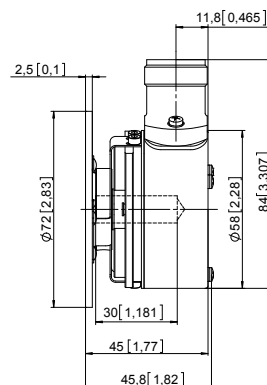


**Flange with stator coupling,  $\varnothing$  65 [2.56]**  
**Flange type 3 and 4**

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

Insertion depth blind hollow shaft with flange 4:  
max. 30 mm [1.18"]



# Absolute encoders - singleturn

Standard optical

5852 / 5872 (shaft / hollow shaft)

Parallel, highspeed



The singleturn encoders 5852 and 5872 with parallel interface and optical technology achieve a very high refresh rate of the position data of 40 kHz with a resolution of max. 14 bits.



High rotational speed



Temperature range  
-20°...+85°C



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Optical sensor

## Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector M23.

## Fast

- Refresh rate of the position data 40 kHz.

## Order code Shaft version

8.5852 . XX XX . XXX 1  
Type                      a   b   c                      d

### a Flange, shaft

- 12 = clamping flange, ø 58 mm [2.28"] with shaft 10 x 20 mm [0.39 x 0.79"]
- 21 = synchro flange, ø 58 mm [2.28"] with shaft 6 x 10 mm [0.24 x 0.39"]

### b Interface / power supply

- 1 = parallel (CMOS-TTL) / 5 V DC
- 3 = parallel / 10 ... 30 V DC

### c Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- 2 = radial cable, 1 m [3.28'] PVC
- 3 = axial M23 connector, 17-pin, without mating connector
- 5 = radial M23 connector, 17-pin, without mating connector

### d Code type and division

- E03 = 360 gray-excess
- E01 = 1000 gray-excess
- E14 = 1440 gray-excess
- E20 = 2000 gray-excess
- G10 = 1024 (10 bit) gray
- G12 = 4096 (12 bit) gray
- G13 = 8192 (13 bit) gray
- G14 = 16384 (14 bit) gray

### Optional on request

- other code types
- other divisions

## Order code Hollow shaft

8.5872 . XXXX . XXX 1  
Type                      a   b   c   d                      e

### a Flange

- 1 = with spring element, short
- 3 = with stator coupling, ø 65 mm [2.56"]

### c Interface / power supply

- 1 = parallel (CMOS-TTL) / 5 V DC
- 3 = parallel / 10 ... 30 V DC

### d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- 2 = radial M23 connector, 17-pin, without mating connector

### e Code type and division

- E03 = 360 gray-excess
- E01 = 1000 gray-excess
- E14 = 1440 gray-excess
- E20 = 2000 gray-excess
- G10 = 1024 (10 bit) gray
- G12 = 4096 (12 bit) gray
- G13 = 8192 (13 bit) gray
- G14 = 16384 (14 bit) gray

### Optional on request

- other code types
- other divisions

## Reverse count direction

(Only with output type 3 and up to 13 bit gray code available)

### Normal operation:

Rising code values when shaft turning clockwise (cw). Falling code values when shaft turning counterclockwise (ccw), top view of shaft.

## Reverse operation:

Output MSB inverted (pin 16) instead of output MSB (pin 3) connected. Falling code values when shaft turning clockwise (cw). Rising code values when shaft turning counterclockwise (ccw), top view of shaft.

# Absolute encoders - singleturn

| Standard optical  | 5852 / 5872 (shaft / hollow shaft)                                      | Parallel, highspeed     |
|---|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b>                                      |   | Order no.               |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]     | <b>8.0000.1102.0606</b> |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]    | <b>8.0000.1102.1010</b> |
| <b>Mounting accessory for hollow shaft encoders</b>                               |   | Order no.               |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1) | Dimensions in mm [inch]   |                         |
|   | with fixing thread  | <b>8.0010.4700.0000</b> |
|   |   |                         |
| <b>Connection technology</b>  |   | Order no.               |
| <b>Cordset, pre-assembled</b>   | M23 female connector with coupling nut, 17-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6741.0002</b> |
| <b>Connector, self-assembly (straight)</b>  | M23 female connector with coupling nut, 17-pin                          | <b>8.0000.5042.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |                      |   |
|--|----------------------|---|
| <b>Mechanical characteristics</b>                      |                      |   |
| <b>Maximum speed</b>                                   | shaft version        | 12000 min <sup>-1</sup>                               |
|  | hollow shaft version | 6000 min <sup>-1</sup> 1)                             |
| <b>Mass moment of inertia</b>                          | shaft version        | approx. 1.8 x 10 <sup>-6</sup> kgm <sup>2</sup>       |
|  | hollow shaft version | approx. 6 x 10 <sup>-6</sup> kgm <sup>2</sup>         |
| <b>Starting torque</b><br>at 20°C [68°F]               | shaft version        | < 0.01 Nm   |
|  | hollow shaft version | < 0.05 Nm   |
| <b>Load capacity of shaft</b>                          | radial               | 80 N  |
|  | axial                | 40 N  |
| <b>Weight</b>  |                      | approx. 0.4 kg [14.11 oz]                             |
| <b>Protection</b> acc. to EN 60529                     | shaft version        | IP65  |
|  | hollow shaft version | IP66  |
| <b>Working temperature range</b>                       |                      | -20°C ... +85°C 2)<br>[-4°F ... +185°F] 2)            |
| <b>Material</b>  | shaft / hollow shaft | stainless steel                                       |
| <b>Shock resistance</b> acc. EN 60068-2-27             |                      | 2500 m/s <sup>2</sup> , 6 ms                          |
| <b>Vibration resistance</b> acc. EN 60068-2-6          |                      | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                 |
| <b>Electrical characteristics (parallel interface)</b> |                      |   |
| <b>Power supply (+V)</b>                               |                      | 5 V DC (±5 %) 10 ... 30 V DC                          |
| <b>Output driver</b>                                   |                      | CMOS-TTL Push-pull                                    |
| <b>Power consumption</b><br>(no load)                  | typ.                 | 40 mA 100 mA  |
|  | max.                 | 75 mA 159 mA  |
| <b>Permissible load / channel</b>                      |                      | max. +0.5 / -2.0 mA max. +/- 10 mA                    |
| <b>Refresh rate of the position data</b>               |                      | 40000/s 40000/s                                       |
| <b>Signal level</b>                                    | HIGH                 | min. 3.4 V min. +V - 2.8 V                            |
|  | LOW                  | max. 0.3 V max. 1.8 V                                 |
| <b>Rising edge time t<sub>r</sub></b> (without cable)  |                      | max. 0.2 µs max. 1µs                                  |
| <b>Falling edge time t<sub>f</sub></b> (without cable) |                      | max. 0.2 µs max. 1µs                                  |
| <b>Short circuit proof outputs</b> 3)                  |                      | yes yes   |
| <b>Reverse polarity protection of the power supply</b> |                      | no yes  |
| <b>UL approval</b>                                     |                      | file 224618   |
| <b>CE compliant</b> acc. to                            |                      | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

1) For continuous operation max. 1500 min<sup>-1</sup>.  
2) 70°C [158°F] for 14 bit version.  
3) If power supply +V correctly applied.

# Absolute encoders - singleturn

**Standard optical**

**5852 / 5872 (shaft / hollow shaft)**

**Parallel, highspeed**

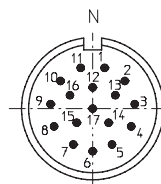
## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |    |    |          |          |          |          |          |                        |
|-----------|--------------------|---|-----|----|----|----|----|----|----|----|----|----|----------|----------|----------|----------|----------|------------------------|
| 1, 3      | 5852: 1, 2         | Signal  | 0 V | +V | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9        | 10       | 11       | 12       | 13       | 14 (V/R) <sup>1)</sup> |
|           | 5872: 1            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY<br>PK | RD<br>BU | WH<br>GN | BN<br>GN | WH<br>YE | YE<br>BN               |

| Interface | Type of connection | M23 connector, 17-pin |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |                       |    |
|-----------|--------------------|-----------------------|-----|----|---|---|---|---|---|---|---|----|----|----|----|----|----|-----------------------|----|
| 1, 3      | 5852: 3, 5         | Signal                | 0 V | +V | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8  | 9  | 10 | 11 | 12 | 13 | 1 (V/R) <sup>1)</sup> | ±  |
|           | 5872: 2            | Pin:                  | 1   | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16                    | 17 |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Signal: 1 = MSB; 2 = MSB-1; 3 = MSB-2 usw.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- PH ±: Plug connector housing (shield)

Top view of mating side, male contact base



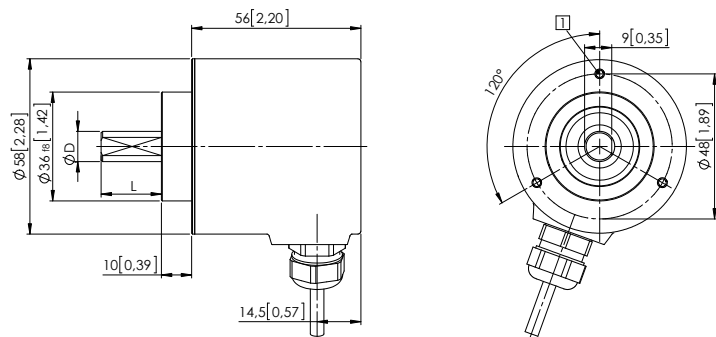
M23 connector, 17-pin (parallel)

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange, ø 58 [2.28]  
with shaft, ø 10 [0.39]  
Flange type 12**

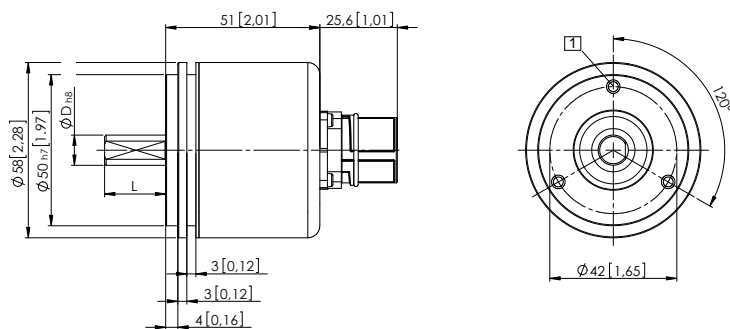
- 1) 3 x M3, 5 [0.20] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h8  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |

**Synchro flange, ø 58 [2.28]  
with shaft, ø 6 [0.24]  
Flange type 21**

- 1) 3 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h8  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |

1) V/R only with output circuit 3 up to max. 13 bit. MSB to change the count direction.



# Absolute encoders - singleturn

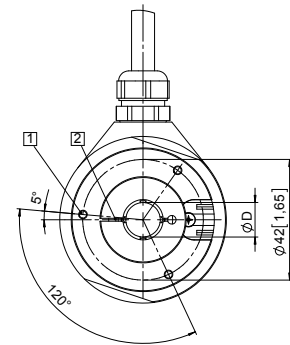
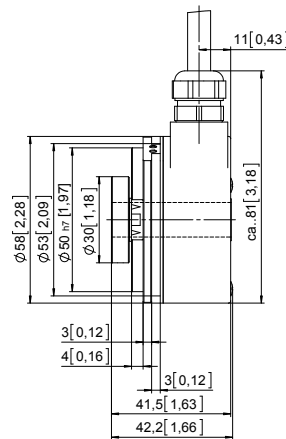
|                         |   |                            |
|-------------------------|---|----------------------------|
| <b>Standard optical</b> | <b>5852 / 5872 (shaft / hollow shaft)</b> | <b>Parallel, highspeed</b> |
|-------------------------|---|----------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

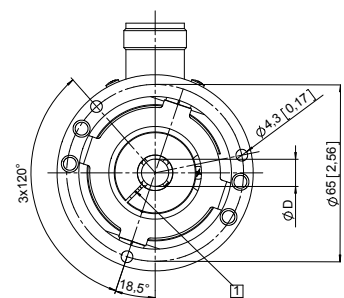
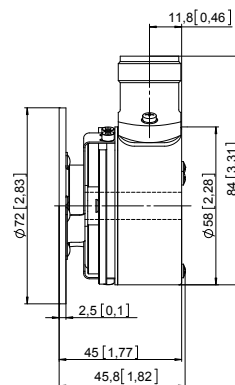
- 1 3 x M3, 5 [0.20] deep
- 2 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

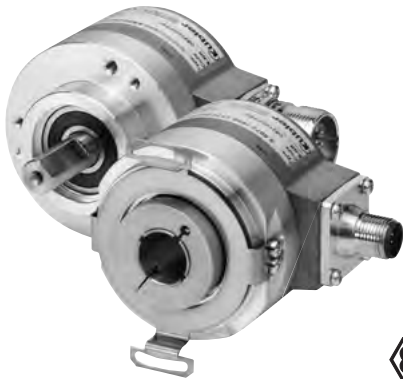
Absolute encoders  
singleturn

# Absolute encoders - singleturn

Standard optical

Sendix 5853 / 5873 (shaft / hollow shaft)

SSI / BiSS + incremental



The Sendix 5853 and Sendix 5873 singleturn encoders with optical sensor technology can achieve a resolution of max. 21 bits.

Easy integration in the application thanks to the BiSS interface, with electronic data sheet.

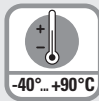
This series offers special versions for use on direct drives for the lift technology.



Electronic data sheet



Safety-Lock™



Temperature range  
-40°...+90°C



High protection level  
IP67



High shaft load capacity



Shock / vibration resistant



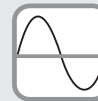
Magnetic field proof



Short-circuit proof



Reverse polarity protection



SinCos



Optical sensor

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C.

## Versatile

- High-precision with a data refresh rate of the position value  $\leq 1\mu s$ .
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

## Order code Shaft version

**8.5853**  
Type

**. X X X X . X X 2 X**  
a b c d e f g h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = clamping flange, IP65  $\varnothing$  58 mm [2.28"]**
- 3 = clamping flange, IP67  $\varnothing$  58 mm [2.28"]
- 2 = synchro flange, IP65  $\varnothing$  58 mm [2.28"]**
- 4 = synchro flange, IP67  $\varnothing$  58 mm [2.28"]
- 5 = square flange, IP65  $\square$  63.5 mm [2.5"]
- 7 = square flange, IP67  $\square$  63.5 mm [2.5"]

### b Shaft ( $\varnothing \times L$ ), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>**
- 2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>**
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

### c Interface / power supply

- 1 = SSI, BiSS / 5 V DC
- 2 = SSI, BiSS / 10 ... 30 V DC**
- 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
- 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
- 5 = SSI, BiSS / 5 V DC, with sensor output
- 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
- 7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
- 8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

### d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC \*)
- 2 = radial cable, 1 m [3.28'] PVC**
- B = radial cable, special length PVC \*)
- 3 = axial M23 connector, 12-pin
- 4 = radial M23 connector, 12-pin**
- 5 = axial M12 connector, 8-pin<sup>3)</sup>
- 6 = radial M12 connector, 8-pin<sup>3)</sup>

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5853.112A.G323.0030 (for cable length 3 m)

### e Code

- B = SSI, binary
- C = BiSS, binary
- G = SSI, gray**

### f Resolution<sup>4)</sup>

- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- 3 = 13 bit**
- 4 = 14 bit
- 5 = 15 bit
- C = 21 bit<sup>5)</sup>

### g Inputs / outputs<sup>4)</sup>

- 2 = SET, DIR input**  
additional status output

### h Options (service)

- 1 = no option
- 2 = status LED
- 3 = SET button and status LED**

### Optional on request

- Ex 2/22<sup>6)</sup>
- surface protection
- salt spray tested
- other resolutions

1) Preferred type only in conjunction with flange type 2.  
2) Preferred type only in conjunction with flange type 1.  
3) Can be combined only with interface 1 and 2.

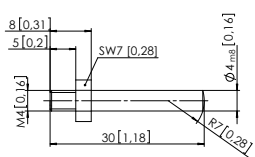
4) Resolution, preset value and counting direction factory-programmable.  
5) Only in conjunction with interface 1 or 2 and code C.  
6) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

|  |  |   |   |
|--|--|---|---|
| <b>Order code</b><br><b>Hollow shaft</b>   | <b>8.5873</b><br><small>Type</small>   | <b>.XXXX.XX2X</b><br><small>a b c d e f g h</small>   | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px; width: 40px; float: right;">10 By 10</div> |
| <b>a Flange</b>  | <b>c Interface / power supply</b>  | <b>e Code</b>   | <b>g Inputs / outputs<sup>3)</sup></b>  |
| 1 = with spring element, long, IP65<br>2 = with spring element, long, IP67<br>3 = with stator coupling, IP65 ø 65 mm [2.56"]<br>4 = with stator coupling, IP67 ø 65 mm [2.56"]<br><u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u><br>6 = with stator coupling, IP67 ø 63 mm [2.48"]<br>E = with stator coupling, IP65 mounting without screws <sup>1)</sup><br>F = with stator coupling, IP67 mounting without screws <sup>1)</sup><br>G = with stator coupling, IP65 ø 72 mm [2.83"] <sup>1)</sup><br>H = with expanding coupling, IP65 ø 65 mm [2.56"] <sup>1)</sup> | 1 = SSI, BiSS / 5 V DC<br><u>2 = SSI, BiSS / 10 ... 30 V DC</u><br>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC<br>5 = SSI, BiSS / 5 V DC, with sensor output<br>6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output<br>7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC<br>8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC<br>9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output                     | B = SSI, binary<br>C = BiSS, binary<br><u>G = SSI, gray</u>   | <u>2 = SET, DIR input</u><br>additional status output<br><br><b>h Options (service)</b><br>1 = no option<br>2 = status LED<br><u>3 = SET button and status LED</u><br><br><i>Optional on request</i><br>- Ex 2/22 (not with type of connection E or F) <sup>5)</sup><br>- surface protection salt spray tested<br>- other resolutions   |
| <b>b Through hollow shaft</b>  | <b>d Type of connection</b>  | <b>f Resolution<sup>3)</sup></b>  |   |
| 3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>6 = ø 15 mm [0.59"]<br>8 = ø 3/8"<br>9 = ø 1/2"<br><i>Tapered shaft</i><br>K = ø 10 mm [0.39"]   | 2 = radial cable, 1 m [3.28"] PVC<br>B = radial cable, special length PVC *)<br><u>E = tangential cable, 1 m [3.28"] PVC</u><br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u><br>6 = radial M12 connector, 8-pin <sup>2)</sup><br><br>*) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5873.542B.G323.0030 (for cable length 3 m) | A = 10 bit<br>1 = 11 bit<br>2 = 12 bit<br><u>3 = 13 bit</u><br>4 = 14 bit<br>7 = 17 bit<br>C = 21 bit <sup>4)</sup> |   |

Absolute encoders singleturn

| Mounting accessory for shaft encoders   |   | Order no.   |
|---|---|---|
| <b>Coupling</b>   | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]<br>bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                               | <b>8.0000.1102.0606</b><br><b>8.0000.1102.1010</b>          |
| Mounting accessory for hollow shaft encoders  |   | Order no.   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread<br>   | <b>8.0010.4700.0000</b>                                     |
| Connection technology   |   | Order no.   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable<br>M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>05.00.6041.8211.002M</b><br><b>8.0000.6901.0002.0031</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut, 8-pin<br>M23 female connector with coupling nut, 12-pin   | <b>05.CMB 8181-0</b><br><b>8.0000.5012.0000</b>             |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Can be combined only with shaft K and type of connection E or F.  
2) Can be combined only with interface 1 and 2.  
3) Resolution, preset value and counting direction factory-programmable.

4) Only in conjunction with interface 1 or 2 and code C.  
5) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

## Technical data

| Mechanical characteristics                    |  |  |
|---|--|--|
| <b>Maximum speed shaft version</b>            |  |  |
| IP65 up to 70°C [158°F]                       | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |  |
| IP65 up to T <sub>max</sub>                   | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C [158°F]                       | 11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)  |  |
| IP67 up to T <sub>max</sub>                   | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| <b>Maximum speed hollow shaft version</b>     |  |  |
| IP65 up to 70°C [158°F]                       | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |  |
| IP65 up to T <sub>max</sub>                   | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C [158°F]                       | 8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to T <sub>max</sub>                   | 4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)   |  |
| <b>Starting torque at 20°C [68°F]</b>         | IP65   | < 0.01 Nm  |
|   | IP67   | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                 |  |  |
|   | shaft version  | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>          |
|   | hollow shaft version   | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>          |
| <b>Load capacity of shaft</b>                 |  |  |
|   | radial   | 80 N   |
|   | axial  | 40 N   |
| <b>Weight</b>                                 |  |  |
|   |  | approx. 0.35 kg [12.35 oz]                       |
| <b>Protection acc. to EN 60529</b>            |  |  |
|   | housing side   | IP67   |
|   | shaft side   | IP65, opt. IP67                                  |
| <b>Working temperature range</b>              |  |  |
|   |  | -40°C ... +90°C [-40°F ... +194°F] <sup>1)</sup> |
| <b>Materials</b>                              |  |  |
|   | shaft/hollow shaft   | stainless steel                                  |
|   | flange   | aluminum   |
|   | housing  | zinc die-cast                                    |
|   | cable  | PVC (PUR for Ex 2/22)                            |
| <b>Shock resistance acc. EN 60068-2-27</b>    |  |  |
|   |  | 2500 m/s <sup>2</sup> , 6 ms                     |
| <b>Vibration resistance acc. EN 60068-2-6</b> |  |  |
|   |  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz            |

| Electrical characteristics                             |                |   |
|--|----------------|---|
| <b>Power supply</b>                                    |                |   |
|  |                | 5 V DC (+5 %) or 10 ... 30 V DC                       |
| <b>Current consumption (no load)</b>                   |                |   |
|  | 5 V DC         | max. 70 mA  |
|  | 10 ... 30 V DC | max. 45 mA  |
| <b>Reverse polarity protection of the power supply</b> |                |   |
|  |                | yes   |
| <b>Short circuit proof outputs</b>                     |                |   |
|  |                | yes <sup>2)</sup>                                     |
| <b>UL approval</b>                                     |                |   |
|  |                | file 224618   |
| <b>CE compliant acc. to</b>                            |                |   |
|  |                | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SSI interface   |                                  |                          |
|---|----------------------------------|--------------------------|
| <b>Output driver</b>  |                                  |                          |
|   |                                  | RS485 transceiver type   |
| <b>Permissible load / channel</b>   |                                  |                          |
|   |                                  | max. +/- 20 mA           |
| <b>Signal level</b>   |                                  |                          |
|   | HIGH                             | typ. 3.8 V               |
|   | LOW at I <sub>Load</sub> = 20 mA | typ. 1.3 V               |
| <b>Resolution</b>   |                                  |                          |
|   |                                  | 10 ... 14 bit and 17 bit |
| <b>Code</b>   |                                  |                          |
|   |                                  | binary or gray           |
| <b>SSI clock rate</b>   |                                  |                          |
|   |                                  | 50 kHz ... 2 MHz         |
| <b>Data refresh rate</b>  |                                  |                          |
|   | resolution ≤ 14 bit              | ≤ 1 μs                   |
|   | resolution ≥ 15 bit              | 4 μs                     |
| <b>Monoflop time</b>  |                                  |                          |
|   |                                  | ≤ 15 μs                  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |                                  |                          |

| BiSS interface                    |  |  |
|-----------------------------------|--|--|
| <b>Output driver</b>              |  |  |
|                                   |  | RS485 transceiver type                                 |
| <b>Permissible load / channel</b> |  |  |
|                                   |  | max. +/- 20 mA   |
| <b>Signal level</b>               |  |  |
|                                   | HIGH   | typ. 3.8 V   |
|                                   | LOW at I <sub>Load</sub> = 20 mA   | typ. 1.3 V   |
| <b>Resolution</b>                 |  |  |
|                                   |  | 10 ... 14 bit; 17, 19 and 21 bit                       |
| <b>Code</b>                       |  |  |
|                                   |  | binary   |
| <b>Clock rate</b>                 |  |  |
|                                   |  | 50 kHz ... 10 MHz                                      |
| <b>Max. update rate</b>           |  |  |
|                                   |  | < 15 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>          |  |  |
|                                   |  | < 1 μs   |
| <b>Protocol</b>                   |  |  |
|                                   |  | BiSS-C BP3 encoder profile                             |
| <b>Note:</b>                      |  |  |
|                                   | <ul style="list-style-type: none"> <li>- Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>- CRC data verification</li> <li>- EDS (electronic data sheet)</li> </ul> |  |

| Status output and LED   |   |   |
|---|---|---|
| <b>Output driver</b>  |   |   |
|   |   | open collector, internal pull up resistor 22 kOhm |
| <b>Permissible load</b>   |   |   |
|   |   | max. 20 mA  |
| <b>Signal level</b>   |   |   |
|   | HIGH  | +V  |
|   | LOW   | < 1 V   |
| <b>Active</b>   |   |   |
|   |   | LOW   |
| The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (Open Collector with int. pull-up 22 kOhm). |   |   |
| An active status output (LOW) displays:   |   |   |
|   | <ul style="list-style-type: none"> <li>- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)</li> <li>- LED fault (failure or ageing)</li> <li>- over- or under-temperature</li> </ul> |   |
| In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.  |   |   |

| Option incremental outputs (A/B), 2048 ppr |                           |                                     |
|--|---------------------------|-------------------------------------|
|  | <b>SinCos</b>             | <b>RS422 TTL compatible</b>         |
| <b>Max. frequency -3dB</b>                 | 400 kHz                   | 400 kHz                             |
| <b>Signal level</b>                        | 1 V <sub>pp</sub> (±20 %) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>                 | yes                       | yes                                 |

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

| SET input or SET button          |  |
|----------------------------------|--|
| <b>Input</b>                     | active HIGH                                    |
| <b>Input type</b>                | comparator                                     |
| <b>Signal level</b>              | HIGH min: 60 % of +V (power supply)<br>max: +V |
|                                  | LOW max: 25 % of +V (power supply)             |
| <b>Input current</b>             | < 0.5 mA                                       |
| <b>Min. pulse duration (SET)</b> | 10 ms  |
| <b>Timeout after SET signal</b>  | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar).

Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

Absolute encoders  
singleturn

# Absolute encoders - singleturn

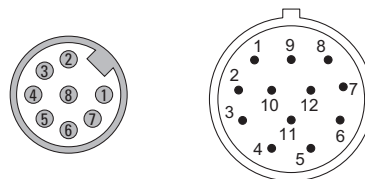
|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

## Terminal assignment

| Interface   | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up)        |
|---|--------------------|--|--|
| 1, 2  | 1, 2, A, B, E, F   | SET, DIR, Status                       | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C $\perp$              |
|   |                    |  | Cable color: WH BN GN YE GY PK BU RD BK - - - shield                     |
| M23 connector, 12-pin   |                    |  |  |
| 1, 2  | 3, 4               | SET, DIR, Status                       | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C $\perp$              |
|   |                    |  | Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH                                       |
| Cable (isolate unused wires individually before initial start-up) |                    |  |  |
| 5   | 1, 2, A, B, E, F   | SET, DIR, Status<br>sensor output      | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens $\perp$        |
|   |                    |  | Cable color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield             |
| M23 connector, 12-pin   |                    |  |  |
| 5   | 3, 4               | SET, DIR, Status<br>sensor output      | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens $\perp$        |
|   |                    |  | Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH                                       |
| Cable (isolate unused wires individually before initial start-up) |                    |  |  |
| 3, 4, 7, 8  | 1, 2, A, B, E, F   | SET, DIR, SinCos<br>or incr. RS422     | Signal: 0 V +V C+ C- D+ D- SET DIR A $\bar{A}$ B $\bar{B}$ $\perp$       |
|   |                    |  | Cable color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield            |
| M23 connector, 12-pin   |                    |  |  |
| 3, 4, 7, 8  | 3, 4               | SET, DIR, SinCos<br>or incr. RS422     | Signal: 0 V +V C+ C- D+ D- SET DIR A $\bar{A}$ B $\bar{B}$ $\perp$       |
|   |                    |  | Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH                                       |
| Cable (isolate unused wires individually before initial start-up) |                    |  |  |
| 6, 9  | 1, 2, A, B, E, F   | SinCos o. incr. RS422<br>sensor output | Signal: 0 V +V C+ C- D+ D- A $\bar{A}$ B $\bar{B}$ 0Vsens +Vsens $\perp$ |
|   |                    |  | Cable color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield            |
| M23 connector, 12-pin   |                    |  |  |
| 6, 9  | 3, 4               | SinCos o. incr. RS422<br>sensor output | Signal: 0 V +V C+ C- D+ D- A $\bar{A}$ B $\bar{B}$ 0Vsens +Vsens $\perp$ |
|   |                    |  | Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH                                       |
| M12 connector, 8-pin  |                    |  |  |
| 1, 2  | 5, 6               | SET, DIR                               | Signal: 0 V +V C+ C- D+ D- SET DIR $\perp$                               |
|   |                    |  | Pin: 1 2 3 4 5 6 7 8 PH  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin

M23 connector, 12-pin

# Absolute encoders - singleturn

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

## Dimensions shaft version

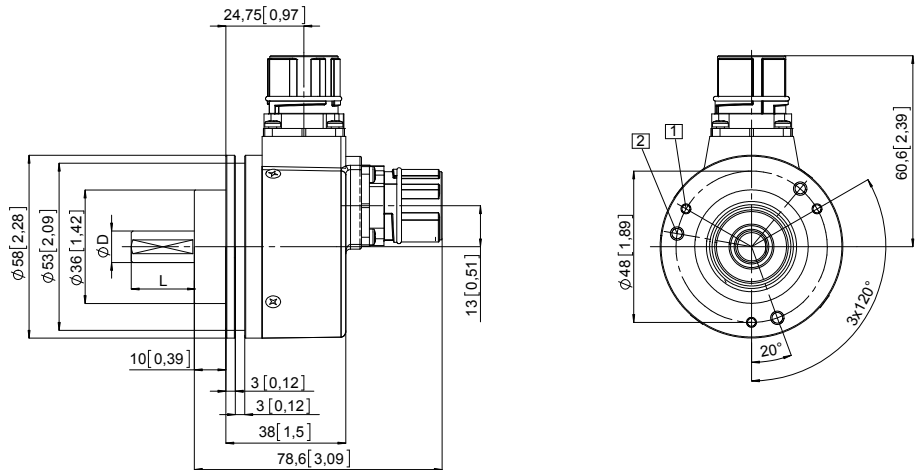
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



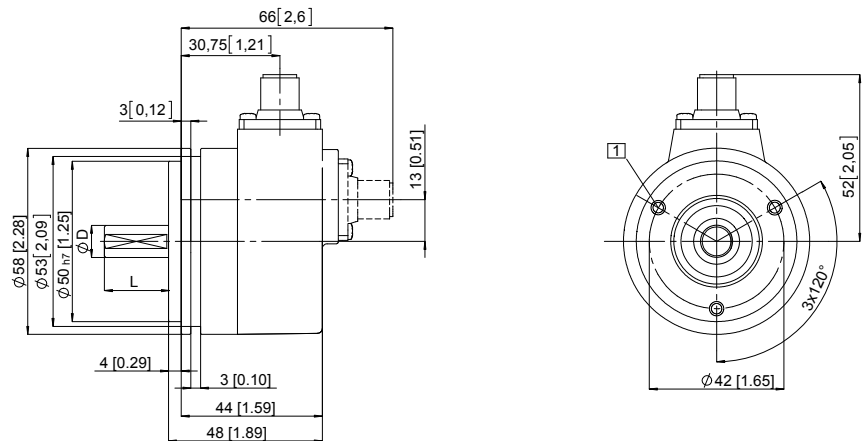
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

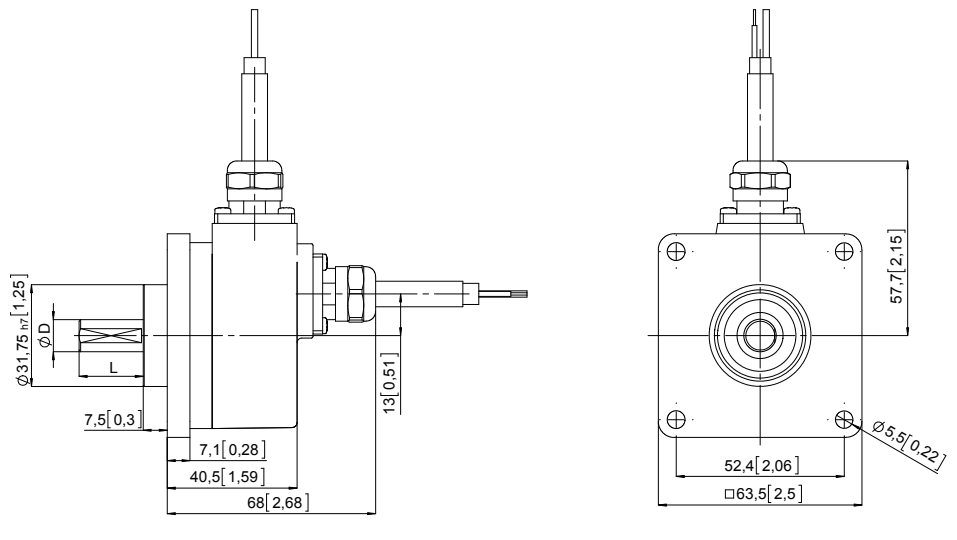


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

#### Flange type 5 and 7

(drawing with cable)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Absolute encoders - singleturn

**Standard optical**

**Sendix 5853 / 5873 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

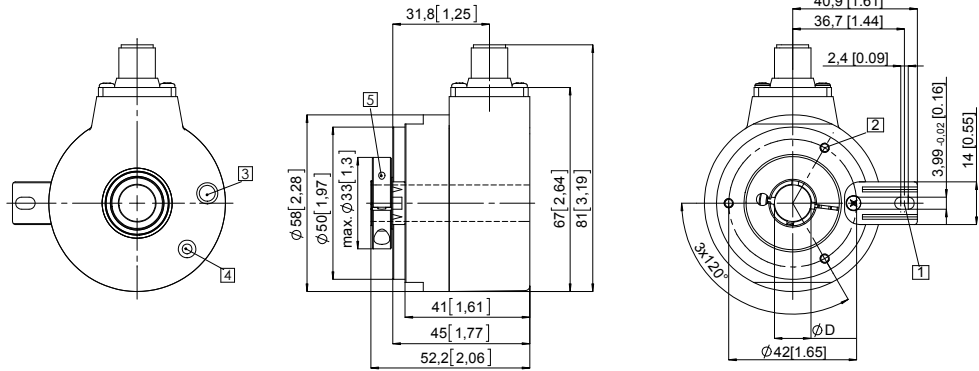
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |

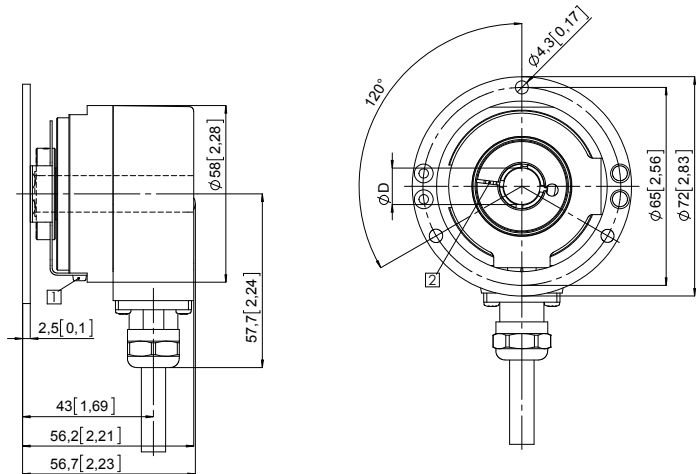
### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(drawing with cable)

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |

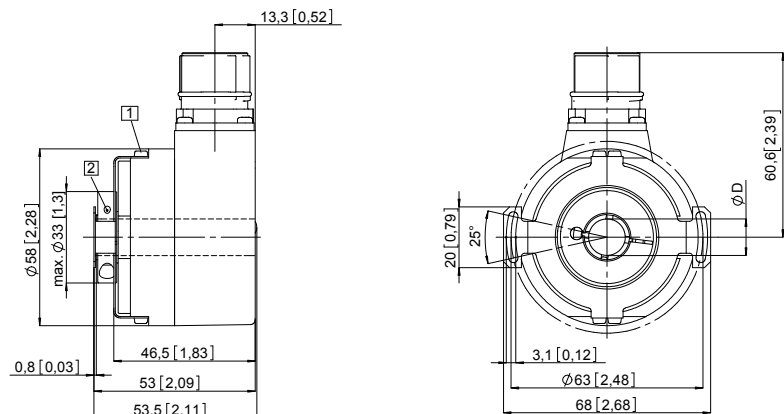
### Flange with stator coupling, $\varnothing 63$ [2.48]

#### Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(drawing with M23 connector)

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |



# Absolute encoders - singleturn

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

## Dimensions hollow shaft version

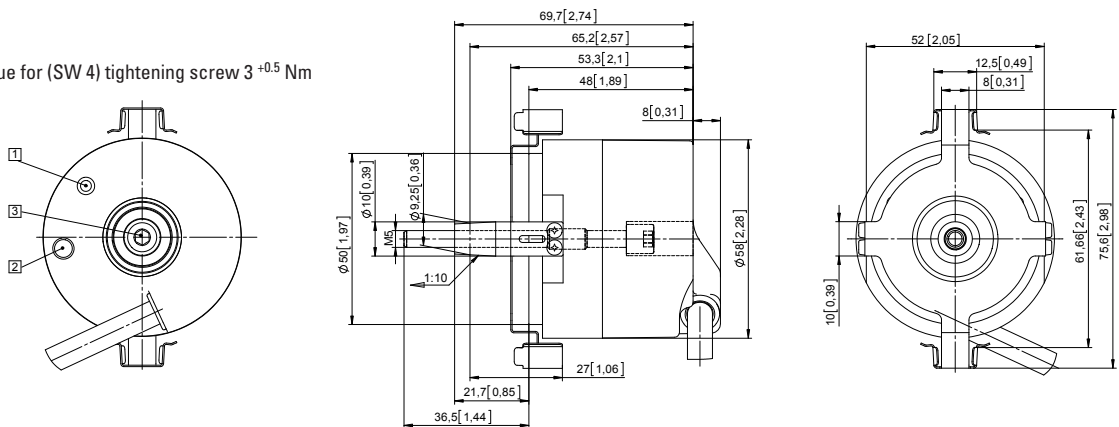
Dimensions in mm [inch]

### Flange with stator coupling, mounting without screws

#### Flange type E and F

(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET button
- 3 Recommended torque for (SW 4) tightening screw  $3^{+0.5}$  Nm

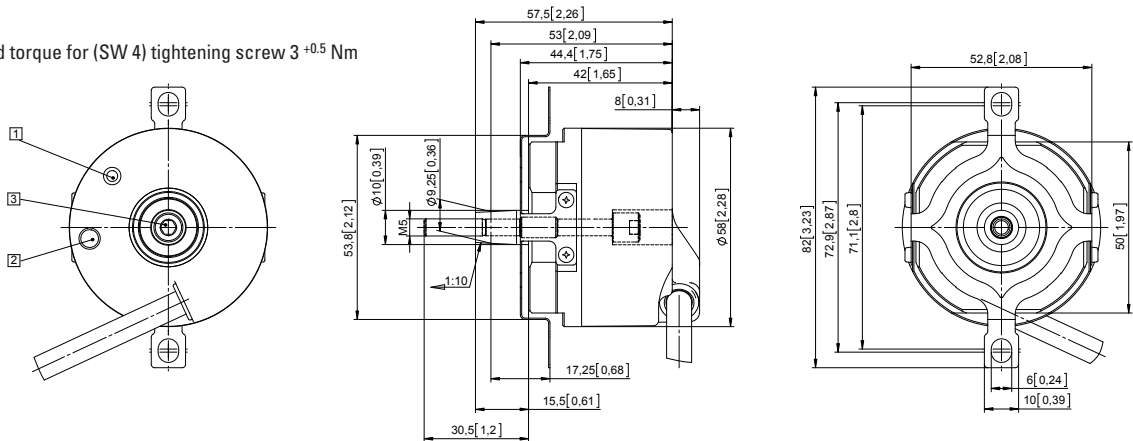


### Flange with stator coupling, ø 72 [2.83]

#### Flange type G

(with tapered shaft K and tangential cable)

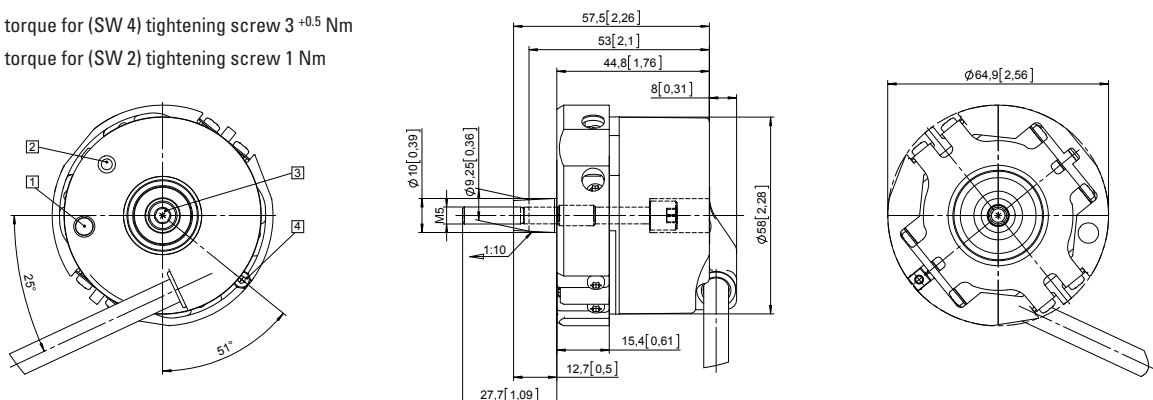
- 1 Status LED
- 2 SET Button
- 3 Recommended torque for (SW 4) tightening screw  $3^{+0.5}$  Nm



### Flange with expanding coupling, ø 65 [2.56"]

#### Flange type H

- 1 Status-LED
- 2 SET button
- 3 Recommended torque for (SW 4) tightening screw  $3^{+0.5}$  Nm
- 4 Recommended torque for (SW 2) tightening screw 1 Nm

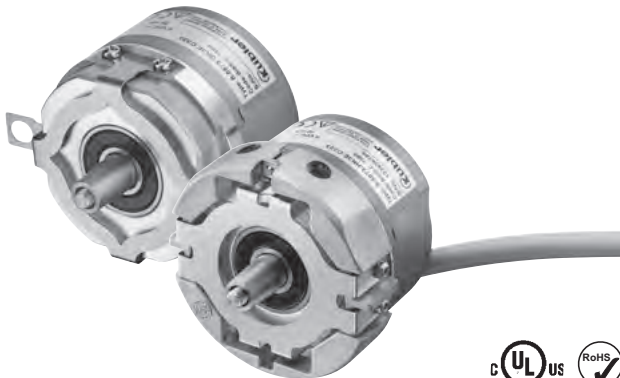


# Absolute encoders - singleturn

**Standard  
Motor-Line, optical**

**Sendix 5873 (tapered shaft)**

**SSI / BiSS + incremental**



The optical Sendix 5873 singleturn encoders with SSI or BiSS interface and optional 2048 ppr SinCos incremental track reach a resolution of up to 21 bits.

Advantages: Plug-and-Play for commissioning, including electronic data sheet and possibility to set the absolute measuring system to a predefined position value.

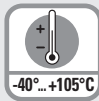
Specially designed for mounting on direct drives in the elevator technology.



Electronic data sheet



Safety-Lock™



Temperature range  
-40°...+105°C



High protection level  
IP



High shaft load capacity



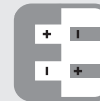
Shock / vibration resistant



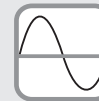
Magnetic field proof



Short-circuit proof



Reverse polarity protection



SinCos



Optical sensor

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Encoder specially designed for mounting on direct drives in the elevator technology.

## Versatile

- High-precision with a data refresh rate of the position value  $\leq 1\mu\text{s}$ .
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

## Order code Tapered shaft

**8.5873** . **XKXX** . **XX2X**  
Type      a b c d      e f g h

### a Flange

G = with stator coupling, IP65,  $\varnothing$  72 mm [2.83"]  
H = with expanding coupling, IP65,  $\varnothing$  65 mm [2.56"]

### b Tapered shaft

K =  $\varnothing$  10 mm [0.39"]

### c Interface / power supply

1 = SSI, BiSS / 5 V DC  
2 = SSI, BiSS / 10 ... 30 V DC  
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC  
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC  
5 = SSI, BiSS / 5 V DC, with sensor output  
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output  
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output  
E = SSI, BiSS + 2048 ppr. SinCos / 4.5 ... 5.5 V DC, with sensor output<sup>1)</sup>

### d Type of connection

E = tangential cable, 1 m PVC  
F = tangential cable, length PVC see below \*)  
G = tangential cable, with Sub-D connector (male contact, 15-pin, double-row), length PVC s. below \*)<sup>2)</sup>  
H = tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), length PVC s. below \*)<sup>2)</sup>

\*) Available lengths (connection types F, G, H):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5873.GK2E.G323.0030 (for cable length 3 m)

### e Code

B = SSI, binary  
C = BiSS, binary  
G = SSI, gray

### f Resolution<sup>3)</sup>

A = 10 bit  
1 = 11 bit  
2 = 12 bit  
3 = 13 bit  
4 = 14 bit  
7 = 17 bit  
C = 21 bit<sup>4)</sup>

### g Inputs / outputs<sup>3)</sup>

2 = SET, DIR input  
additional status output

### h Options (service)

1 = no option  
2 = status LED  
3 = SET button and status LED

1) Without reverse polarity protection.

2) Can be combined as a standard only with interface E (other variants on request).

3) Resolution, preset value and counting direction factory-programmable.

4) Only in conjunction with interface 1 or 2 and code C.

# Absolute encoders - singleturn

|                                     |                                    |                                 |
|-------------------------------------|------------------------------------|---------------------------------|
| <b>Standard Motor-Line, optical</b> | <b>Sendix 5873 (tapered shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------------------|------------------------------------|---------------------------------|

## Technical data

### Mechanical characteristics

|   |                             |  |
|---|-----------------------------|--|
| <b>Maximum speed</b>                          | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)                           |
|   | IP65 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)                           |
| <b>Starting torque at 20°C [68°F]</b>         |                             | < 0.01 Nm  |
| <b>Mass moment of inertia</b>                 |                             | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                 | radial                      | 80 N   |
|   | axial                       | 40 N   |
| <b>Weight</b>                                 |                             | approx. 0.35 kg [12.35 oz]   |
| <b>Protection acc. to EN 60529</b>            | housing side                | IP67   |
|   | shaft side                  | IP65   |
| <b>Working temperature range</b>              |                             | -40°C ... +90°C [-40°F ... +194°F]<br>(+105°C [+212°F] with interface E) <sup>1)</sup> |
| <b>Materials</b>                              | tapered shaft               | stainless steel  |
|   | flange                      | aluminum   |
|   | housing                     | zinc die-cast  |
|   | cable                       | PVC  |
| <b>Shock resistance acc. EN 60068-2-27</b>    |                             | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. EN 60068-2-6</b> |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

### Electrical characteristics

|  |                |   |
|--|----------------|---|
| <b>Power supply</b>                                    |                | 5 V DC (+5 %) or 10 ... 30 V DC                       |
| <b>Current consumption (no load)</b>                   | 5 V DC         | max. 70 mA  |
|  | 10 ... 30 V DC | max. 45 mA  |
| <b>Reverse polarity protection of the power supply</b> |                | yes (not for interface E)                             |
| <b>Short circuit proof outputs</b>                     |                | yes <sup>2)</sup>                                     |
| <b>UL approval</b>                                     |                | file 224618   |
| <b>CE compliant acc. to</b>                            |                | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

### SSI interface

|                                   |                                  |                          |
|-----------------------------------|----------------------------------|--------------------------|
| <b>Output driver</b>              |                                  | RS485 transceiver type   |
| <b>Permissible load / channel</b> |                                  | max. +/- 20 mA           |
| <b>Signal level</b>               | HIGH                             | typ. 3.8 V               |
|                                   | LOW at I <sub>Load</sub> = 20 mA | typ. 1.3 V               |
| <b>Resolution</b>                 |                                  | 10 ... 14 bit and 17 bit |
| <b>Code</b>                       |                                  | binary or gray           |
| <b>SSI clock rate</b>             |                                  | 50 kHz ... 2 MHz         |
| <b>Data refresh rate</b>          | resolution ≤ 14 bit              | ≤ 1 μs                   |
|                                   | resolution ≥ 15 bit              | 4 μs                     |
| <b>Monoflop time</b>              |                                  | ≤ 15 μs                  |

**Note:** If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.

### BiSS interface

|                                   |  |  |
|-----------------------------------|--|--|
| <b>Output driver</b>              |  | RS485 transceiver type                                 |
| <b>Permissible load / channel</b> |  | max. +/- 20 mA   |
| <b>Signal level</b>               | HIGH   | typ. 3.8 V   |
|                                   | LOW at I <sub>Load</sub> = 20 mA   | typ. 1.3 V   |
| <b>Resolution</b>                 |  | 10 ... 14 bit; 17, 19 and 21 bit                       |
| <b>Code</b>                       |  | binary   |
| <b>Clock rate</b>                 |  | 50 kHz ... 10 MHz                                      |
| <b>Max. update rate</b>           |  | < 15 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>          |  | < 1 μs   |
| <b>Protocol</b>                   |  | BiSS-C BP3 encoder profile                             |
| <b>Note:</b>                      | <ul style="list-style-type: none"> <li>- Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>- CRC data verification</li> <li>- EDS (electronic data sheet)</li> </ul> |  |

### Status output and LED

|                         |      |   |
|-------------------------|------|---|
| <b>Output driver</b>    |      | open collector, internal pull up resistor 22 kOhm |
| <b>Permissible load</b> |      | max. 20 mA  |
| <b>Signal level</b>     | HIGH | +V  |
|                         | LOW  | < 1 V   |
| <b>Active</b>           |      | LOW   |

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (Open Collector with int. pull-up 22 kOhm).

An active status output (LOW) displays:

- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

### Option incremental outputs (A/B), 2048 ppr

|                            | SinCos                    | RS422 TTL compatible                |
|----------------------------|---------------------------|-------------------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   | 400 kHz                             |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±20 %) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b> | yes                       | yes                                 |

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).  
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|                                     |                                    |                                 |
|-------------------------------------|------------------------------------|---------------------------------|
| <b>Standard Motor-Line, optical</b> | <b>Sendix 5873 (tapered shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------------------|------------------------------------|---------------------------------|

| SET input or SET button          |  |
|----------------------------------|--|
| <b>Input</b>                     | active HIGH  |
| <b>Input type</b>                | comparator   |
| <b>Signal level</b>              | HIGH min: 60 % of +V (power supply)<br>max: +V<br>LOW max: 25 % of +V (power supply) |
| <b>Input current</b>             | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b> | 10 ms  |
| <b>Timeout after SET signal</b>  | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar).

Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. |      |
| The LED will come ON and the status output will switch to LOW.  |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

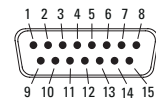
| Interface | Type of connection | Features                            | Cable (isolate unused wires individually before initial start-up)   |
|-----------|--------------------|-------------------------------------|---|
| 1, 2      | E, F               | SET, DIR, Status                    | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C $\perp$   |
|           |                    |                                     | Cable color: WH BN GN YE GY PK BU RD BK - - - shield  |
| 5         | E, F               | SET, DIR, Status sensor output      | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens $\perp$   |
|           |                    |                                     | Cable color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield  |
| 3, 4      | E, F               | SET, DIR, SinCos or incr. RS422     | Signal: 0 V +V C+ C- D+ D- SET DIR A $\bar{A}$ B $\bar{B}$ $\perp$  |
|           |                    |                                     | Cable color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield   |
| 6, 9, E   | E, F               | SinCos or incr. RS422 sensor output | Signal: 0 V +V C+ C- D+ D- A $\bar{A}$ B $\bar{B}$ 0Vsens +Vsens $\perp$  |
|           |                    |                                     | Cable color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield   |
| E         | H                  | SinCos sensor output                | Tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), 16-pin  |
|           |                    |                                     | Signal: +V +Vsens 0 V 0Vsens N/C A $\bar{A}$ B $\bar{B}$ C+ C- D+ D- N/C N/C N/C<br>Pin: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 |
| E         | G                  | SinCos sensor output                | Tangential cable, with Sub-D connector (male contact), 15-pin   |
|           |                    |                                     | Signal: A 0 V B +V D+ - - C+ $\bar{A}$ 0Vsens $\bar{B}$ +Vsens D- - C- $\perp$<br>Pin: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15      |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH  $\perp$ : Plug connector housing (shield)

### Top view of mating side, male contact base



Phoenix Contact connector (MC1.5/16-STF-3.81), 16-pin



Sub-D connector (male contact), double-row, 15-pin

# Absolute encoders - singleturn

|   |                                    |                                 |
|---|------------------------------------|---------------------------------|
| <b>Standard<br/>Motor-Line, optical</b> | <b>Sendix 5873 (tapered shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|------------------------------------|---------------------------------|

## Dimensions tapered shaft version

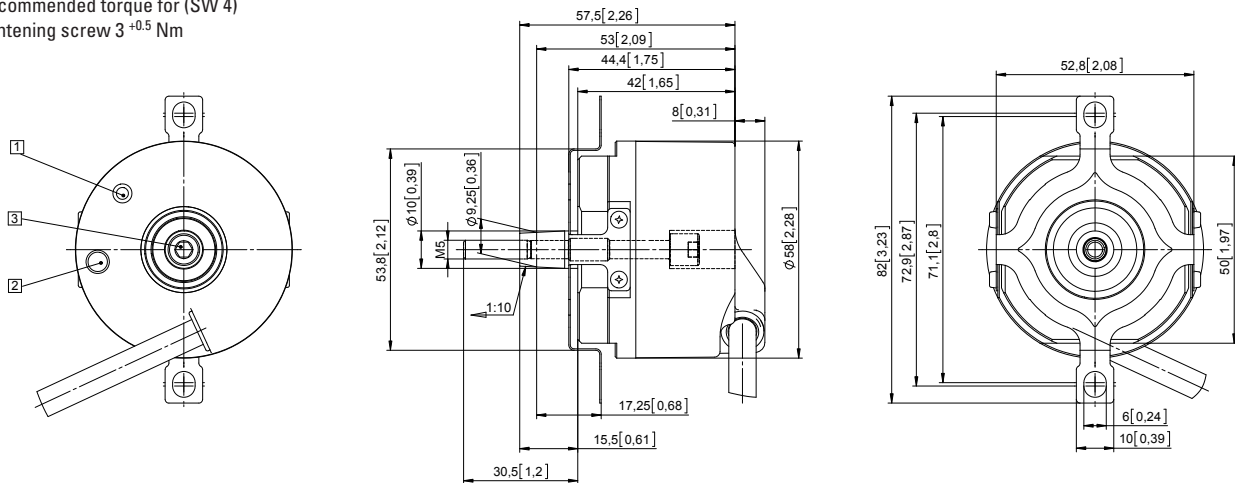
Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 72 [2.83]

#### Flange type G

(with tapered shaft K and tangential cable)

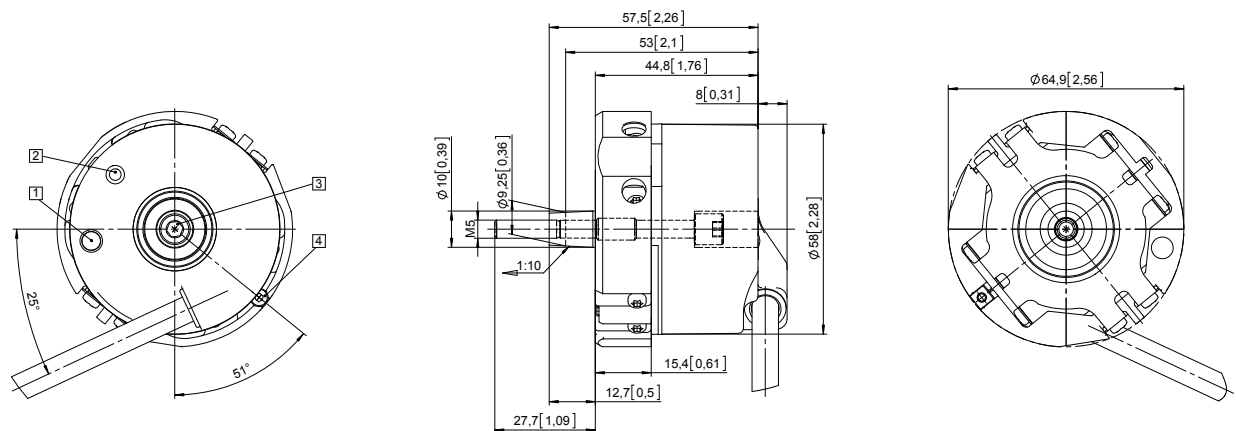
- 1 SET button
- 2 Status-LED
- 3 Recommended torque for (SW 4) tightening screw  $3^{+0.5}$  Nm



### Flange with expanding coupling, $\varnothing$ 65 [2.56"]

#### Flange type H

- 1 Status-LED
- 2 SET button
- 3 Recommended torque for (SW 4) tightening screw  $3^{+0.5}$  Nm
- 4 Recommended torque for (SW 2) tightening screw 1 Nm



Absolute encoders  
singleturn

# Absolute encoders - singleturn

Standard  
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI/BiSS + SinCos



The absolute singleturn encoders 5853FS2 and 5873FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.



Safety-Lock™



High rotational speed



Temperature range  
-40°... +90°C



High protection level  
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

### Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

### Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

### Order code Shaft version

8.5853FS2 . 1 X X X . X X 2 X  
Type a b c d e f g h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

1 = clamping flange, IP65, ø 58 mm [2.28"]

#### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

A = 10 x 20 mm [0.39 x 0.79"], with feather key

#### c Interface / power supply

3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC

4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

#### d Type of connection

1 = axial cable, 1 m [3.28'] PVC

A = axial cable, special length PVC \*)

2 = radial cable, 1 m [3.28'] PVC

B = radial cable, special length PVC \*)

3 = axial M23 connector, 12-pin

4 = radial M23 connector, 12-pin

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5853FS2.124A.G322.0030 (for cable length 3 m)

#### e Code

B = SSI, binary

C = BiSS, binary

G = SSI, gray.

#### f Resolution <sup>1)</sup>

A = 10 bit

1 = 11 bit

2 = 12 bit

3 = 13 bit

4 = 14 bit

7 = 17 bit

#### g Input / output <sup>1)</sup>

2 = SET, DIR input

#### h Options (service)

1 = no option

2 = status LED

3 = SET button and status LED

Optional on request

- Ex 2/22 <sup>2)</sup>

- other resolutions

1) Resolution, preset value and count direction are factory-programmable.

2) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

|   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>Order code</b><br>Hollow shaft   | <b>8.5873FS2</b><br>Type   | <table border="1" style="font-size: 0.8em; text-align: center;"> <tr> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">2</td> <td style="border: none;">X</td> </tr> <tr> <td style="border: none;">a</td> <td style="border: none;">b</td> <td style="border: none;">c</td> <td style="border: none;">d</td> <td style="border: none;">e</td> <td style="border: none;">f</td> <td style="border: none;">g</td> <td style="border: none;">h</td> <td style="border: none;">i</td> <td style="border: none;">j</td> </tr> </table> | . | X | X | X | X | . | X | X | 2 | X | a | b | c | d | e | f | g | h | i | j | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px 5px; display: inline-block;"><b>10</b> By <b>10</b></div> |
| .   | X  | X   | X | X | . | X | X | 2 | X |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| a   | b  | c   | d | e | f | g | h | i | j |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>a</b> Flange   | <b>d</b> Type of connection  | <b>i</b> Resolution <sup>1)</sup>   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 = with torque stop, flexible, IP65<br>A = with torque stop set, rigid, IP65<br><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u> | 2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br>E = tangential cable, 1 m [3.28'] PVC<br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u>              | A = 10 bit<br>1 = 11 bit<br>2 = 12 bit<br><u>3 = 13 bit</u><br>4 = 14 bit<br>7 = 17 bit   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>b</b> Through hollow shaft   | *) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5873FS2.B44B.G322.0030 (for cable length 3 m) | <b>j</b> Input / output <sup>1)</sup>   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>Tapered shaft<br>K = ø 10 mm [0.39"]                        | <b>e</b> Code  | <u>2 = SET, DIR input</u><br>3 = SET button and status LED  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>c</b> Interface / power supply   | B = SSI, binary<br>C = BiSS, binary<br><u>G = SSI, gray</u>  | <b>h</b> Options (service)  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u>                                   |  | 1 = no option<br><u>2 = status LED</u><br>3 = SET button and status LED   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <i>Optional on request</i><br>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br>- other resolutions                          |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

 Absolute encoders  
singleturn

| Accessories                                      | Order no.   |
|--|---|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting<br><b>8.0000.4G06.0000</b>  |
| <b>Screw retention</b>                           | Loctite 243, 5 ml<br><b>8.0000.4G05.0000</b>  |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |
| <b>LED SSI display 570 / 575</b>                 | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      | Order no.  |
|--|--|
| <b>Cordset, pre-assembled</b>              | M23 female connector with coupling nut, 12-pin single-ended,<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6901.0002.0031</b>                                      |
|  | M23 female connector with coupling nut, 12-pin<br>M23 male connector with external thread, 12-pin<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6905.0002.0032</b> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin<br><b>8.0000.5012.0000</b>  |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and count direction are factory-programmable.  
2) For the cable connection type, cable material PUR.  
3) Other lengths available.



# Absolute encoders - singleturn

|                                      |  |                          |
|--------------------------------------|--|--------------------------|
| <b>Standard</b><br>SIL2/PLd, optical | <b>Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--------------------------------------|--|--------------------------|

## Technical data

|   |  |
|---|--|
| <b>Notes regarding "Functional Safety"</b>  |  |
| These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. |  |
| Additional functions can be found in the operating manual.  |  |

|   |   |
|---|---|
| <b>Safety characteristics</b>             |   |
| <b>Classification</b>                     | PLd / SIL2  |
| <b>System structure</b>                   | 2 channel (Cat. 3)  |
| <b>PFH<sub>d</sub> value<sup>1)</sup></b> | $2.16 \times 10^{-8} \text{ h}^{-1}$                            |
| <b>Mission time / Proof test interval</b> | 20 years  |
| <b>Relevant standards</b>                 | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007 |

|  |   |
|--|---|
| <b>Electrical characteristics</b>                      |   |
| <b>Power supply</b>                                    | 5 V DC ( $\pm 5\%$ ) or 10 ... 30 V DC  |
| <b>Current consumption</b><br>(no load)                | 5 V DC max. 70 mA<br>10 ... 30 V DC max. 45 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

|  |  |
|--|--|
| <b>Mechanical characteristics</b>                |  |
| <b>Maximum speed shaft version</b>               | up to 70°C [158°F] 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous) |
| <b>Maximum speed hollow shaft version</b>        | up to 70°C [158°F] 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque - at 20°C [68°F]</b>          | shaft version < 0.01 Nm<br>hollow shaft version < 0.03 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version $4.0 \times 10^{-6} \text{ kgm}^2$<br>hollow shaft version $7.0 \times 10^{-6} \text{ kgm}^2$  |
| <b>Insertion depth for shaft</b>                 | hollow shaft version min. 34 mm [1.34"]  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.45 kg [15.87 oz]   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +90°C [-40°F ... +194°F] <sup>3)</sup>   |
| <b>Material</b>                                  | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

|                           |  |
|---------------------------|--|
| <b>EMC</b>                |  |
| <b>Relevant standards</b> | EN 55011 class B :2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

|   |  |
|---|--|
| <b>SSI interface</b>  |  |
| <b>Output driver</b>  | RS485 transceiver type   |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ. 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ. 1.3 V |
| <b>Resolution</b>   | 10 ... 14 bit and 17 bit                                       |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | resolution ≤ 14 bit ≤ 1 μs<br>resolution ≥ 15 bit 4 μs         |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |  |

|  |  |
|--|--|
| <b>BiSS interface</b>  |  |
| <b>Resolution</b>  | 10 ... 14 bit and 17 bit                               |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>- CRC data verification</li> </ul> |  |

|                            |                                  |
|----------------------------|----------------------------------|
| <b>SinCos interface</b>    |                                  |
| <b>Max. frequency -3dB</b> | 400 kHz                          |
| <b>Signal level</b>        | 1 V <sub>pp</sub> ( $\pm 10\%$ ) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>                |
| <b>Pulse rate</b>          | 2048 ppr                         |

|   |  |
|---|--|
| <b>LED</b>  |  |
| The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.   |  |
| If the LED is ON (status output LOW) this indicates: <ul style="list-style-type: none"> <li>- sensor error, singleturn or multiturn (soiling, glass breakage etc.)</li> <li>- LED error, failure or ageing</li> <li>- Over- or under-temperature</li> </ul> |  |
| In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.  |  |

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].



# Absolute encoders - singleturn

|                                   |  |                          |
|-----------------------------------|--|--------------------------|
| <b>Standard SIL2/PLd, optical</b> | <b>Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|-----------------------------------|--|--------------------------|

| SET input or SET button          |   |
|----------------------------------|---|
| <b>Input</b>                     | HIGH active   |
| <b>Input type</b>                | comparator  |
| <b>Signal level</b>              | HIGH min: 60 % of +V, max: +V<br>LOW max: 25 % of +V (power supply) |
| <b>Input current</b>             | < 0.5 mA  |
| <b>Min. pulse duration (SET)</b> | 10 ms   |
| <b>Timeout after SET signal</b>  | 14 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input  |      |
|--|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.   |      |
| <b>Response time (DIR input)</b>   | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

Absolute encoders singleturn

## Terminal assignment

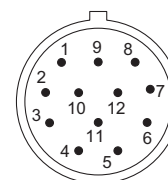
| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |    |           |       |           |         |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| 3, 4      | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | BK | VT        | GY-PK | RD-BU     | shield  |

| Interface | Type of connection | M23 connector, 12-pin |     |    |    |    |    |    |     |     |   |           |    |           |         |
|-----------|--------------------|-----------------------|-----|----|----|----|----|----|-----|-----|---|-----------|----|-----------|---------|
| 3, 4      | 3, 4               | Signal:               | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A | $\bar{A}$ | B  | $\bar{B}$ | $\perp$ |
|           |                    | Pin:                  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9 | 10        | 11 | 12        | PH      |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

# Absolute encoders - singleturn

|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

## Dimensions shaft version

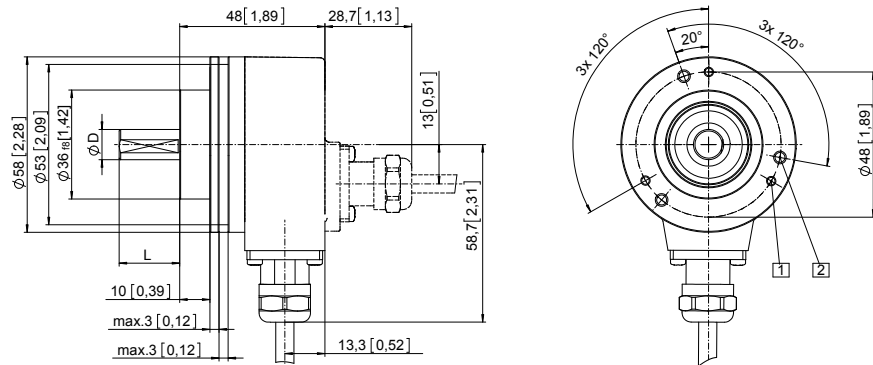
Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 1 with shaft type 2

(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



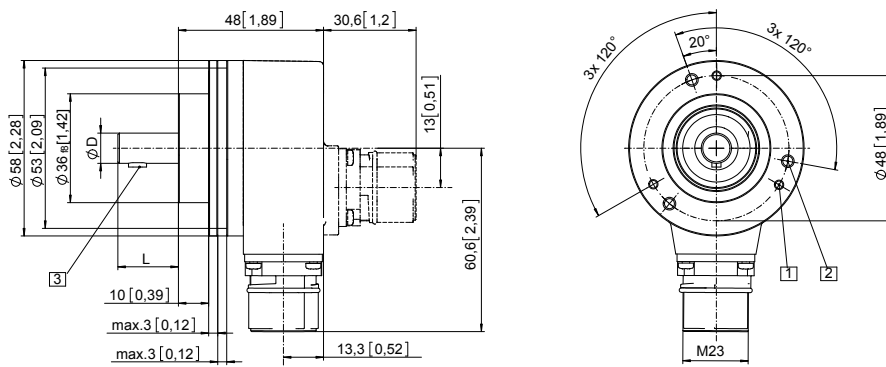
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

### Clamping flange, ø 58 [2.28]

#### Flange type 1 with shaft type A

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders - singleturn

**Standard**  
**SIL2/PLd, optical**

**Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)**

**SSI/BiSS + SinCos**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 63 [2.48]

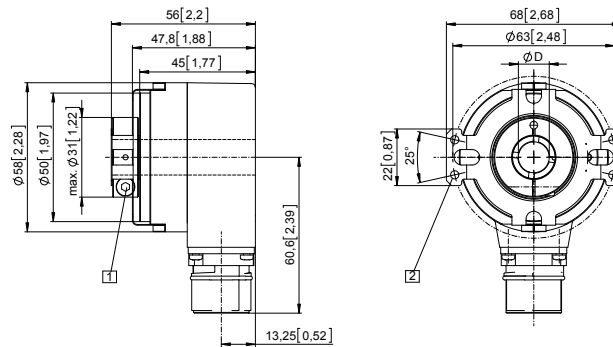
#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm

2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type B

#### Tapered shaft

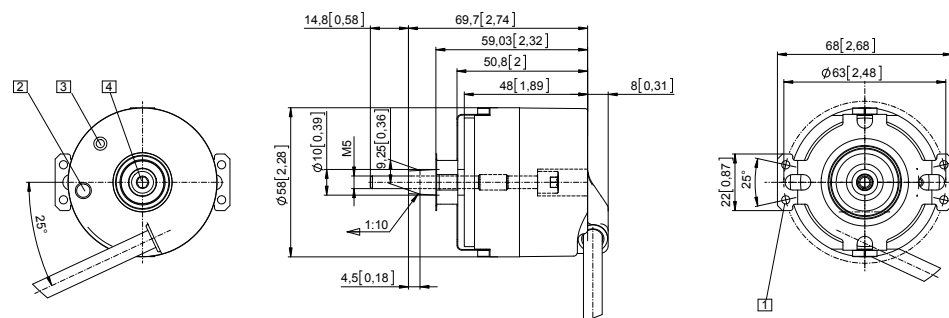
(drawing with tangential cable outlet)

1 For (4x) M3 screw

2 Status LED

3 SET button

4 SW 4



# Absolute encoders - singleturn

|                                      |  |                          |
|--------------------------------------|--|--------------------------|
| <b>Standard</b><br>SIL3/PLe, optical | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--------------------------------------|--|--------------------------|



The absolute singleturn encoders 5853FS3 and 5873FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

The extra strong Safety-Lock™ Design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



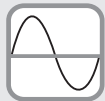
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

## Order code

### Shaft version

**8.5853FS3** . 1 X X X . X X 2 X  
Type      a    b    c    d    e    f    g    h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

1 = clamping flange, IP65, ø 58 mm [2.28"]

#### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat  
 A = 10 x 20 mm [0.39 x 0.79"], with feather key

#### c Interface / power supply

3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC  
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

#### d Type of connection

1 = axial cable, 1 m [3.28'] PVC  
 A = axial cable, special length PVC \*)  
 2 = radial cable, 1 m [3.28'] PVC  
 B = radial cable, special length PVC \*)  
 3 = axial M23 connector, 12-pin  
4 = radial M23 connector, 12-pin  
 \*) Available special lengths (connection types A, B):  
 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.5853FS3.124A.G322.0030 (for cable length 3 m)

#### e Code

B = SSI, binary  
 C = BiSS, binary  
G = SSI, gray

#### f Resolution <sup>1)</sup>

A = 10 bit  
 1 = 11 bit  
 2 = 12 bit  
3 = 13 bit  
 4 = 14 bit  
 7 = 17 bit

#### g Input / output <sup>1)</sup>

2 = SET, DIR input

#### h Options (service)

1 = no option  
2 = status LED  
 3 = SET button and status LED

*Optional on request*

- Ex 2/22 <sup>2)</sup>

- other resolutions

1) Resolution, preset value and count direction are factory-programmable.

2) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

|  |  |  |  |  |  |  |   |
|--|--|--|--|--|--|--|---|
| <b>Order code<br/>Hollow shaft</b>   | <b>8.5873FS3</b><br>Type   | <b>. X X X X . X X 2 X</b><br>a b c d e f g h  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.   |  |  |  |   |
| <b>a Flange</b><br>9 = with torque stop, flexible, IP65<br>A = with torque stop set, rigid, IP65<br><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u> | <b>b Through hollow shaft</b><br>3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br><i>Tapered shaft</i><br>K = ø 10 mm [0.39"] | <b>c Interface / power supply</b><br>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u> | <b>d Type of connection</b><br>2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br>E = tangential cable, 1 m [3.28'] PVC<br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u><br>*) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5873FS3.B44B.G322.0030 (for cable length 3 m) | <b>e Code</b><br>B = SSI, binary<br>C = BiSS, binary<br><u>G = SSI, gray</u> | <b>f Resolution <sup>1)</sup></b><br>A = 10 bit<br>1 = 11 bit<br>2 = 12 bit<br><u>3 = 13 bit</u><br>4 = 14 bit<br>7 = 17 bit | <b>g Input / output <sup>1)</sup></b><br><u>2 = SET, DIR input</u> | <b>h Options (service)</b><br>1 = no option<br><u>2 = status LED</u><br>3 = SET button and status LED |
|  |  |  | <i>Optional on request</i><br>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br>- other resolutions   |  |  |  |   |

| Accessories                                      |   | Order no.               |
|--|---|-------------------------|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting   | <b>8.0000.4G06.0000</b> |
| <b>Screw retention</b>                           | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b> |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                         |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                         |
| <b>LED SSI display 570 / 575</b>                 | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |                         |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      |  | Order no.                    |
|--|--|------------------------------|
| <b>Cordset, pre-assembled</b>              | M23 female connector with coupling nut, 12-pin single-ended,<br>2 m [6.56'] PVC cable <sup>3)</sup>                                      | <b>8.0000.6901.0002.0031</b> |
|  | M23 female connector with coupling nut, 12-pin<br>M23 male connector with external thread, 12-pin<br>2 m [6.56'] PVC cable <sup>3)</sup> | <b>8.0000.6905.0002.0032</b> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin   | <b>8.0000.5012.0000</b>      |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and count direction are factory-programmable.  
2) For the cable connection type, cable material PUR.  
3) Other lengths available.

# Absolute encoders - singleturn

|                                      |  |                          |
|--------------------------------------|--|--------------------------|
| <b>Standard</b><br>SIL3/PLe, optical | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--------------------------------------|--|--------------------------|

## Technical data

**Notes regarding "Functional Safety"**

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

| Safety characteristics                    |   |
|---|---|
| <b>Classification</b>                     | PLe / SIL3  |
| <b>System structure</b>                   | 2 channel (Cat. 4)  |
| <b>PFH<sub>d</sub> value<sup>1)</sup></b> | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>                         |
| <b>Mission time / Proof test interval</b> | 20 years  |
| <b>Relevant standards</b>                 | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007 |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   |
| <b>Current consumption</b>                             | 5 V DC max. 70 mA<br>(no load) 10 ... 30 V DC max. 45 mA                                |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed shaft version</b>               | up to 70°C [158°F] 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous) |
| <b>Maximum speed hollow shaft version</b>        | up to 70°C [158°F] 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque - at 20°C [68°F]</b>          | shaft version < 0.01 Nm<br>hollow shaft version < 0.03 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Insertion depth for shaft</b>                 | hollow shaft version min. 34 mm [1.34"]  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.45 kg [15.87 oz]   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +90°C [-40°F ... +194°F] <sup>3)</sup>   |
| <b>Material</b>                                  | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B :2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

| SSI interface                     |  |
|-----------------------------------|--|
| <b>Output driver</b>              | RS485 transceiver type   |
| <b>Permissible load / channel</b> | max. +/- 20 mA   |
| <b>Signal level</b>               | HIGH typ. 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ. 1.3 V |
| <b>Resolution</b>                 | 10 ... 14 bit and 17 bit                                       |
| <b>Code</b>                       | binary or gray   |
| <b>SSI clock rate</b>             | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>          | resolution ≤ 14 bit ≤ 1 μs<br>resolution ≥ 15 bit 4 μs         |
| <b>Monoflop time</b>              | ≤ 15 μs  |

**Note:** If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.

| BiSS interface           |  |
|--------------------------|--|
| <b>Resolution</b>        | 10 ... 14 bit and 17 bit   |
| <b>Code</b>              | binary   |
| <b>Clock rate</b>        | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length   |
| <b>Data refresh rate</b> | ≤ 1 μs   |
| <b>Note:</b>             | - bidirectional, factory programmable parameters are:<br>resolution, code, direction, alarms and warnings<br>- CRC data verification |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

**LED**

The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.

If the LED is ON (status output LOW) this indicates:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or ageing
- Over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

# Absolute encoders - singleturn

|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

| SET input or SET button  |   |
|--|---|
| <b>Input</b>   | HIGH active   |
| <b>Input type</b>  | comparator  |
| <b>Signal level</b>  | HIGH min: 60 % of +V, max: +V<br>LOW max: 25 % of +V (power supply) |
| <b>Input current</b>   | < 0.5 mA  |
| <b>Min. pulse duration (SET)</b>   | 10 ms   |
| <b>Timeout after SET signal</b>  | 14 ms   |
| <p>The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed.</p> <p>The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p> |   |

| DIR input  |      |
|--|------|
| <p>Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error.</p> <p>The LED will come ON and the status output will switch to LOW.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p> |      |
| <b>Response time (DIR input)</b>   | 1 ms |

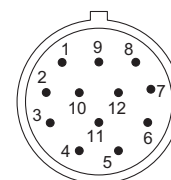
| Power-ON  |  |
|---|--|
| <p>After Power-ON the device requires a time of approx. 150 ms before valid data can be read.</p> |  |
| <p>Hot plugging of the encoder should be avoided.</p>   |  |

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |    |           |       |           |         |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| 3, 4      | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | BK | VT        | GY-PK | RD-BU     | shield  |
| Interface | Type of connection | M23 connector, 12-pin   |     |    |    |    |    |    |     |     |    |           |       |           |         |
| 3, 4      | 3, 4               | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9  | 10        | 11    | 12        | PH      |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin



# Absolute encoders - singleturn

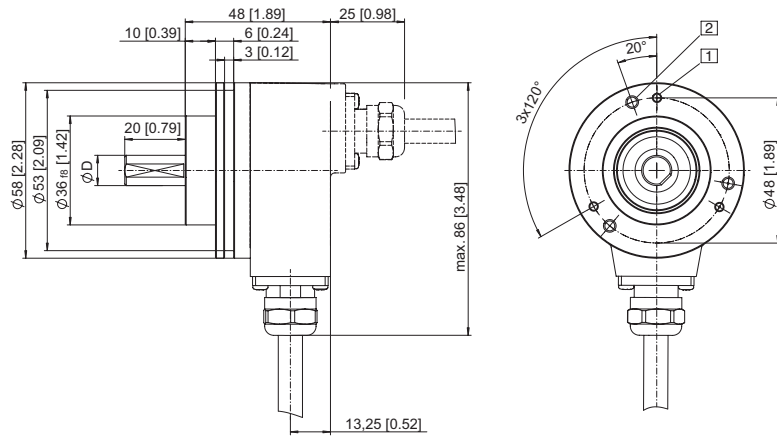
|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange, ø 58 [2.28]**  
**Flange type 1 with shaft type 2**  
 (drawing with cable)

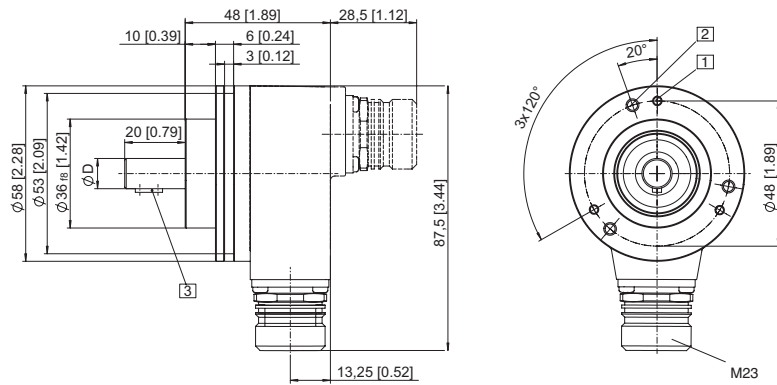
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

**Clamping flange, ø 58 [2.28]**  
**Flange type 1 with shaft type A**  
 (drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders - singleturn

|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 63 [2.48]

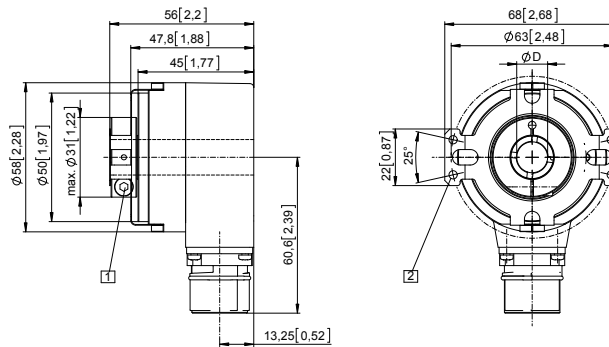
#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type B

#### Tapered shaft

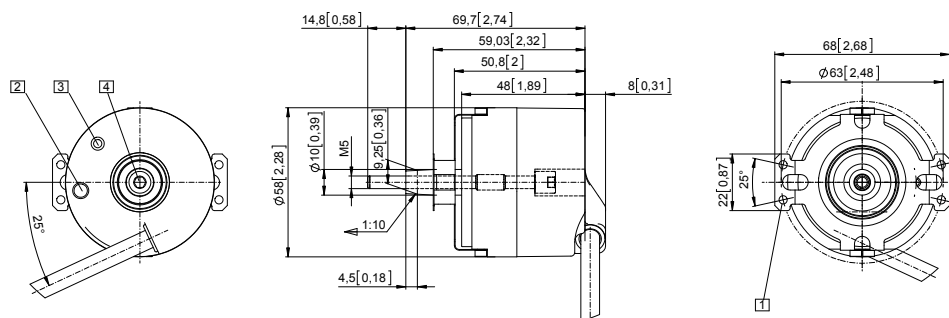
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



# Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

PROFIBUS DP



The singleturn encoders 5858 and 5878 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

They offer a maximum resolution of 16 bits, divided over 360°. These encoders are available with blind hollow shaft up to 15 mm.



## Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

## Flexible

- Fast, simple, error-free connection using versions with M12 connector.
- Wide-ranging programming options thanks to latest encoder profile.

### Order code Shaft version

8.5858 . X X 3 X . 31 1 X  
Type a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

#### b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>
- 2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

#### c Interface / power supply

- 3 = PROFIBUS DP V0  
encoder profile V 1.1, 10 ... 30 V DC

#### d Type of connection

- removable bus terminal cover
- 1 = with radial cable gland fitting
- 2 = with 3 x radial M12 connectors

#### f Options (Service)

- 2 = no option
- 3 = SET button

Optional on request

- Ex 2/22
- surface protection salt spray tested

### Order code Hollow shaft

8.5878 . X X 3 X . 31 1 X  
Type a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

#### b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

#### c Interface / power supply

- 3 = PROFIBUS DP V0  
encoder profile V 1.1, 10 ... 30 V DC

#### d Type of connection

- removable bus terminal cover
- 1 = with radial cable gland fitting
- 2 = with 3 x radial M12 connectors

#### f Options (Service)

- 2 = no option
- 3 = SET button

Optional on request

- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2  
2) Preferred type only in conjunction with flange type 1

# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|-------------------------|--|--------------------|

| Mounting accessory for shaft encoders   |   | Order no.                   |
|---|---|-----------------------------|
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]                     | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]                    | <b>8.0000.1102.1010</b>     |
| Mounting accessory for hollow shaft encoders  |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread<br>  | <b>8.0010.4700.0000</b>     |
| Connection technology   |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut for bus in , 5-pin<br>5 m [16.40'] PUR cable     | <b>05.00.6011.3211.005M</b> |
|   | M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PUR cable    | <b>05.00.6011.3411.005M</b> |
|   | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut for bus in , 5-pin                               | <b>05.BMWS 8151-8.5</b>     |
|   | M12 male connector with external thread for bus out, 5-pin                              | <b>05.BMSWS 8151-8.5</b>    |
|   | M12 female connector with coupling nut for power supply, 4-pin                          | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |                             |  |
|--|-----------------------------|--|
| <b>Maximum speed</b>                             | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |
|  | IP65 up to T <sub>max</sub> | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|  | IP67 up to 70°C [158°F]     | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|  | IP67 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>          | IP65                        | < 0.01 Nm  |
|  | IP67                        | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|  | hollow shaft version        | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                    | radial                      | 80 N   |
|  | axial                       | 40 N   |
| <b>Weight</b>                                    | with bus terminal cover     | approx. 0.53 kg [18.69 oz]                                   |
|  | with fixed connection       | approx. 0.50 kg [17.64 oz]                                   |
| <b>Protection acc. to EN 60529</b>               | housing side                | IP67   |
|  | shaft side                  | IP65, opt. IP67  |
| <b>Working temperature range</b>                 |                             | -40°C ... +80°C [-40°F ... +176°F]                           |
| <b>Material</b>                                  | shaft/hollow shaft          | stainless steel  |
|  | flange                      | aluminum   |
|  | housing                     | zinc die-cast  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 110 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SET button (zero or defined value, option)  |  |
|---|--|
| Protection against accidental activation.<br>Button can only be operated with a ball-pen or pencil. |  |

| Diagnostic LED (yellow)                |                               |
|--|-------------------------------|
| <b>LED is ON with following errors</b> | sensor error (Profibus error) |

# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|-------------------------|--|--------------------|

| Interface characteristics PROFIBUS DP |  |
|---------------------------------------|--|
| <b>Resolution</b>                     | 1 ... 65536 (16 bit), scalable default: 8192 (13 bit)  |
| <b>Code</b>                           | binary   |
| <b>Interface</b>                      | interface specification acc. to PROFIBUS DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated |
| <b>Protocol</b>                       | Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons                               |
| <b>Baud rate</b>                      | max. 12 Mbit/s   |
| <b>Device address</b>                 | 1 ... 127 set by rotary switches   |
| <b>Termination switchable</b>         | set by DIP switches  |

### Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the user-specific component within the Profibus field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that Profibus-compliant device systems can be used now with the guarantee that they are ready for the future too.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling (Number of steps per revolution).
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter .
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full Class 1 and Class 2 functionality.

### Terminal assignment terminal box

| Interface | Type of connection | BUS IN    |   |   |     | BUS OUT |     |    |   | The shield of the connection cable must be connected over a large area via the cable gland. |   |
|-----------|--------------------|-----------|---|---|-----|---------|-----|----|---|---|---|
|           |                    | Signal:   | B | A | 0 V | +V      | 0 V | +V | B |   | A |
| 3         | 1 (terminal box)   | Terminal: | 1 | 2 | 3   | 4       | 5   | 6  | 7 | 8   |   |

| Interface | Type of connection    | Funktion     | 3 x M12 connector |                       |      |                       |      |        |        |
|-----------|-----------------------|--------------|-------------------|-----------------------|------|-----------------------|------|--------|--------|
|           |                       |              | Signal:           | –                     | PB_A | –                     | PB_B |        | Shield |
| 3         | 2 (3 x M12 connector) | Bus in       | Signal:           | –                     | PB_A | –                     | PB_B | Shield |        |
|           |                       | Pin:         | 1                 | 2                     | 3    | 4                     | 5    |        |        |
|           |                       | Power supply | Signal:           | +V                    | –    | 0 V                   | –    |        |        |
| Pin:      | 1                     | 2            | 3                 | 4                     |      |                       |      |        |        |
|           |                       | Bus out      | Signal:           | BUS_VDC <sup>1)</sup> | PB_A | BUS_GND <sup>1)</sup> | PB_B | Shield |        |
|           |                       | Pin:         | 1                 | 2                     | 3    | 4                     | 5    |        |        |

1) For supplying an external Profibus termination resistor.

# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|-------------------------|--|--------------------|

## Dimensions shaft version, with removable bus terminal cover

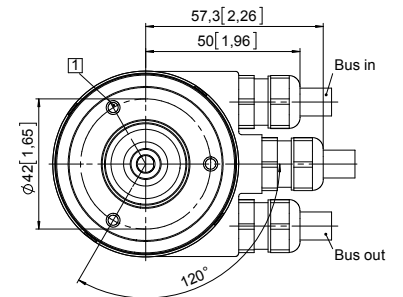
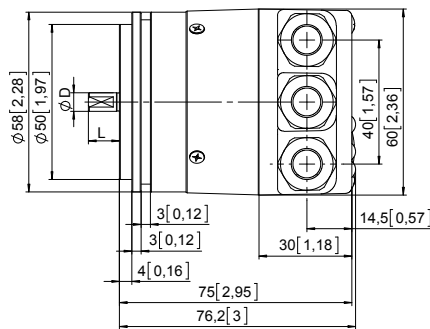
Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with cable)

- ① 3 x M4, 6 [0.24] deep



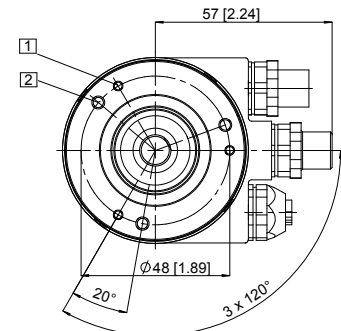
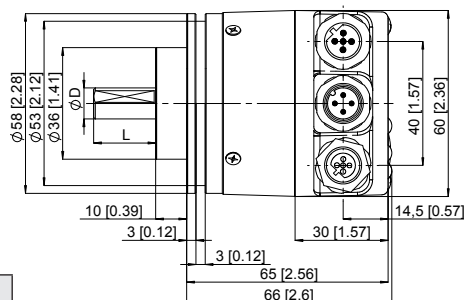
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with 3 x M12 connector)

- ① 3 x M3, 6 [0.24] deep
- ② 3 x M4, 8 [0.32] deep

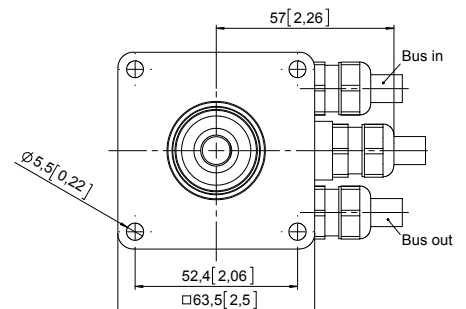
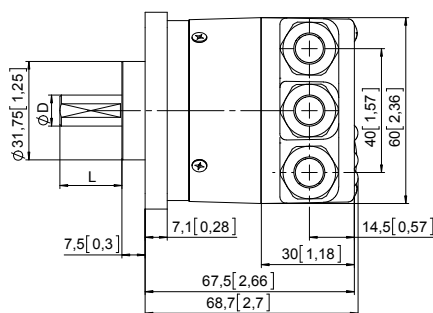


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

#### Flange type 5 and 7

(drawing with cable)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Absolute encoders - singleturn

**Standard optical**

**Sendix 5858 / 5878 (shaft / hollow shaft)**

**PROFIBUS DP**

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

### Flange with spring element, long

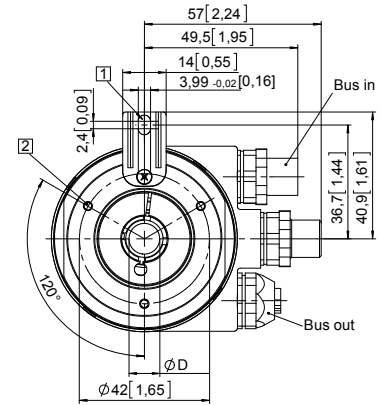
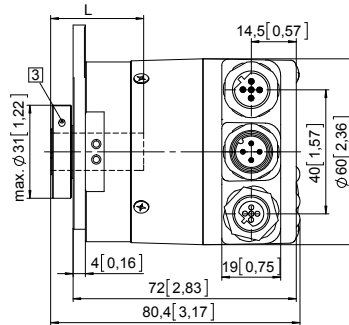
#### Flange type 1 and 2

(drawing with 3 x M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



### Flange with stator coupling, $\varnothing 63$ [2.48]

#### Flange type 5 and 6

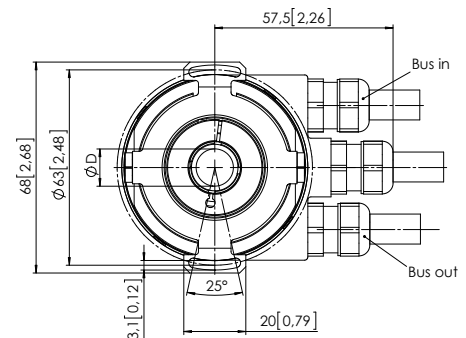
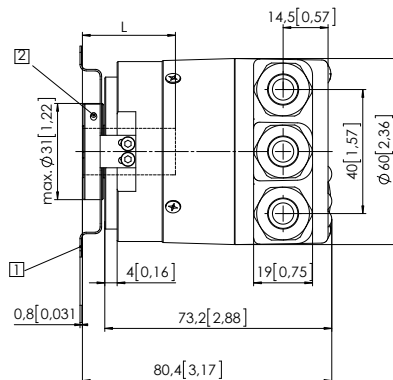
Pitch circle diameter for fixing screws 63 [2.48]

(drawing with cable)

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 3 and 4

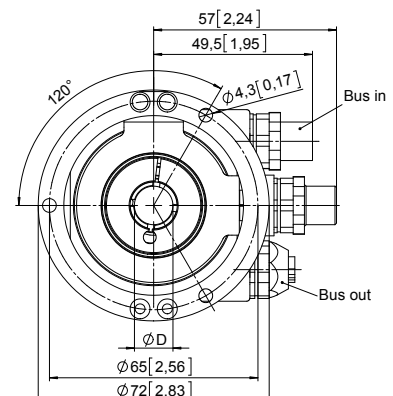
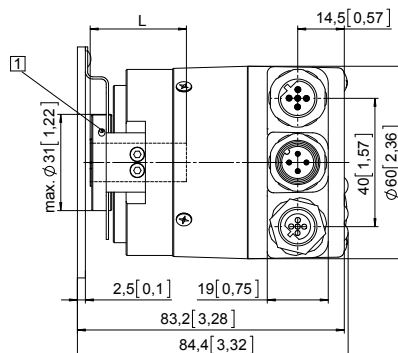
Pitch circle diameter for fixing screws, 65 [2.56]

(drawing 3 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft





# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|



The singleturn encoders 5858 and 5878 with CANopen interface and optical sensor technology are ideal for use in all CANopen applications.

They offer a maximum resolution of 16 bits, divided over 360°. These encoders are available with blind hollow shaft up to 15 mm.



Absolute encoders singleturn

|              |                       |                                  |                             |                          |                             |                      |                      |                             |                |   |
|--------------|-----------------------|----------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------|----------------------|-----------------------------|----------------|---|
|              |                       |                                  |                             |                          |                             |                      |                      |                             |                |   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°..+80°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Magnetic field proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional |

## Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

## Flexible

- Node address can be set via rotary switches or software.
- Baud rate and termination can be set via DIP switches or software.
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.

## Order code Shaft version

|               |   |          |          |          |          |   |           |          |          |
|---------------|---|----------|----------|----------|----------|---|-----------|----------|----------|
| <b>8.5858</b> | . | <u>X</u> | <u>X</u> | <u>2</u> | <u>X</u> | . | <u>21</u> | <u>1</u> | <u>X</u> |
| Type          |   | a        | b        | c        | d        |   | e         | f        |          |

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



- a Flange**  
1 = clamping flange, IP65 ø 58 mm [2.28"]  
 3 = clamping flange, IP67 ø 58 mm [2.28"]  
2 = synchro flange, IP65 ø 58 mm [2.28"]  
 4 = synchro flange, IP67 ø 58 mm [2.28"]  
 5 = square flange, IP65 □ 63.5 mm [2.5"]  
 7 = square flange, IP67 □ 63.5 mm [2.5"]
- b Shaft (ø x L), with flat**  
1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>  
2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>  
 3 = 1/4" x 7/8"  
 4 = 3/8" x 7/8"
- c Interface / power supply**  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d Type of connection removable bus terminal cover**  
 1 = radial cable gland  
2 = 2 x M12 connector, 5-pin  
*Fixed connection without bus terminal cover*  
 A = radial cable, 2 m [6.56'] PVC  
 B = radial cable, special length PVC \*)  
 E = 1 x radial M12 connector, 5-pin  
 F = 2 x radial M12 connector, 5-pin  
 I = 1 x radial M23 connector, 12-pin  
 J = 2 x radial M23 connector, 12-pin
- \*) Available special lengths (connection type B):  
 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.5858.112B.2113.0030 (for cable length 3 m)

- e Fieldbus profile**  
21 = CANopen encoder profile DS406 V3.2
- f Options (service)**  
 2 = no options  
3 = SET button
- Optional on request*  
 - Ex 2/22<sup>3)</sup>  
 - surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.  
 2) Preferred type only in conjunction with flange type 1.

3) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

|   |                       |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
|---|-----------------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| <b>Order code</b><br><b>Hollow shaft</b>  | <b>8.5878</b><br>Type | <table border="1" style="font-size: 0.8em; border-collapse: collapse;"> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">2</td> <td style="text-align: center;">X</td> <td style="text-align: center;">.</td> <td style="text-align: center;">2</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> <td style="text-align: center;">f</td> <td style="text-align: center;">g</td> <td style="text-align: center;">h</td> <td style="text-align: center;">i</td> </tr> </table> | X | X | 2 | X | . | 2 | 1 | 1 | X | a | b | c | d | e | f | g | h | i | <p>If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="float: right; border: 1px solid black; border-radius: 50%; padding: 2px 5px; font-weight: bold;">10 by 10</div> |
| X   | X                     | 2  | X | . | 2 | 1 | 1 | X |   |   |   |   |   |   |   |   |   |   |   |   |  |
| a   | b                     | c  | d | e | f | g | h | i |   |   |   |   |   |   |   |   |   |   |   |   |  |
| <p><b>a Flange</b><br/>           1 = with spring element, long, IP65<br/>           2 = with spring element, long, IP67<br/>           3 = with stator coupling, IP65 ø 65 mm [2.56"]<br/>           4 = with stator coupling, IP67 ø 65 mm [2.56"]<br/> <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u><br/>           6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> <p><b>b Blind hollow shaft</b><br/>           (insertion depth max. 30 mm [1.18"])<br/>           3 = ø 10 mm [0.39"]<br/> <u>4 = ø 12 mm [0.47"]</u><br/>           5 = ø 14 mm [0.55"]<br/>           6 = ø 15 mm [0.59"]<br/>           8 = ø 3/8"<br/>           9 = ø 1/2"</p> <p><b>c Interface / power supply</b><br/> <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u></p> |                       | <p><b>d Type of connection</b><br/> <i>removable bus terminal cover</i><br/>           1 = radial cable gland<br/> <u>2 = 2 x M12 connector, 5-pin</u><br/> <i>Fixed connection without bus terminal cover</i><br/>           A = radial cable, 2 m [6.56'] PVC<br/>           B = radial cable, special length PVC *)<br/>           E = 1 x radial M12 connector, 5-pin<br/>           F = 2 x radial M12 connector, 5-pin<br/>           I = 1 x radial M23 connector, 12-pin<br/>           J = 2 x radial M23 connector, 12-pin</p> <p>*) Available special lengths (connection type B):<br/>           3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br/>           order code expansion .XXXX = length in dm<br/>           ex.: 8.5878.542B.2113.0030 (for cable length 3 m)</p>                                     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| <p><b>e Fieldbus profile</b><br/> <u>21 = CANopen encoder profile DS406 V3.2</u></p> <p><b>f Options (service)</b><br/>           2 = no options<br/> <u>3 = SET button</u></p> <p style="text-align: right;"><i>Optional on request</i><br/>           - Ex 2/22 <sup>1)</sup><br/>           - surface protection<br/>           salt spray tested</p>  |                       |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |

| Mounting accessory for shaft encoders | Order no. |
|---------------------------------------|-----------|
|---------------------------------------|-----------|

|                 |  |                         |
|-----------------|--|-------------------------|
| <b>Coupling</b> | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                 | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders | Dimensions in mm [inch] | Order no. |
|--|-------------------------|-----------|
|--|-------------------------|-----------|

|   |                    |                         |
|---|--------------------|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread | <b>8.0010.4700.0000</b> |
|   |                    |                         |

| Connection technology | Order no. |
|-----------------------|-----------|
|-----------------------|-----------|

|  |  |                             |
|--|--|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut for bus in , 5-pin<br>5 m [16.40'] PVC cable  | <b>05.00.6091.A211.005M</b> |
|  | M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PVC cable | <b>05.00.6091.A411.005M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut for bus in , 5-pin                            | <b>8.0000.5116.0000</b>     |
|  | M12 male connector with external thread for bus out, 5-pin                           | <b>8.0000.5111.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) For the cable connection type, cable material PUR.

# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

## Technical data

| Mechanical characteristics                       |  |  |
|--|--|--|
| <b>Maximum speed</b>                             |  |  |
| IP65 up to 70°C [158°F]                          | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |  |
| IP65 up to T <sub>max</sub>                      | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |  |
| IP67 up to 70°C [158°F]                          | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |  |
| IP67 up to T <sub>max</sub>                      | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |  |
| <b>Starting torque - at 20°C [68°F]</b>          |  |  |
| IP65   | < 0.01 Nm  |  |
| IP67   | < 0.05 Nm  |  |
| <b>Mass moment of inertia</b>                    |  |  |
| shaft version                                    | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |  |
| hollow shaft version                             | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |  |
| <b>Load capacity of shaft</b>                    |  |  |
| radial   | 80 N   |  |
| axial  | 40 N   |  |
| <b>Weight</b>                                    |  |  |
| with bus terminal cover                          | approx. 0.53 kg [18.69 oz]                                   |  |
| with fixed connection                            | approx. 0.50 kg [17.64 oz]                                   |  |
| <b>Protection acc. to EN 60529</b>               |  |  |
| housing side                                     | IP67   |  |
| shaft side                                       | IP65, opt. IP67  |  |
| <b>Working temperature range</b>                 |  |  |
| -40°C ... +80°C [-40°F ... +176°F] <sup>1)</sup> |  |  |
| <b>Material</b>                                  |  |  |
| shaft/hollow shaft                               | stainless steel  |  |
| flange   | aluminum   |  |
| housing  | zinc die-cast  |  |
| cable  | PVC (PUR for Ex 2/22)  |  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  |  |
| 2500 m/s <sup>2</sup> , 6 ms                     |  |  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  |  |
| 100 m/s <sup>2</sup> , 55 ... 2000 Hz            |  |  |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 90 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics CANopen |   |
|-----------------------------------|---|
| <b>Resolution</b>                 | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)                            |
| <b>Code</b>                       | binary  |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN<br>CAN specification 2.0 B |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                    |
| <b>Baud rate</b>                  | 10 ... 1000 kbit/s<br>can be set via DIP switches,<br>software configurable         |
| <b>Node address</b>               | 1 ... 127<br>can be set via rotary switches,<br>software configurable               |
| <b>Termination switchable</b>     | can be set via DIP switches,<br>software configurable                               |

 Absolute encoders  
singleturn

### General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device specific profiles such as encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, acceleration** as well as the **status of the working area**.

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

### CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

### CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.
- "Watchdog controlled" device.

All profiles stated here: key-features

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

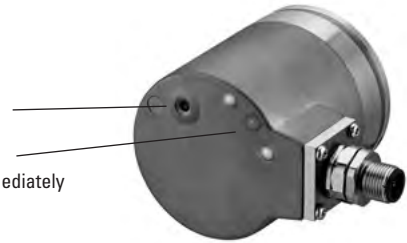
# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

|   |   |
|---|---|
| <b>SET button (zero or defined value, option)</b>   |   |
| Protection against accidental activation.<br>Button can only be operated with a ball-pen or pencil. |   |
| <b>Diagnostic LED (yellow)</b>  |   |
| <b>LED is ON with the following fault conditions</b>  | sensor error (internal code or LED error),<br>voltage too low, over-temperature |

**SET button**  
for fast, simple on-site start-up

**Green, red, yellow LEDs**  
Fault-free operation immediately visible on the bus.



## Terminal assignment

|           |                    |   |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|-----------|--------------------|---|---------------------|--------------------|-------|---------------------|--------------------|---------------------|--------------------|-------|-------|---------|--|
| Interface | Type of connection | Cable gland (bus terminal cover with terminal box)                |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | 1                  | Bus OUT   |                     |                    |       |                     | Bus IN             |                     |                    |       |       |         |  |
|           |                    | Signal:   | CAN_GND             | CAN_L              | CAN_H | 0 V<br>power supply | +V<br>power supply | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |  |
|           |                    | Abbreviation:   | CG                  | CL                 | CH    | 0 V                 | +V                 | 0 V                 | +V                 | CL    | CH    | CG      |  |
| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | A, B               | Bus IN  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Cable color:  | WH                  | BN                 | YE    | GN                  | GY                 |                     |                    |       |       |         |  |
| Interface | Type of connection | 2 x M12 connector, 5-pin  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | 2, F               | Bus OUT   |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 3                   | 2                  | 5     | 4                   | 1                  |                     |                    |       |       |         |  |
|           |                    | Bus IN  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 3                   | 2                  | 5     | 4                   | 1                  |                     |                    |       |       |         |  |
| Interface | Type of connection | 1 x M12 connector, 5-pin  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | E                  | Bus IN  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 3                   | 2                  | 5     | 4                   | 1                  |                     |                    |       |       |         |  |
| Interface | Type of connection | 2 x M23 connector, 12-pin   |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | J                  | Bus OUT   |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 10                  | 12                 | 2     | 7                   | 3                  |                     |                    |       |       |         |  |
|           |                    | Bus IN  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 10                  | 12                 | 2     | 7                   | 3                  |                     |                    |       |       |         |  |
| Interface | Type of connection | 1 x M23 connector, 12-pin   |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
| 2         | I                  | Bus IN  |                     |                    |       |                     |                    |                     |                    |       |       |         |  |
|           |                    | Signal:   | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H               | CAN_GND            |                     |                    |       |       |         |  |
|           |                    | Pin:  | 10                  | 12                 | 2     | 7                   | 3                  |                     |                    |       |       |         |  |

# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

## Dimensions shaft version, with removable bus terminal cover

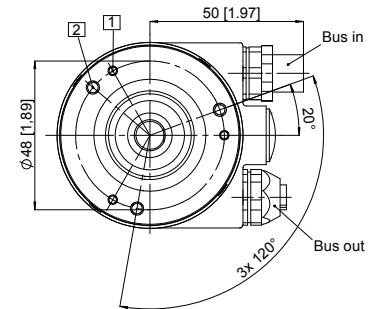
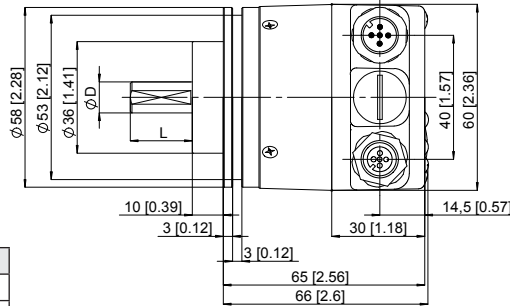
Dimensions in mm [inch]

### Clamping flange, $\varnothing 58$ [2.28]

#### Flange type 1 and 3

(drawing with 2 x M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



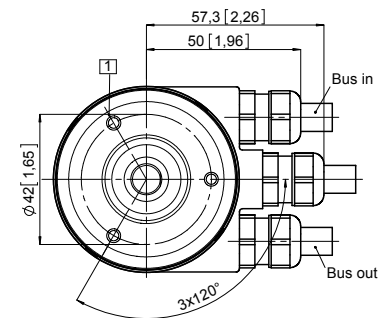
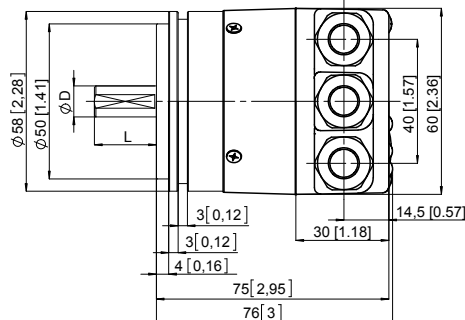
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Synchro flange, $\varnothing 58$ [2.28]

#### Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep

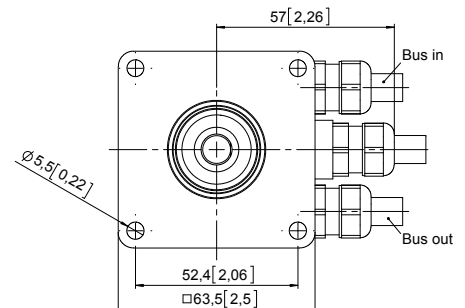
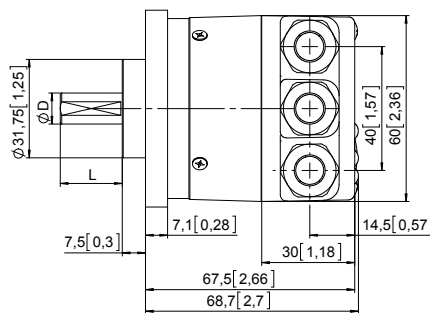


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square 63.5$ [2.5]

#### Flange type 5 and 7

(drawing with cable)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Absolute encoders - singleturn

**Standard optical**

**Sendix 5858 / 5878 (shaft / hollow shaft)**

**CANopen**

## Dimensions shaft version, with fixed connection

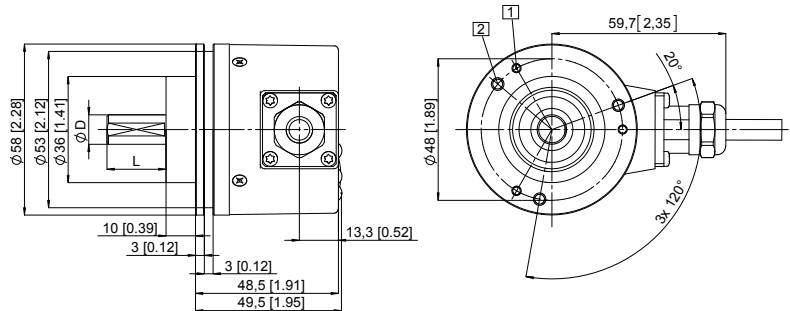
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

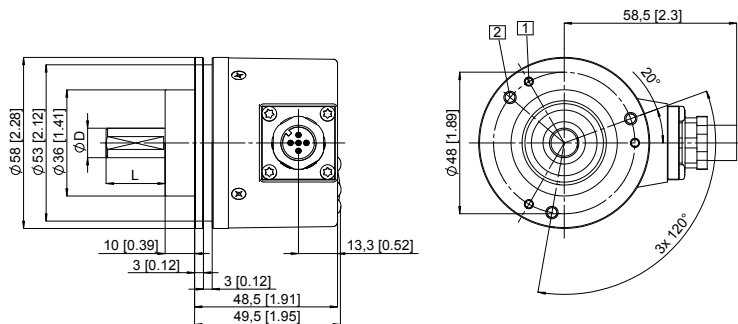
(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



(drawing with M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



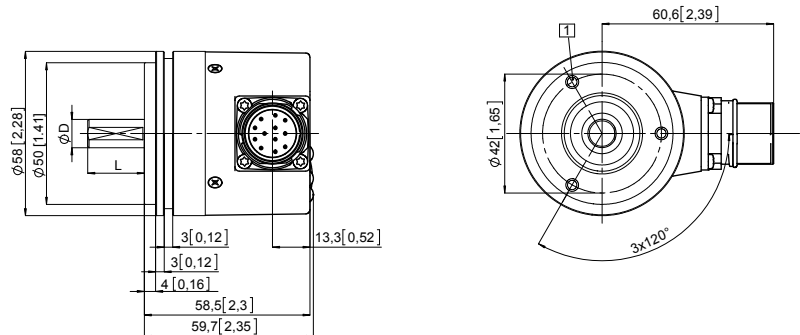
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

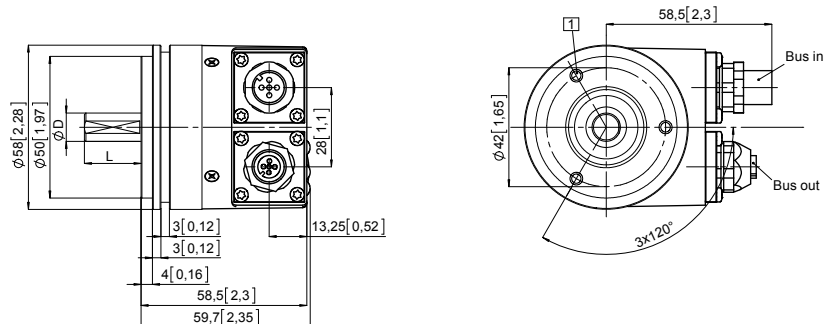
(drawing with M23 connector)

- 1 3 x M4, 6 [0.24] deep



(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep



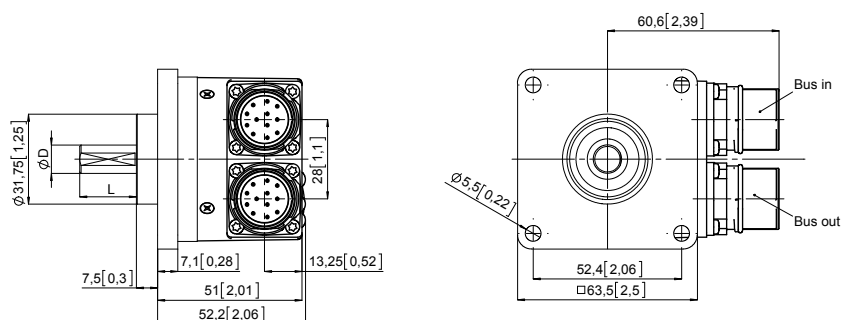
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

#### Flange type 5 and 7

(drawing with 2 x M23 connector)

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



# Absolute encoders - singleturn

|                         |  |                |
|-------------------------|--|----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|-------------------------|--|----------------|

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

### Flange with spring element, long

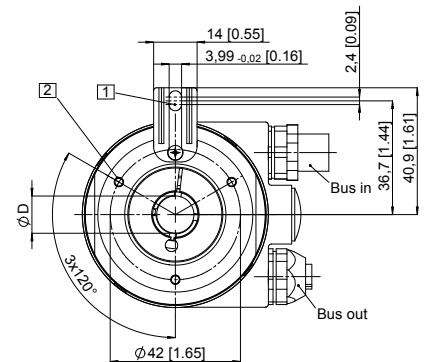
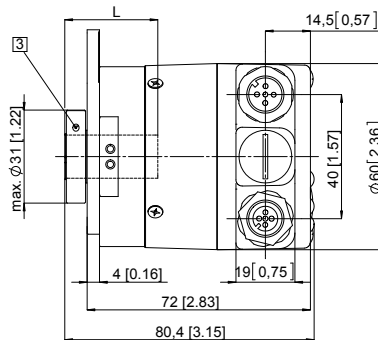
#### Flange type 1 and 2

(drawing with 2 x M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



### Flange with stator coupling, $\varnothing 63$ [2.48]

#### Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

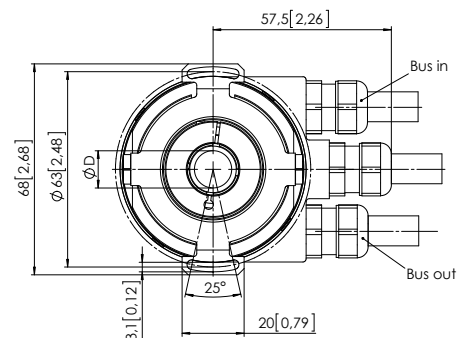
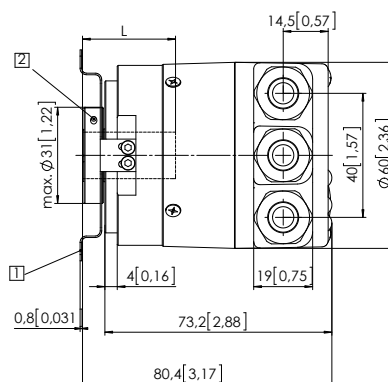
63 [2.48]

(drawing with cable)

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

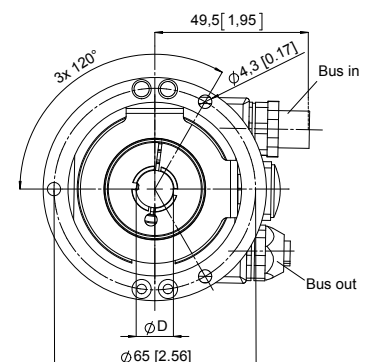
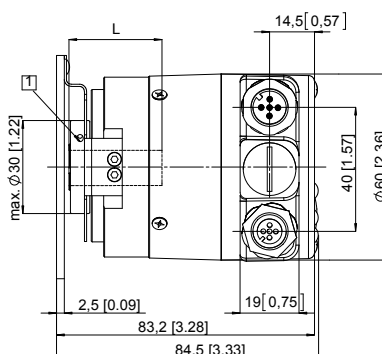
65 [2.56]

(drawing with 2 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft









# Absolute encoders - singleturn

|                         |  |                 |
|-------------------------|--|-----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>EtherCAT</b> |
|-------------------------|--|-----------------|



The singleturn encoders 5858 and 5878 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.



**EtherCAT**  
Conformance tested

Absolute encoders singleturn

|              |                       |                                    |                             |                          |                             |                      |                     |                             |                |   |
|--------------|-----------------------|------------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|---|
|              |                       |                                    |                             |                          |                             |                      |                     |                             |                |   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°... +80°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional |

### Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

### Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.

|  |               |  |  |   |          |   |  |  |
|--|---------------|--|--|---|----------|---|--|--|
| <b>Order code</b>  | <b>8.5858</b> | <b>. X X B 2 . B2 12</b>   | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |   |          |   |  |  |
| <b>Shaft version</b>   | Type          | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 25%;"><b>a</b></td> <td style="width: 25%;"><b>b</b></td> <td style="width: 25%;"><b>c</b></td> <td style="width: 25%;"><b>e</b></td> </tr> </table> | <b>a</b>   | <b>b</b>  | <b>c</b> | <b>e</b>  |  |  |
| <b>a</b>   | <b>b</b>      | <b>c</b>   | <b>e</b>   |   |          |   |  |  |
| <p><b>a Flange</b><br/> <u>1 = clamping flange, IP65 ø 58 mm [2.28"]</u><br/>           3 = clamping flange, IP67 ø 58 mm [2.28"]<br/> <u>2 = synchro flange, IP65 ø 58 mm [2.28"]</u><br/>           4 = synchro flange, IP67 ø 58 mm [2.28"]<br/>           5 = square flange, IP65 □ 63.5 mm [2.5"]<br/>           7 = square flange, IP67 □ 63.5 mm [2.5"]</p> |               | <p><b>b Shaft (ø x L), with flat</b><br/> <u>1 = 6 x 10 mm [0.24 x 0.39"]</u><sup>1)</sup><br/> <u>2 = 10 x 20 mm [0.39 x 0.79"]</u><sup>2)</sup><br/>           3 = 1/4" x 7/8"<br/>           4 = 3/8" x 7/8"</p>  |  | <p><b>c Interface / power supply</b><br/> <u>B = EtherCAT / 10 ... 30 V DC</u></p> <p><b>d Type of connection</b><br/> <u>removable bus terminal cover</u><br/> <u>2 = 3 x M12 connector, 4-pin</u></p> |          | <p><b>e Fieldbus profile</b><br/> <u>B2 = EtherCAT with CoE (CAN over EtherNet)</u></p> <p>Optional on request<br/>           - Ex 2/22<br/>           - surface protection salt spray tested</p> |  |  |

|   |               |  |  |   |          |   |  |  |
|---|---------------|--|--|---|----------|---|--|--|
| <b>Order code</b>   | <b>8.5878</b> | <b>. X X B 2 . B2 12</b>   | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |   |          |   |  |  |
| <b>Hollow shaft</b>   | Type          | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 25%;"><b>a</b></td> <td style="width: 25%;"><b>b</b></td> <td style="width: 25%;"><b>c</b></td> <td style="width: 25%;"><b>e</b></td> </tr> </table>               | <b>a</b>   | <b>b</b>  | <b>c</b> | <b>e</b>  |  |  |
| <b>a</b>  | <b>b</b>      | <b>c</b>   | <b>e</b>   |   |          |   |  |  |
| <p><b>a Flange</b><br/>           1 = with spring element, long, IP65<br/>           2 = with spring element, long, IP67<br/>           3 = with stator coupling, IP65 ø 65 mm [2.56"]<br/>           4 = with stator coupling, IP67 ø 65 mm [2.56"]<br/> <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u><br/>           6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> |               | <p><b>b Blind hollow shaft</b><br/> <i>(insertion depth max. 30 mm [1.18"])</i><br/>           3 = ø 10 mm [0.39"]<br/> <u>4 = ø 12 mm [0.47"]</u><br/>           5 = ø 14 mm [0.55"]<br/>           6 = ø 15 mm [0.59"]<br/>           8 = ø 3/8"<br/>           9 = ø 1/2"</p> |  | <p><b>c Interface / power supply</b><br/> <u>B = EtherCAT / 10 ... 30 V DC</u></p> <p><b>d Type of connection</b><br/> <u>removable bus terminal cover</u><br/> <u>2 = 3 x M12 connector, 4-pin</u></p> |          | <p><b>e Fieldbus profile</b><br/> <u>B2 = EtherCAT with CoE (CAN over EtherNet)</u></p> <p>Optional on request<br/>           - Ex 2/22<br/>           - surface protection salt spray tested</p> |  |  |

1) Preferred type only in conjunction with flange type 2.  
 2) Preferred type only in conjunction with flange type 1.

# Absolute encoders - singleturn

| Standard optical  | Sendix 5858 / 5878 (shaft / hollow shaft)  | EtherCAT                    |
|---|--|-----------------------------|
| <b>Mounting accessory for shaft encoders</b>  |  | Order no.                   |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]                              | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]                             | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>                                   |  | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]  |                             |
|   | with fixing thread<br>   | <b>8.0010.4700.0000</b>     |
| <b>Connection technology</b>  |  | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 male connector with external thread for port IN and port OUT, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6031.4411.002M</b> |
|   | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable          | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 male connector with external thread for port IN and port OUT, 4-pin                          | <b>05.WACSY4S</b>           |
|   | M12 female connector with coupling nut for power supply, 4-pin                                   | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |                             |  |
|--|-----------------------------|--|
| <b>Mechanical characteristics</b>  |                             |  |
| <b>Maximum speed</b>   | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |
|  | IP65 up to T <sub>max</sub> | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|  | IP67 up to 70°C [158°F]     | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|  | IP67 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>  | IP65                        | < 0.01 Nm  |
|  | IP67                        | < 0.05 Nm  |
| <b>Mass moment of inertia</b>  | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|  | hollow shaft version        | 6.9 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>  | radial                      | 80 N   |
|  | axial                       | 40 N   |
| <b>Weight</b>  |                             | approx. 0.50 kg [17.64 oz]                                   |
| <b>Protection acc. to EN 60529</b>   | housing side                | IP67   |
|  | shaft side                  | IP65, opt. IP67  |
| <b>Working temperature range</b>   |                             | -40°C ... +80°C [-40°F ... +176°F]                           |
| <b>Material</b>  | shaft/hollow shaft          | stainless steel  |
|  | flange                      | aluminum   |
|  | housing                     | zinc die-cast  |
| <b>Shock resistance acc. to EN 60068-2-27</b>  |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b>   |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |
| <b>Electrical characteristics</b>  |                             |  |
| <b>Power supply</b>  |                             | 10 ... 30 V DC   |
| <b>Power consumption (no load)</b>   |                             | max. 110 mA  |
| <b>Reverse polarity protection of the power supply</b>   |                             | yes  |
| <b>UL approval</b>   |                             | file 224618  |
| <b>CE compliant acc. to</b>  |                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU        |
| <b>Interface characteristics EtherCAT</b>  |                             |  |
| <b>Resolution</b>  |                             | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)     |
| <b>Code</b>  |                             | binary   |
| <b>Protocol</b>  |                             | EtherNet / EtherCAT  |
| <b>Diagnostic LED (red)</b>  |                             |  |
| LED is ON with the following fault conditions:<br>Sensor error (internal code or LED error), low voltage, over-temperature |                             |  |
| <b>Run LED (green)</b>   |                             |  |
| LED is ON with the following conditions:<br>Preop-, Safeop and Op-State (EtherCAT status machine)                          |                             |  |
| <b>2 x Link LEDs (yellow)</b>  |                             |  |
| LED is ON with the following conditions (port IN and port OUT):<br>Link detected   |                             |  |
| <b>Modes</b>   |                             |  |
| Freerun, Distributed Clock   |                             |  |

# Absolute encoders - singleturn

|                         |  |                 |
|-------------------------|--|-----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>EtherCAT</b> |
|-------------------------|--|-----------------|

### General information about CoE (CAN over EtherNet)

The EtherCAT encoders support the CANopen communication profile according to DS301. In addition device-specific profiles like the encoder profile DS406 are available.

Scaling, preset values, limit switch values and many other parameters can be programmed via the EtherCAT bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined as PDO (PDO mapping): **position**, **speed**, **temperature values** and **working area state** as well as other process values.

### CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

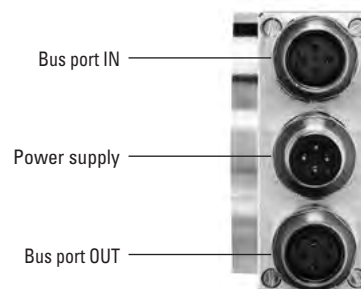
The following parameters are programmable:

- Position update time of 62.5 µs.
- EtherCAT certificate of conformity.
- Speed with sign.
- Four units for speed calculation: steps/sec, steps/100 ms, steps/10 ms, rotation/min.
- Time stamp as system time at the point in time when the position is read out.
- Two working area state registers.
- Along with the scaled position, the raw data – position as process value – is also mappable.
- Dynamic mapping.
- Gating time: setting of the time interval, via which the speed value can be interpolated.
- Sensor temperature in degrees Celsius.
- Comprehensive plausibility test when downloading parameters to the encoder.
- Alarm and warning messages.
- User interface with visual display of bus and fault status – 4 LEDs.
- Extended error management for position sensing with integrated temperature control.
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011.

Absolute encoders singleturn

### Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                | Diagram |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|---------|
|           |                          |              | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
| B         | 2<br>(3 x M12 connector) | Bus port IN  | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Power supply | Signal:              | Voltage +      | –             | Voltage –       | –              |         |
|           |                          |              | Abbreviation:        | + V            | –             | 0 V             | –              |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Bus port OUT | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |



# Absolute encoders - singleturn

**Standard optical**

**Sendix 5858 / 5878 (shaft / hollow shaft)**

**EtherCAT**

## Dimensions shaft version, with removable bus terminal cover

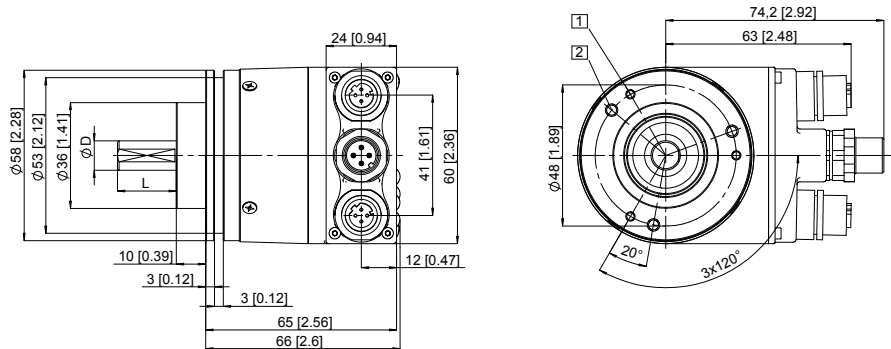
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

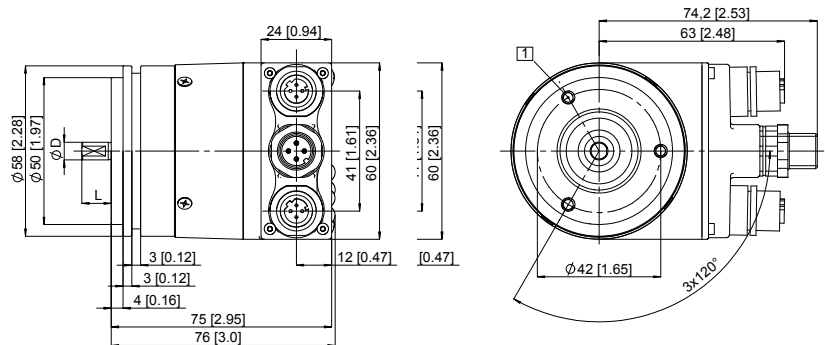


### Synchro flange, $\varnothing$ 58 [2.28]

Flange type 2 and 4

- 1 3 x M4, 6 [0.24] deep

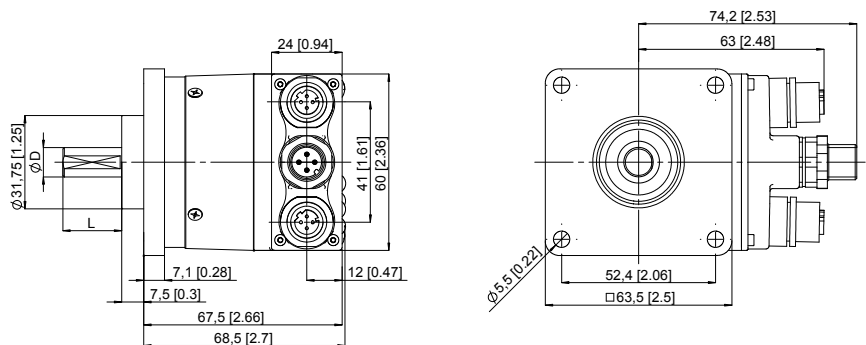
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



### Square flange, $\square$ 63.5 [2.5]

Flange type 5 and 7

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



# Absolute encoders - singleturn

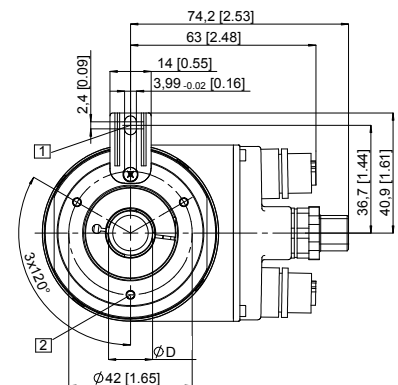
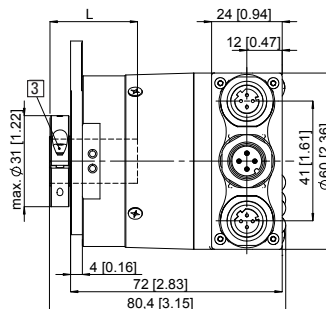
|                         |  |                 |
|-------------------------|--|-----------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>EtherCAT</b> |
|-------------------------|--|-----------------|

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\phi$  4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

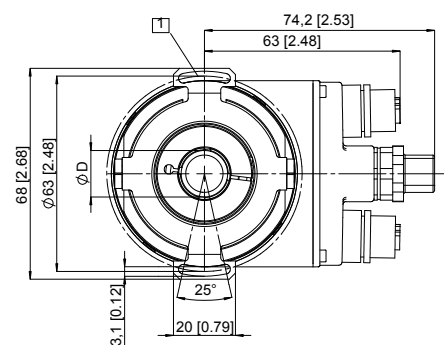
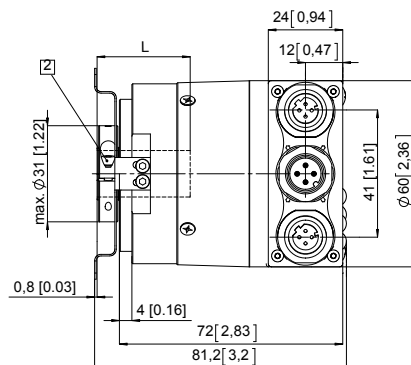


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\phi$ 63 [2.48] Flange type 5 and 6

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm

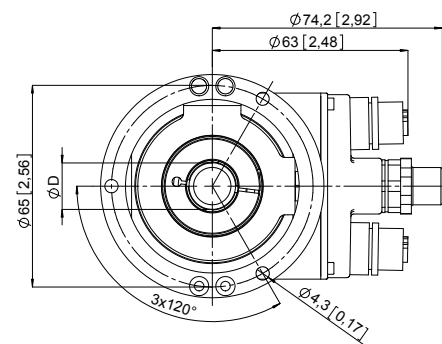
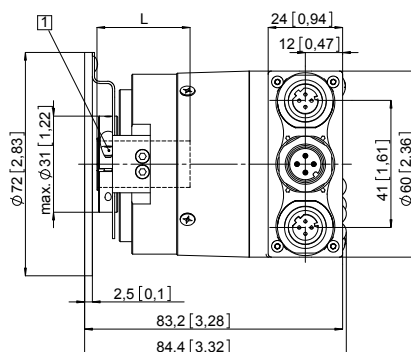


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\phi$ 65 [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

**Standard optical**

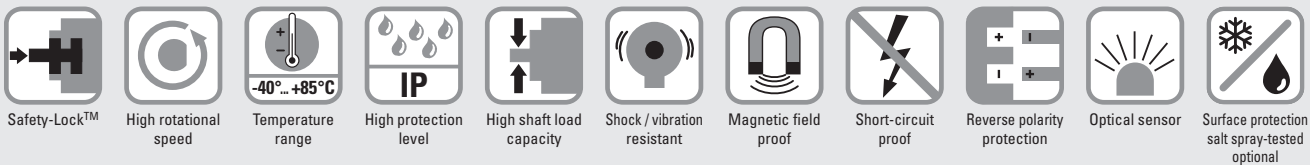
**Sendix 5858 / 5878 (shaft / hollow shaft)**

**PROFINET IO**



The singleturn encoders 5858 and 5878 with PROFINET interface and optical sensor technology are ideal for use in all applications with a PROFINET interface.

The encoder supports the IRT mode and is therefore ideal for real-time applications.



## Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

## Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time  $\leq 1$  ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

## Order code Shaft version

**8.5858** . **XXC2** . **C2 12**  
Type                      a   b   c   d   e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = clamping flange, IP65  $\varnothing$  58 mm [2.28"]**
- 3 = clamping flange, IP67  $\varnothing$  58 mm [2.28"]
- 2 = synchro flange, IP65  $\varnothing$  58 mm [2.28"]**
- 4 = synchro flange, IP67  $\varnothing$  58 mm [2.28"]
- 5 = square flange, IP65  $\square$  63.5 mm [2.5"]
- 7 = square flange, IP67  $\square$  63.5 mm [2.5"]

### b Shaft ( $\varnothing \times L$ ), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>**
- 2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>**
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

### c Interface / power supply

- C = PROFINET IO / 10 ... 30 V DC**

### e Field bus profile

- C2 = PROFINET IO**

### d Type of connection

- 2 = 3 x M12 connector, 4-pin**

Optional on request

- Ex 2/22
- surface protection salt spray tested

## Order code Hollow shaft

**8.5878** . **XXC2** . **C2 12**  
Type                      a   b   c   d   e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65  $\varnothing$  65 mm [2.56"]
- 4 = with stator coupling, IP67  $\varnothing$  65 mm [2.56"]
- 5 = with stator coupling, IP65  $\varnothing$  63 mm [2.48"]**
- 6 = with stator coupling, IP67  $\varnothing$  63 mm [2.48"]

### b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 =  $\varnothing$  10 mm [0.39"]
- 4 =  $\varnothing$  12 mm [0.47"]**
- 5 =  $\varnothing$  14 mm [0.55"]
- 6 =  $\varnothing$  15 mm [0.59"]
- 8 =  $\varnothing$  3/8"
- 9 =  $\varnothing$  1/2"

### c Interface / power supply

- C = PROFINET IO / 10 ... 30 V DC**

### e Field bus profile

- C2 = PROFINET IO**

### d Type of connection

- 2 = 3 x M12 connector, 4-pin**

Optional on request

- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.  
2) Preferred type only in conjunction with flange type 1.

# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|-------------------------|--|--------------------|

| Mounting accessory for shaft encoders |  | Order no.               |
|---------------------------------------|--|-------------------------|
| <b>Coupling</b>                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders  |   | Order no.               |
|---|---|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]<br>with fixing thread<br> | <b>8.0010.4700.0000</b> |

| Connection technology                      |   | Order no.                   |
|--|---|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 male connector with external thread for port 1 and port 2, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6031.4411.002M</b> |
|  | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable       | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 male connector with external thread for port 1 and port 2, 4-pin                          | <b>05.WASCSY4S</b>          |
|  | M12 female connector with coupling nut for power supply, 4-pin                                | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |                             |  |
|--|-----------------------------|--|
| <b>Maximum speed</b>                             | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |
|  | IP65 up to T <sub>max</sub> | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|  | IP67 up to 70°C [158°F]     | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|  | IP67 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>          | IP65                        | < 0.01 Nm  |
|  | IP67                        | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|  | hollow shaft version        | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                    | radial                      | 80 N   |
|  | axial                       | 40 N   |
| <b>Weight</b>                                    |                             | approx. 0.50 kg [17.64 oz]                                   |
| <b>Protection</b> acc. to EN 60529               | housing side                | IP67   |
|  | shaft side                  | IP65, opt. IP67  |
| <b>Working temperature range</b>                 |                             | -40°C ... +85°C [-40°F ... +185°F]                           |
| <b>Material</b>                                  | shaft/hollow shaft          | stainless steel  |
|  | flange                      | aluminum   |
|  | housing                     | zinc die-cast  |
| <b>Shock resistance</b> acc. to EN 60068-2-27    |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance</b> acc. to EN 60068-2-6 |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption</b> (no load)                     | max. 200 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant</b> acc. to                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics PROFINET IO |  |
|---------------------------------------|--|
| <b>Resolution</b>                     | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit) |
| <b>Code</b>                           | binary   |
| <b>Protocol</b>                       | PROFINET IO  |

| Link 1 and 2, LED (green / yellow) |        |               |
|------------------------------------|--------|---------------|
| Two colored                        | green  | active link   |
|                                    | yellow | data transfer |

| Error LED (red) / PWR LED (green) |  |
|-----------------------------------|--|
| Functionality see manual          |  |



# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|-------------------------|--|--------------------|

### General information about PROFINET IO

The PROFINET encoder implements the encoder profile 4.1. (according to the specification Encoder Version 4.1 Dec 2008“)

It permits scaling and preset values, as well as many other additional parameters to be programmed via the PROFINET bus.

When switching on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure, or taken over by the controller in the start-up phase.

Position, speed and many other states of the encoder can be transmitted.

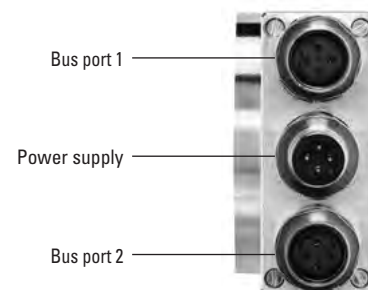
### PROFINET IO

The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**rotocol is implemented here. Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

### Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                | Diagram |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|---------|
|           |                          |              | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
| C         | 2<br>(3 x M12 connector) | Bus port 1   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Power supply | Signal:              | Voltage +      | -             | Voltage -       | -              |         |
|           |                          |              | Abbreviation:        | + V            | -             | 0 V             | -              |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Bus port 2   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |





# Absolute encoders - singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix 5858 / 5878 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|-------------------------|--|--------------------|

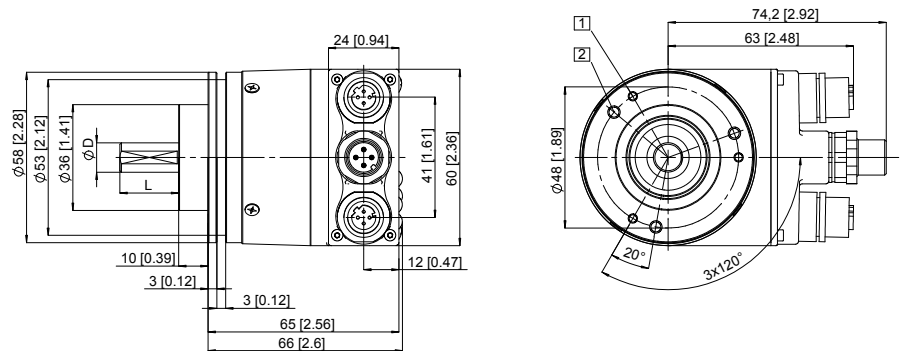
## Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28] Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep

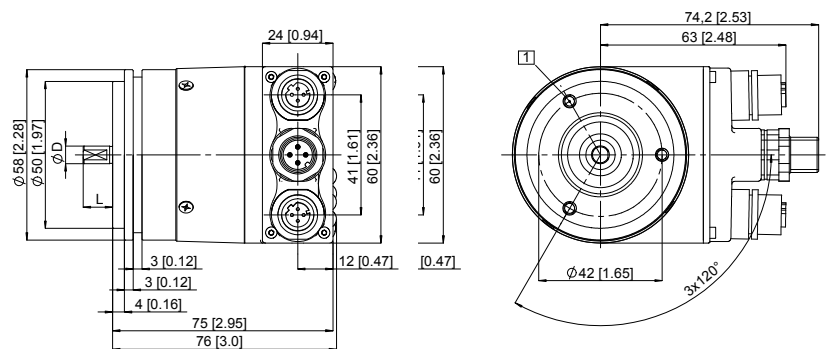
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



### Synchro flange, $\varnothing$ 58 [2.28] Flange type 2 and 4

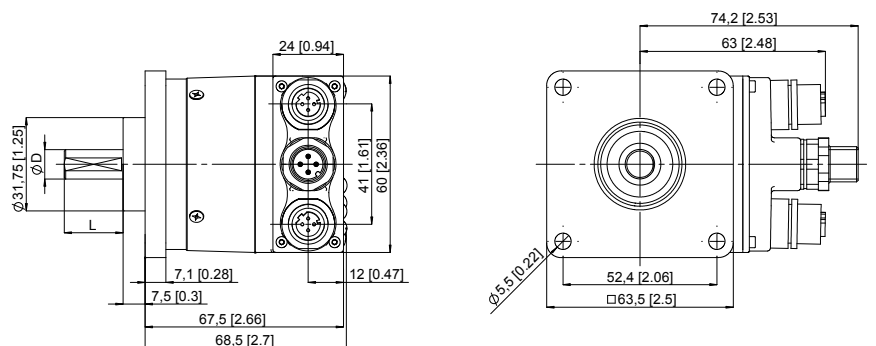
- 1 3 x M4, 6 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



### Square flange, $\square$ 63.5 [2.5] Flange type 5 and 7

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |



# Absolute encoders - singleturn

**Standard optical**

**Sendix 5858 / 5878 (shaft / hollow shaft)**

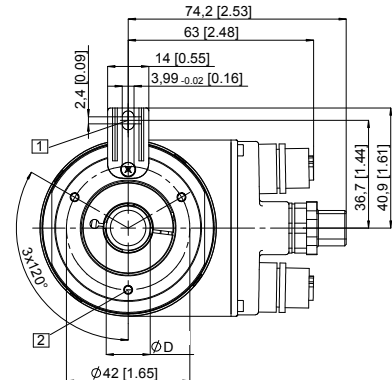
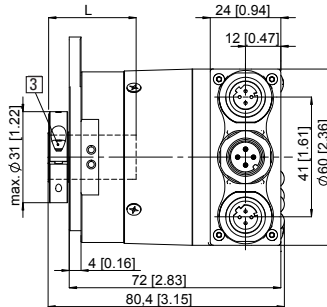
**PROFINET IO**

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

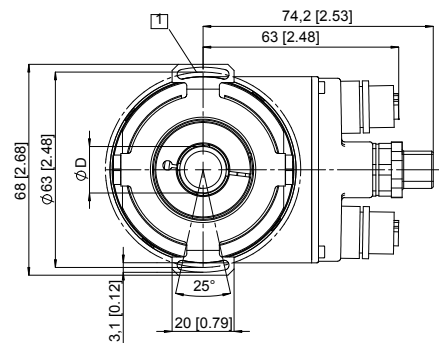
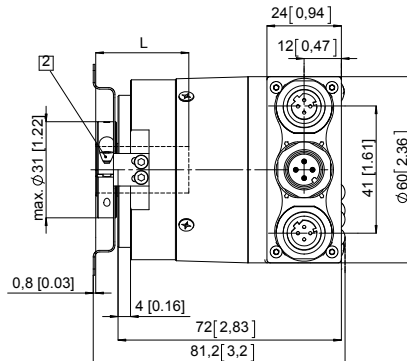


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm

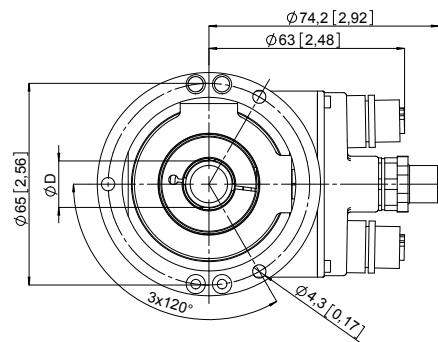
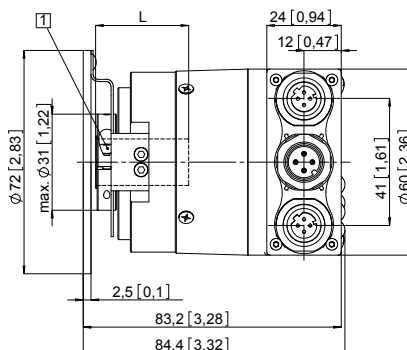


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix F5858 / F5878 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|-------------------------|--|--------------------|



The Sendix F58 singleturn is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity.

16 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.



**EtherNet/IP™**



Safety-Lock™



High rotational speed



Temperature range  
-40°... +80°C



High protection level  
IP65



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor

## Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.
- Wide temperature range, -40°C ... +80°C.

### Order code Shaft version

**8.F5858 . XXAN . A2 2 2**  
Type

**a** Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]

**b** Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]
- 2 = 10 x 20 mm [0.39 x 0.79"]
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

**c** Interface / Power supply

- A = EtherNet IP / 10 ... 30 V DC

**e** Fieldbus profile

- A2 = EtherNet/IP

**d** Type of connection

- N = 3 x axial M12 connector, 4-pin

Optional on request

- Ex 2/22

### Order code Hollow version

**8.F5878 . XXAN . A2 2 2**  
Type

**a** Flange

- 1 = with spring element long, IP65
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]

**b** Blind hollow shaft

(insertion depth max. 30 mm [1.18"])

- A = ø 10 mm [0.39"]
- B = ø 12 mm [0.47"]
- C = ø 14 mm [0.55"]
- D = ø 15 mm [0.59"]
- E = ø 3/8"
- F = ø 1/2"

**c** Interface / Power supply

- A = EtherNet IP / 10 ... 30 V DC

**e** Fieldbus profile

- A2 = EtherNet/IP

**d** Type of connection

- N = 3 x axial M12 connector, 4-pin

Optional on request

- Ex 2/22

# Absolute encoders – singleturn

| Standard optical  | Sendix F5858 / F5878 (shaft / hollow shaft)   | EtherNet/IP                 |
|---|---|-----------------------------|
| <b>Mounting accessory for shaft encoders</b>                                      |   | Order no.                   |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]                           | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]                          | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>                               |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1) | Dimensions in mm [inch]   | <b>8.0010.4700.0000</b>     |
|   | with fixing thread  |                             |
|   |   |                             |
| <b>Connection technology</b>  |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 male connector with external thread for port 1 and port 2, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6031.4411.002M</b> |
|   | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable       | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 male connector with external thread for port 1 and port 2, 4-pin                          | <b>05.WACSY4S</b>           |
|   | M12 female connector with coupling nut for power supply, 4-pin                                | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |                             |  |
|---|-----------------------------|--|
| <b>Mechanical characteristics</b>                           |                             |  |
| <b>Max. speed shaft version</b>                             | IP65 up to 70°C             | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|   | IP65 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
| <b>Max. speed hollow shaft version</b>                      | IP65 up to 70°C             | 6000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|   | IP65 up to T <sub>max</sub> | 4000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque at 20°C [68°F]</b>                       |                             | < 0.01 Nm  |
| <b>Moment of inertia</b>                                    | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|   | hollow shaft version        | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                               | radial                      | 80 N   |
|   | axial                       | 40 N   |
| <b>Weight</b>   |                             | approx. 0.45 kg  |
| <b>Protection acc. to EN 60529</b>                          |                             | IP65   |
| <b>Working temperature range</b>                            |                             | -40°C ... +80°C [-40°F ... +176°F]                           |
| <b>Material</b>   | shaft/hollow shaft          | stainless steel  |
|   | flange                      | aluminum   |
|   | housing                     | aluminum   |
| <b>Shock resistance acc. EN 60068-2-27</b>                  |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. EN 60068-2-6</b>               |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |
| <b>Electrical characteristics</b>                           |                             |  |
| <b>Power supply</b>   |                             | 10 ... 30 V DC   |
| <b>Power consumption (no load)</b>                          |                             | max. 250 mA  |
| <b>Reverse polarity protection of the power supply (+V)</b> |                             | yes  |
| <b>UL approval</b>  |                             | File 224618  |
| <b>CE compliant acc. to</b>                                 |                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU        |
| <b>Interface characteristics EtherNet/IP</b>                |                             |  |
| <b>Resolution</b>   |                             | 1 ... 65.536 (16 bit), scalable<br>default: 65.536 (16 bit)  |
| <b>Code</b>   |                             | binary   |
| <b>Protocol</b>   |                             | EtherNet/IP  |

# Absolute encoders – singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix F5858 / F5878 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|-------------------------|--|--------------------|

## General information about EtherNet/IP

EtherNet/IP conformance tested acc. to version CT-12 of 11. Dez. 2014  
 EtherNet/IP specification Vol 2, Ed 1.17  
 CIP specification Vol 1, Ed 3.16

## The following functionalities are integrated

### Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Position
- Diagnosis
- Position limit
- Warning messages

### Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Parameter Object
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

### EtherNet/IP features

- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

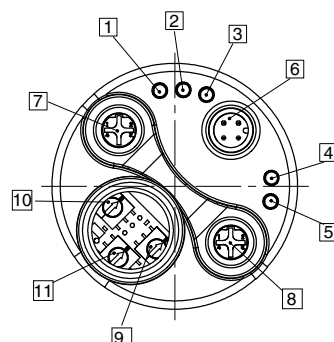
 Absolute encoders  
singleturn

## Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                |  |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|--|
| A         | N<br>(3 x M12 connector) | Bus Port 1   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |  |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |  |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |  |
|           |                          | Power supply | Signal:              | Voltage +      | –             | Voltage –       | –              |  |
|           |                          |              | Abbreviation:        | + V            | –             | 0 V             | –              |  |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |  |
|           |                          | Bus Port 2   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |  |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |  |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |  |

## Rear side connections and display elements

- 1 LED: Link 1
- 2 LED: Mod.
- 3 LED: Net.
- 4 LED: Encoder
- 5 LED: Link 2
- 6 Power
- 7 Port 1
- 8 Port 2
- 9 Switch: x1
- 10 Switch: x100
- 11 Switch: x10



# Absolute encoders – singleturn

**Standard optical**

**Sendix F5858 / F5878 (shaft / hollow shaft)**

**EtherNet/IP**

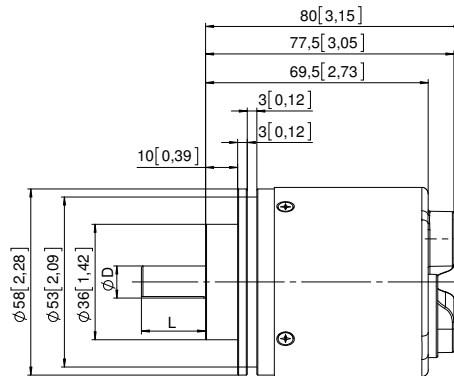
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 1

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

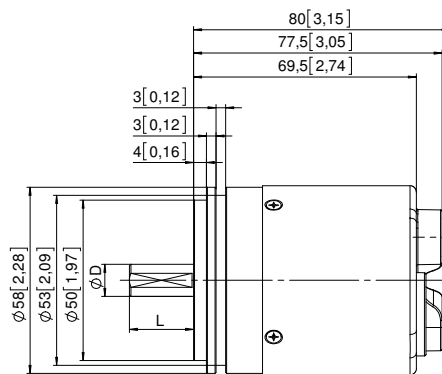


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Synchro flange, ø 58 [2.28]

#### Flange type 2

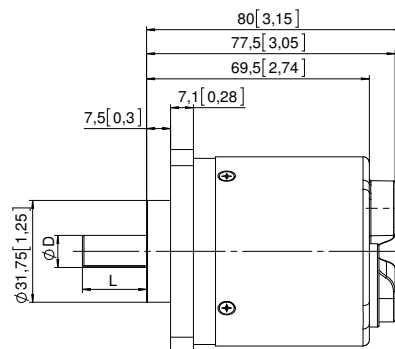
- 1 3 x M3, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### Square flange, □ 63.5 [2.5]

#### Flange type 5



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

# Absolute encoders – singleturn

|                         |  |                    |
|-------------------------|--|--------------------|
| <b>Standard optical</b> | <b>Sendix F5858 / F5878 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|-------------------------|--|--------------------|

## Dimensions hollow shaft version

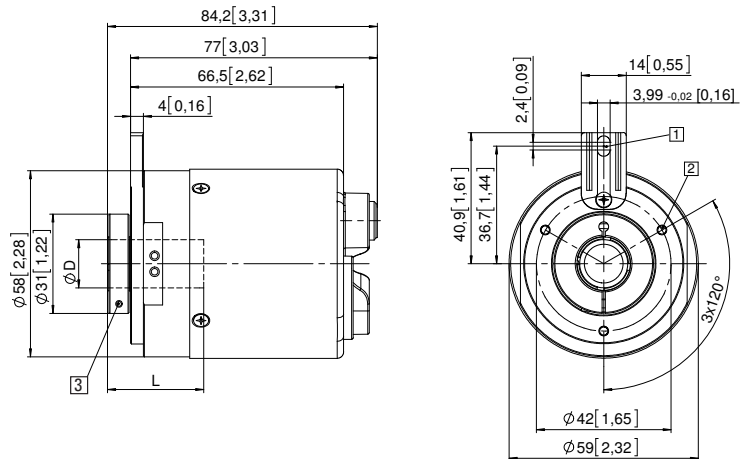
Dimensions in mm [inch]

### Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

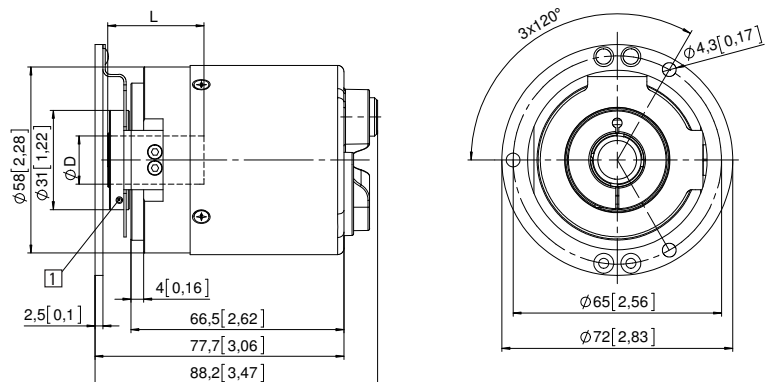


### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

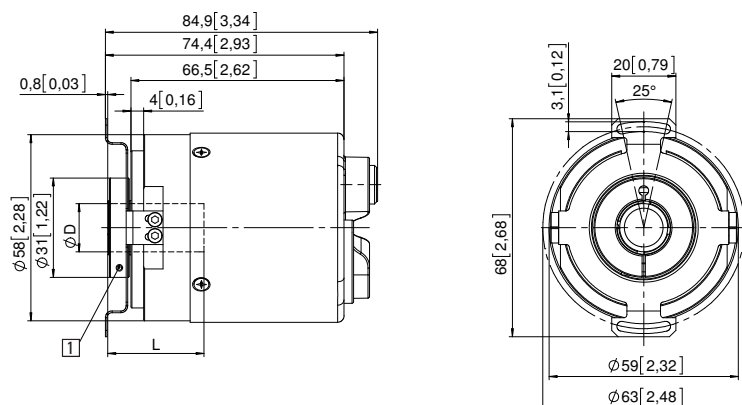


### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



# Absolute encoders - singleturn

|  |                            |                      |
|--|----------------------------|----------------------|
| <b>Standard stainless steel, optical</b> | <b>5876 (hollow shaft)</b> | <b>SSI, parallel</b> |
|--|----------------------------|----------------------|



The singleturn encoder 5876 with SSI or parallel interface and optical sensor technology boasts a hollow shaft of up to 12 mm. It offers a maximum resolution of 14 bits, divided over 360°.



|                   |                             |                     |                             |                |
|-------------------|-----------------------------|---------------------|-----------------------------|----------------|
|                   |                             |                     |                             |                |
| Temperature range | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Optical sensor |

## Safe

- A protection level of IP67 as well as the wide temperature range of -20°C to +80°C allow error-free operation even under the toughest working conditions.
- The stainless-steel (1.4305) housing withstands even the most extreme external influences.

## Adaptable

- Available with a choice of M12 connector or as cable version.
- Gray, binary or BCD code for parallel interface.
- Wide range of possible applications thanks to numerous input options.

## Order code hollow shaft

**8.5876** . **XXXX** . **XXXX**

Type      a b c d      e f

- |   |  |   |
|---|--|---|
| <p><b>a Flange</b><br/>1 = with through hollow shaft, ø 58 mm [2.28"]<br/>2 = with blind hollow shaft, ø 58 mm [2.28"]</p> <p><b>b Hollow shaft</b><br/>(insertion depth blind hollow shaft with flange 2 max. 30 mm [1.18"])<br/>6 = ø 10 mm [0.39"]<br/>8 = ø 12 mm [0.47"]</p> | <p><b>c Interface / power supply</b><br/>1 = SSI / 5 V DC<br/>2 = SSI / 10 ... 30 V DC<br/>3 = parallel / 5 V DC<br/>4 = parallel / 10 ... 30 V DC</p> <p><b>d Type of connection</b><br/>1 = radial cable, 1 m [3.28] PVC<br/>2 = radial M12 connector, 8-pin, without mating connector <sup>1)</sup></p> | <p><b>e Code type and division</b><br/>see table 1 (at interface 3 and 4, parallel)<br/>see table 2 (at interface 1 and 2, SSI)</p> <p><b>f Options</b><br/>2 = SET and V/R<br/>3 = SET and Latch <sup>2)</sup><br/>4 = V/R and Latch <sup>2)</sup></p> <p><i>Optional on request</i><br/>- Ex 2/22 <sup>3)</sup></p> |
|---|--|---|

**Table 1: Code type and divisions for encoders with parallel output**

| Division                      | Interface and power supply, version 3 or 4 (parallel) |     |     |     |     |      |                |      |      |      |      |      |      |      |      |                |      |      |                |                 |
|-------------------------------|---|-----|-----|-----|-----|------|----------------|------|------|------|------|------|------|------|------|----------------|------|------|----------------|-----------------|
|                               | 250   | 360 | 500 | 720 | 900 | 1000 | 1024<br>10 bit | 1250 | 1440 | 1800 | 2000 | 2500 | 2880 | 3600 | 4000 | 4096<br>12 bit | 5000 | 7200 | 8192<br>13 bit | 16384<br>14 bit |
| Order code gray / gray-excess | E02   | E03 | E05 | E07 | E09 | E01  | G10            | E12  | E14  | E18  | E20  | E25  | E28  | E36  | E40  | G12            | E50  | E72  | G13            | G14             |
| Order code binary             | B02   | B03 | B05 | B07 | B09 | B01  | B10            | BA2  | BA1  | B18  | B20  | B25  | B28  | B36  | B40  | B12            | B50  | B72  | B13            | B14             |
| Order code BCD                | D02   | D03 | D05 | D07 | D09 | D01  | D10            | DA2  | DA1  | D18  | D20  |      |      |      |      |                |      |      |                |                 |

**Table 2: Code type and SSI output**

| Interface / power supply, version 1 or 2 |                |                |                |                 |
|--|----------------|----------------|----------------|-----------------|
| Division                                 | 1024<br>10 bit | 4096<br>12 bit | 8192<br>13 bit | 16384<br>14 bit |
| Order code gray                          | G10            | G12            | G13            | G14             |
| Order code binary                        | B10            | B12            | B13            | B14             |

1) Only in conjunction with SSI output.  
2) Not with SSI interface.  
3) For the cable connection type, cable material PUR.



# Absolute encoders - singleturn

|  |                            |                      |
|--|----------------------------|----------------------|
| <b>Standard stainless steel, optical</b> | <b>5876 (hollow shaft)</b> | <b>SSI, parallel</b> |
|--|----------------------------|----------------------|

## Technical data

### Mechanical characteristics

|   |   |  |  |
|---|---|--|--|
| <b>Maximum speed</b> <sup>1)</sup>      | 6000 min <sup>-1</sup>                        | <b>Working temperature range</b>                 | -20°C ... +80°C <sup>2)</sup><br>[-4°F ... +176°F] <sup>2)</sup> |
| <b>Mass moment of inertia</b>           | approx. 6 x 10 <sup>-6</sup> kgm <sup>2</sup> | <b>Material</b>                                  | shaft / housing stainless steel                                  |
| <b>Starting torque</b> - at 20°C [68°F] | < 0.05 Nm                                     | <b>Shock resistance</b> acc. to EN 60068-2-27    | 2500 m/s <sup>2</sup> , 6 ms                                     |
| <b>Weight</b>                           | approx. 0.6 kg [21.16 oz]                     | <b>Vibration resistance</b> acc. to EN 60068-2-6 | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                            |
| <b>Protection</b> acc. to EN 60529      | IP67  |  |  |

### Electrical characteristics

| Interface type  | Synchronous serial (SSI)  | Synchronous serial (SSI) | Parallel                      | Parallel             |
|---|---|--------------------------|-------------------------------|----------------------|
| <b>Power supply (+V)</b>                                | 5 V DC (±5 %)   | 10 ... 30 V DC           | 5 V DC (±5 %)                 | 10 ... 30 V DC       |
| <b>Output driver</b>                                    | RS485   | RS485                    | Push-pull                     | Push-pull            |
| <b>Power consumption</b> (no load)                      | typ. 89 mA<br>max. 138 mA   | 89 mA<br>138 mA          | 109 mA<br>169 mA              | 109 mA<br>169 mA     |
| <b>Permissible load / channel</b>                       | max. +/- 20 mA  | max. +/- 20 mA           | max. +/- 10 mA                | max. +/- 10 mA       |
| <b>Update rate</b>                                      | max. 15000/s  | max. 15000/s             | 40000/s                       | 40000/s              |
| <b>SSI clock rate min./max.</b>                         | 100 kHz / 500 kHz   | 100 kHz / 500 kHz        | –                             | –                    |
| <b>Signal level HIGH</b>                                | typ. 3.8 V  | typ. 3.8 V               | min. 3.4 V                    | min. +V - 2.8 V      |
| <b>Signal level LOW</b>                                 | (I <sub>Load</sub> = 20 mA) typ. 1.3 V<br>(I <sub>Load</sub> = 10 mA) –<br>(I <sub>Load</sub> = 1 mA) – | typ. 1.3 V<br>–<br>–     | –<br>max. 1.5 V<br>max. 0.3 V | –<br>max. 1.8 V<br>– |
| <b>Rising edge time</b> t <sub>r</sub> (without cable)  | max. 100 ns   | max. 100 ns              | max. 0.2 μs                   | max. 1 μs            |
| <b>Falling edge time</b> t <sub>f</sub> (without cable) | max. 100 ns   | max. 100 ns              | max. 0.2 μs                   | max. 1 μs            |
| <b>Short circuit proof outputs</b> <sup>3)</sup>        | yes   | yes <sup>4)</sup>        | yes                           | yes                  |
| <b>Reverse polarity protection of the power supply</b>  | no  | yes                      | no                            | yes                  |
| <b>UL approval</b>                                      | file 224618   |                          |                               |                      |
| <b>CE compliant</b> acc. to                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |                          |                               |                      |

## Control inputs

### Switching levels of the control inputs

|                        |                             |                    |
|------------------------|-----------------------------|--------------------|
| Power supply           | 5 V DC                      | 10 ... 30 V DC     |
| <b>Switching level</b> | LOW ≤ 1.7 V<br>HIGH ≥ 3.4 V | ≤ 4.5 V<br>≥ 8.7 V |

### Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly decreasing code values.

As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is :

|                                 |        |
|---------------------------------|--------|
| for 5 V DC power supply         | 0.4 ms |
| for 10 ... 30 V DC power supply | 2 ms   |

### SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the new zero position in the encoder.

Note : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is :

|                                 |        |
|---------------------------------|--------|
| for 5 V DC power supply         | 0.4 ms |
| for 10 ... 30 V DC power supply | 2 ms   |

### LATCH input

This input is used to "freeze" the current position value. The position value will be statically available on the parallel output as long as this input remains active (HIGH).

The response time is :

|                                 |        |
|---------------------------------|--------|
| for 5 V DC power supply         | 140 μs |
| for 10 ... 30 V DC power supply | 200 μs |

1) For continuous operation max. 1500 min<sup>-1</sup>.

2) 70°C [158°F] cable version.

3) If power supply +V correctly applied.

4) Only one channel allowed to be shorted-out:  
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.  
at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

# Absolute encoders - singleturn

|  |                            |                      |
|--|----------------------------|----------------------|
| <b>Standard stainless steel, optical</b> | <b>5876 (hollow shaft)</b> | <b>SSI, parallel</b> |
|--|----------------------------|----------------------|

## Terminal assignment

### SSI interface

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |    |    |    |    |    |    |    |  |
|-----------|--------------------|---|----|----|----|----|----|----|----|----|--|
|           |                    | Signal  | 0V | +V | C+ | C- | D+ | D- | ST | VR |  |
| 1, 2      | 1                  | Cable color:  | WH | BN | GN | YE | GY | PK | BU | RD |  |
|           |                    | Pin:  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |  |

Top view of mating side, male contact base



M12 connector, 8-pin

### Parallel interface up to max. 14 bit and max. 2 options

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |       |    |    |
|-----------|--------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|----|----|
|           |                    | Signal  | 0V | +V | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | ST/VR | VR/LH | 14 | ⊥  |
| 3, 4      | 1                  | Cable color:  | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY | RD | WH | BN | WH | YE    | WH    | GY | PH |
|           |                    |   |    |    |    |    |    |    |    |    |    |    | PK | BU | GN | GN | YE | BN    | GY    | BN |    |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 etc.
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning.
- LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
- PH ⊥: Plug connector housing (shield)

# Absolute encoders - singleturn

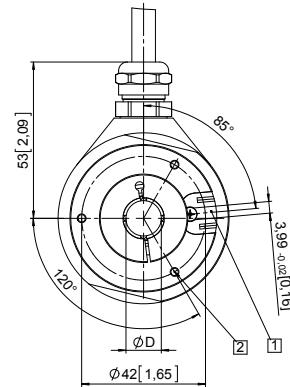
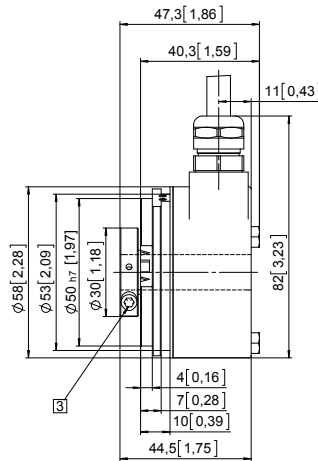
|  |                            |                      |
|--|----------------------------|----------------------|
| <b>Standard stainless steel, optical</b> | <b>5876 (hollow shaft)</b> | <b>SSI, parallel</b> |
|--|----------------------------|----------------------|

## Dimensions

Dimensions in mm [inch]

### Flange with through hollow shaft, $\varnothing$ 58 [2.28"] Flange type 1

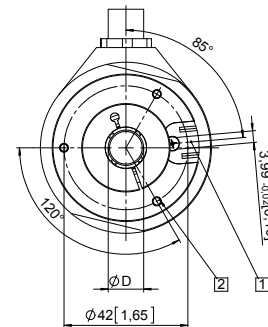
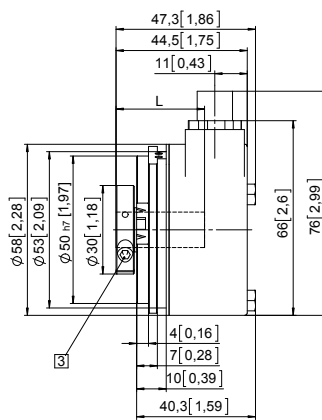
- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 5 [0.2] deep
- 3 Recommended torque for the clamping ring shaft version 6: 0.7 Nm shaft version 8: 1.0 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |

### Flange with blind hollow shaft, $\varnothing$ 58 [2.28"] Flange type 2

- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 5 [0.2] deep
- 3 Recommended torque for the clamping ring shaft version 6: 0.7 Nm shaft version 8: 1.0 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21  
optical

Sendix 7053 / 7073 (shaft / hollow shaft)

SSI / BiSS



The Sendix 7053 / 7073 absolute encoders – singleturn offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code Shaft version

8.7053 . 1 X 2 X . X X 2 1 . XXXX  
Type      a b c d e f g h i <sup>1)</sup>

### a Flange

1 = clamping / synchronous flange, IP67, Ø 70 mm [2.76"]

### b Shaft (Ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

### c Interface / power supply

2 = SSI, BiSS / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 2 m [6.56'] PUR

2 = radial cable, 2 m [6.56'] PUR

A = axial cable, length > 2 m [6.56']

B = radial cable, length > 2 m [6.56']

### e Code

B = SSI, binary

C = BiSS, binary

G = SSI, gray

### f Resolution <sup>2)</sup>

A = 10 bit

1 = 11 bit

2 = 12 bit

3 = 13 bit

4 = 14 bit

7 = 17 bit

### g Inputs / outputs <sup>2)</sup>

2 = SET, DIR input

additional status output

### h Options

1 = no option

### i Cable length in dm <sup>1)</sup>

0050 = 5 m [16.40']

0100 = 10 m [32.81']

0150 = 15 m [49.21']

### Optional on request

- special cable length
- stainless steel version
- other resolutions
- IP65 version for T6

1) Not applicable with connection types 1 and 2.

2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders - singleturn

|   |  |                   |
|---|--|-------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>optical</b> | <b>Sendix 7053 / 7073 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|---|--|-------------------|

|   |   |   |
|---|---|---|
| <b>Order code</b><br><b>Hollow shaft</b>  | <b>8.7073</b><br>Type   | <b>.XX2X.XX21.XXXX</b><br>a b c d e f g h i <sup>1)</sup>   |
| <b>a Flange</b><br>1 = with spring element, short<br>5 = with stator coupling, IP67, ø 65 mm [2.56"]  | <b>e Code</b><br>B = SSI, binary<br>C = BiSS, binary<br>G = SSI, gray   | <b>g Inputs / outputs <sup>2)</sup></b><br>2 = SET, DIR input<br>additional status output   |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 41.5 mm [1.63"])<br>1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]   | <b>f Resolution <sup>2)</sup></b><br>A = 10 bit<br>1 = 11 bit<br>2 = 12 bit<br>3 = 13 bit<br>4 = 14 bit<br>7 = 17 bit | <b>h Options</b><br>1 = no option   |
| <b>c Interface / power supply</b><br>2 = SSI, BiSS / 10 ... 30 V DC   |   | <b>i Cable length in dm <sup>1)</sup></b><br>0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']                  |
| <b>d Type of connection</b><br>1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   | <b>Optional on request</b><br>- special cable length<br>- stainless steel version<br>- other resolutions<br>- IP65 version for T6 |

|   |                         |
|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b>                                | <b>Order no.</b>        |
| <b>Coupling</b><br>bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection Sendix 7053       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7073       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1091 X  |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0020 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 45 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short-circuit proof outputs</b>                  | yes <sup>3)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

1) Not applicable with connection types 1 and 2.  
2) Resolution, preset value and counting direction factory-programmable.  
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|   |  |                   |
|---|--|-------------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7053 / 7073 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|---|--|-------------------|

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque - at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution</b>   | 10 ... 14 bit and 17 bit                                     |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | resolution ≤ 14 bit < 1 μs<br>resolution ≥ 15 bit 4 μs       |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface   |  |
|--|--|
| <b>Resolution</b>  | 10 ... 14 bit and 17 bit                               |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>- CRC data verification</li> </ul> |  |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |      |       |        |  |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|------|-------|--------|--|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | Stat | ⊥     | ⊥      |  |
| 2         | 1, 2, A, B         | SET, DIR | Cable marking:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9    | YE/GN | shield |  |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 C+, C-: Clock signal  
 D+, D-: Data signal  
 SET: Set input

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull-up resistor 22 kOhm |
| <b>Permissible load</b>  | max. 20 mA  |
| <b>Signal level</b>  | HIGH +V<br>LOW < 1 V                              |
| <b>Active at</b>   | LOW   |
| The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation. |   |

| SET input   |  |
|---|--|
| <b>Input</b>  | HIGH active  |
| <b>Input type</b>   | comparator   |
| <b>Signal level</b><br>(+V = power supply)  | HIGH min. 60% of +V<br>max. +V<br>LOW max. 25% of +V |
| <b>Input current</b>  | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>  | 10 ms  |
| <b>Timeout after SET signal</b>   | 14 ms  |
| The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |  |

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

# Absolute encoders - singleturn

|   |  |                   |
|---|--|-------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>optical</b> | <b>Sendix 7053 / 7073 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|---|--|-------------------|

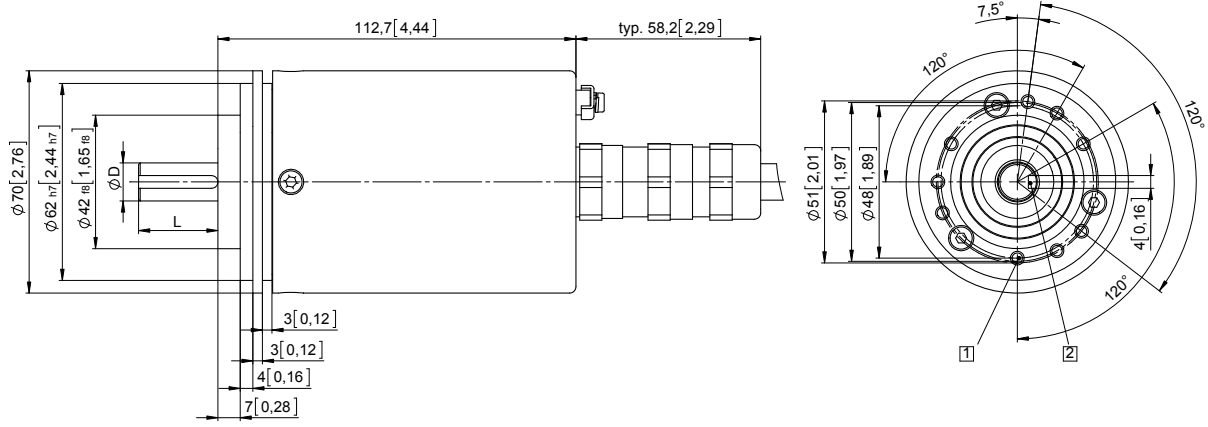
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

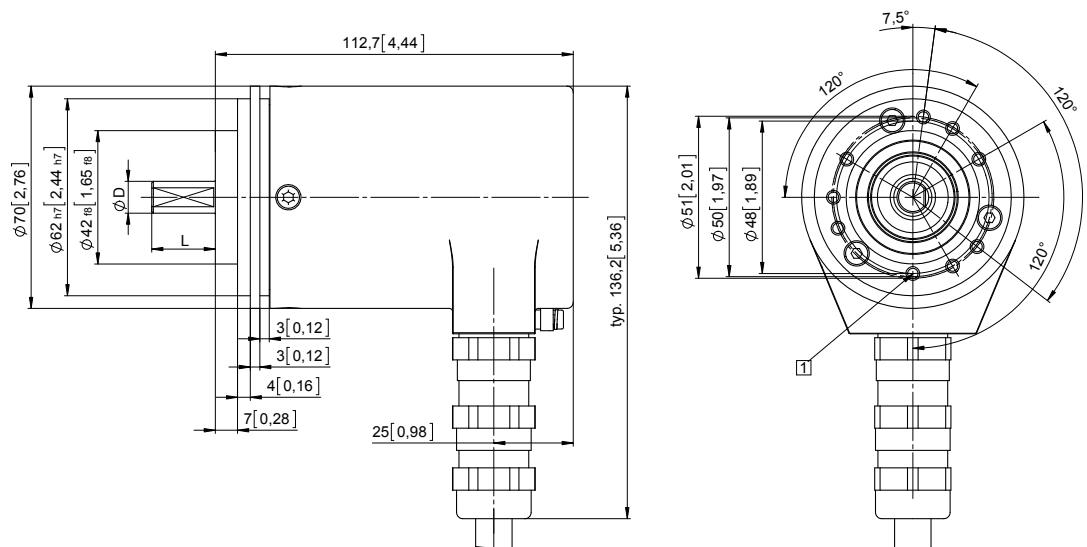


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |





# Absolute encoders - singleturn

|   |                            |                     |
|---|----------------------------|---------------------|
| Standard, ATEX/IECEX – zone 1/21<br>SIL2/PLd, optical | Sendix SIL 7053FS2 (shaft) | SSI / BiSS + SinCos |
|---|----------------------------|---------------------|



Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|------------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable |

Absolute encoders singleturn

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

**Order code** 8.7053FS2 . 1 X 4 X . X X 2 1 . XXXX  
**Shaft version** Type a b c d e f g h i 1)

- |  |   |  |
|--|---|--|
| <p><b>a Flange</b><br/>1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b Shaft (ø x L)</b><br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c Interface / power supply</b><br/>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']<br/>preferred length see <b>i</b>, e. g.: 0100 = 10 m [32.81']</p> | <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f Resolution 2)</b><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> | <p><b>g Inputs / outputs 2)</b><br/>2 = SET input</p> <p><b>h Options</b><br/>1 = no option</p> <p><b>i Cable length in dm 1)</b><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- special cable length<br/>- stainless steel version<br/>- other resolutions</p> |
|--|---|--|

1) Not applicable with connection types 1 and 2.  
 2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders - singleturn

|   |   |                          |
|---|---|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 7053FS2 (shaft)</b>   | <b>SSI/BiSS + SinCos</b> |
| <b>Accessories</b>  |   |                          |
| <b>EMC shield terminal</b>                                    | for top-hat rail mounting   | <b>8.0000.4G06.0000</b>  |
| <b>Screw retention</b>  | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b>  |
| <b>Bellows coupling, safety-oriented</b>                      | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                          |
| <b>Safety modules Safety-M compact / modular</b>              | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                          |
| <b>LED SSI display 570 / 575</b>                              | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |                          |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

|  |  |   |
|--|--|---|
| <b>Technical data</b>  |  |   |
| <b>Explosion protection</b>  |  |   |
| <b>ATEX</b>  |  |   |
| <b>EC type-examination certificate</b>   | PTB09 ATEX 1106 X  |   |
| <b>Category (gas)</b>  | II 2 G Ex d IIC T4 - T6 Gb   |   |
| <b>Category (dust)</b>   | II 2D Ex tb IIIC T135°C - T85°C Db   |   |
| <b>Relevant standards</b>  | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009   |   |
| <b>IECEX</b>   |  |   |
| <b>Certificate of Conformity (CoC)</b>   | IECEX PTB 13.0026 X  |   |
| <b>Category (gas)</b>  | Ex d IIC T4 - T6 Gb  |   |
| <b>Category (dust)</b>   | Ex tb IIIC T135°C - T85°C Db   |   |
| <b>Relevant standards</b>  | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008  |   |
| <b>Notes regarding "Functional Safety"</b>   |  |   |
| These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual. |  |   |
| <b>Safety characteristics</b>  |  |   |
| <b>Classification</b>  | PLd / SIL2   |   |
| <b>System structure</b>  | 2 channel (Cat. 3)   |   |
| <b>PFH<sub>d</sub> value <sup>1)</sup></b>   | 2.16 x 10 <sup>-8</sup> h <sup>-1</sup>  |   |
| <b>Mission time / Proof test interval</b>  | 20 years   |   |
| <b>Relevant standards</b>  | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007  |   |
| <b>Electrical characteristics</b>  |  |   |
| <b>Power supply</b>  | 10 ... 30 V DC   |   |
| <b>Current consumption (no load)</b>   | max. 45 mA   |   |
| <b>Reverse polarity protection for power supply</b>  | yes  |   |
| <b>Short circuit proof outputs</b>   | yes <sup>2)</sup>  |   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU         |   |
| <b>EMC</b>   |  |   |
| <b>Relevant standards</b>  | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013             |   |
| <b>Mechanical characteristics</b>  |  |   |
| <b>Maximum speed</b>   | 6000 min <sup>-1</sup> (continuous)  |   |
| <b>Starting torque – at 20°C [68°F]</b>  | < 0.05 Nm  |   |
| <b>Mass moment of inertia</b>  | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |   |
| <b>Load capacity of shaft</b>  | radial   | 80 N  |
|  | axial  | 40 N  |
| <b>Weight</b>  | approx. 1.3 kg [45.86 oz]  |   |
| <b>Protection acc. to EN 60529</b>   | IP67   |   |
| <b>Ambient temperature</b>   | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |   |
| <b>Material</b>  | shaft  | stainless steel                                 |
|  | flange / housing   | seawater durable Al, type AlSiMgMn (EN AW-6082) |
|  | cable  | PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>  | 500 m/s <sup>2</sup> , 11 ms   |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b>   | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |   |

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|   |                                   |                          |
|---|-----------------------------------|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, optical</b> | <b>Sendix SIL 7053FS2 (shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|-----------------------------------|--------------------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution</b>   | 10 ... 14 bit and 17 bit                                     |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | resolution ≤ 14 bit ≤ 1 μs<br>resolution ≥ 15 bit 4 μs       |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface   |  |
|--|--|
| <b>Resolution</b>  | 10 ... 14 bit and 17 bit                               |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |  |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>1)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | HIGH active  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = Power supply) | HIGH min. 60 % of +V<br>max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Timeout after SET signal</b>            | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |   |           |   |           |         |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|---|-----------|---|-----------|---------|
| 4         | 1, 2, A, B         | SET      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |
|           |                    |          | Cable marking:  | 6   | 1  | 2  | 3  | 4  | 5  | 11  | 7 | 8         | 9 | 10        | shield  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21  
SIL2/PLd, optical**

**Sendix SIL 7053FS2 (shaft)**

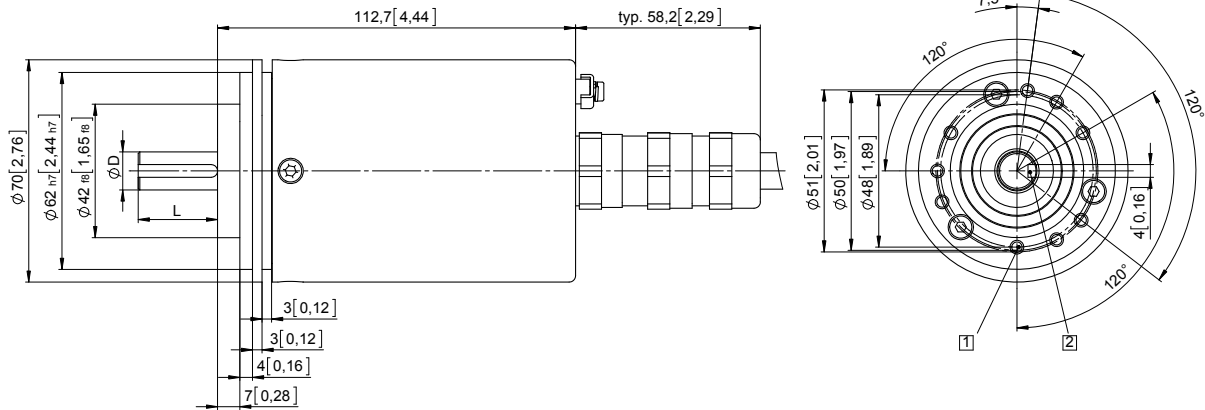
**SSI/BiSS + SinCos**

## Dimensions

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

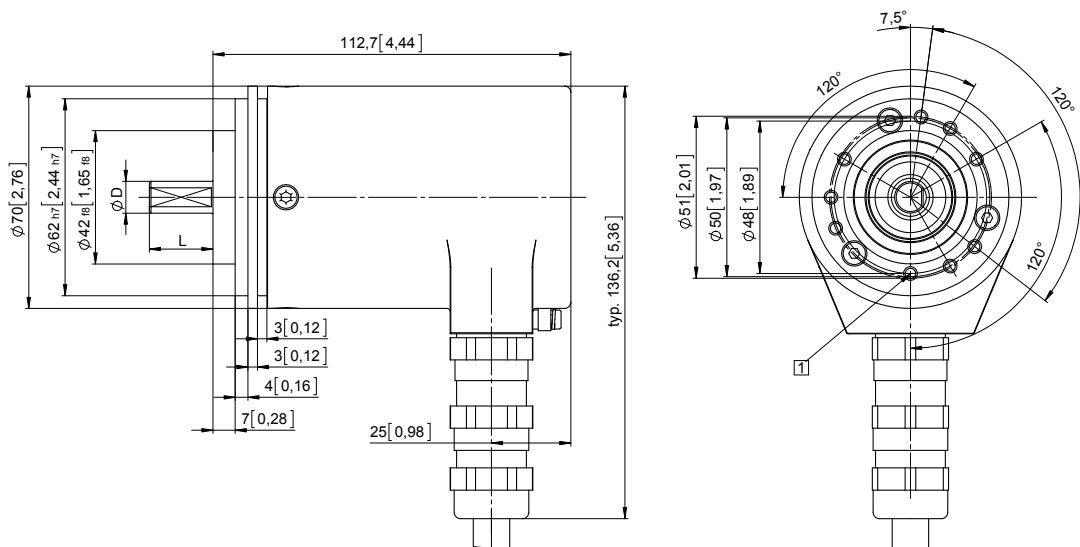
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

|   |                            |                     |
|---|----------------------------|---------------------|
| Standard, ATEX/IECEX – zone 1/21<br>SIL3/PLe, optical | Sendix SIL 7053FS3 (shaft) | SSI / BiSS + SinCos |
|---|----------------------------|---------------------|



Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|------------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable |

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

**Order code** 8.7053FS3 . 1 X 4 X . X X 2 1 . XXXX  
**Shaft version** Type a b c d e f g h i 1)

- |  |   |  |
|--|---|--|
| <p><b>a Flange</b><br/>1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b Shaft (ø x L)</b><br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c Interface / power supply</b><br/>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']<br/>preferred length see <b>i</b>, e. g.: 0100 = 10 m [32.81']</p> | <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f Resolution 2)</b><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> | <p><b>g Inputs / outputs 2)</b><br/>2 = SET input</p> <p><b>h Options</b><br/>1 = no option</p> <p><b>i Cable length in dm 1)</b><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- special cable length<br/>- stainless steel version<br/>- other resolutions</p> |
|--|---|--|

1) Not applicable with connection types 1 and 2.  
 2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders - singleturn

|   |   |                          |
|---|---|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 7053FS3 (shaft)</b>   | <b>SSI/BiSS + SinCos</b> |
| <b>Accessories</b>  |   |                          |
| <b>EMC shield terminal</b>                                    | for top-hat rail mounting   | <b>8.0000.4G06.0000</b>  |
| <b>Screw retention</b>  | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b>  |
| <b>Bellows coupling, safety-oriented</b>                      | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                          |
| <b>Safety modules Safety-M compact / modular</b>              | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                          |
| <b>LED SSI display 570 / 575</b>                              | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |                          |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

|  |  |   |
|--|--|---|
| <b>Technical data</b>  |  |   |
| <b>Explosion protection</b>  |  |   |
| <b>ATEX</b>  |  |   |
| <b>EC type-examination certificate</b>   | PTB09 ATEX 1106 X  |   |
| <b>Category (gas)</b>  | II 2 G Ex d IIC T4 - T6 Gb   |   |
| <b>Category (dust)</b>   | II 2D Ex tb IIIC T135°C - T85°C Db   |   |
| <b>Relevant standards</b>  | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009   |   |
| <b>IECEX</b>   |  |   |
| <b>Certificate of Conformity (CoC)</b>   | IECEX PTB 13.0026 X  |   |
| <b>Category (gas)</b>  | Ex d IIC T4 - T6 Gb  |   |
| <b>Category (dust)</b>   | Ex tb IIIC T135°C - T85°C Db   |   |
| <b>Relevant standards</b>  | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008  |   |
| <b>Electrical characteristics</b>  |  |   |
| <b>Power supply</b>  | 10 ... 30 V DC   |   |
| <b>Current consumption (no load)</b>   | max. 45 mA   |   |
| <b>Reverse polarity protection for power supply</b>  | yes  |   |
| <b>Short circuit proof outputs</b>   | yes <sup>2)</sup>  |   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU         |   |
| <b>EMC</b>   |  |   |
| <b>Relevant standards</b>  | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013             |   |
| <b>Mechanical characteristics</b>  |  |   |
| <b>Maximum speed</b>   | 6000 min <sup>-1</sup> (continuous)  |   |
| <b>Starting torque – at 20°C [68°F]</b>  | < 0.05 Nm  |   |
| <b>Mass moment of inertia</b>  | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |   |
| <b>Load capacity of shaft</b>  | radial   | 80 N  |
|  | axial  | 40 N  |
| <b>Weight</b>  | approx. 1.3 kg [45.86 oz]  |   |
| <b>Protection acc. to EN 60529</b>   | IP67   |   |
| <b>Ambient temperature</b>   | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |   |
| <b>Material</b>  | shaft  | stainless steel                                 |
|  | flange / housing   | seawater durable Al, type AlSiMgMn (EN AW-6082) |
|  | cable  | PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>  | 500 m/s <sup>2</sup> , 11 ms   |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b>   | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |   |
| <b>Notes regarding "Functional Safety"</b>   |  |   |
| These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual. |  |   |
| <b>Safety characteristics</b>  |  |   |
| <b>Classification</b>  | PLe / SIL3   |   |
| <b>System structure</b>  | 2 channel (Cat. 4)   |   |
| <b>PFH<sub>d</sub> value <sup>1)</sup></b>   | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>  |   |
| <b>Mission time / Proof test interval</b>  | 20 years   |   |
| <b>Relevant standards</b>  | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007  |   |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|   |                                   |                          |
|---|-----------------------------------|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 7053FS3 (shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|-----------------------------------|--------------------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution</b>   | 10 ... 14 bit and 17 bit                                     |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | resolution ≤ 14 bit ≤ 1 μs<br>resolution ≥ 15 bit 4 μs       |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface   |  |
|--|--|
| <b>Resolution</b>  | 10 ... 14 bit and 17 bit                               |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |  |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>1)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | HIGH active  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = Power supply) | HIGH min. 60 % of +V<br>max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Timeout after SET signal</b>            | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |   |           |   |           |         |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|---|-----------|---|-----------|---------|
| 4         | 1, 2, A, B         | SET      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |
|           |                    |          | Cable marking:  | 6   | 1  | 2  | 3  | 4  | 5  | 11  | 7 | 8         | 9 | 10        | shield  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21  
SIL3/PLe, optical**

**Sendix SIL 7053FS3 (shaft)**

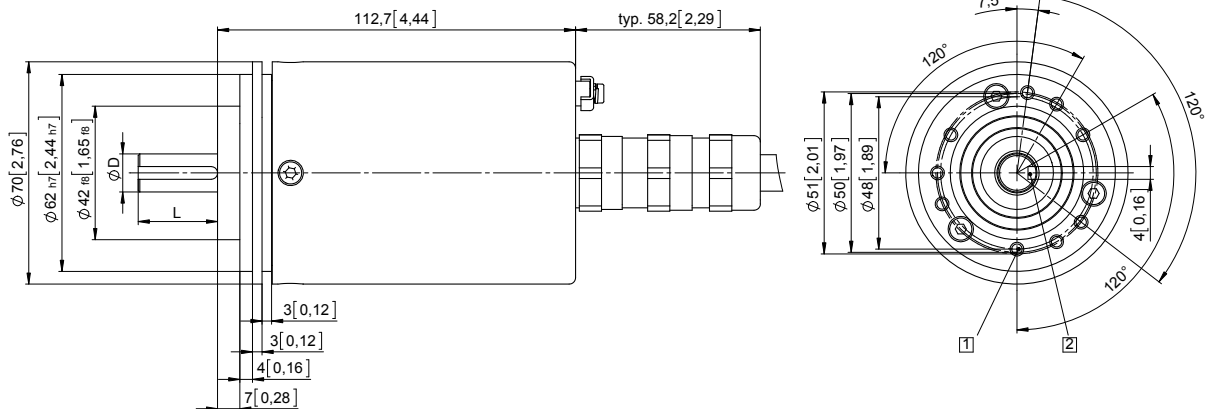
**SSI/BiSS + SinCos**

## Dimensions

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

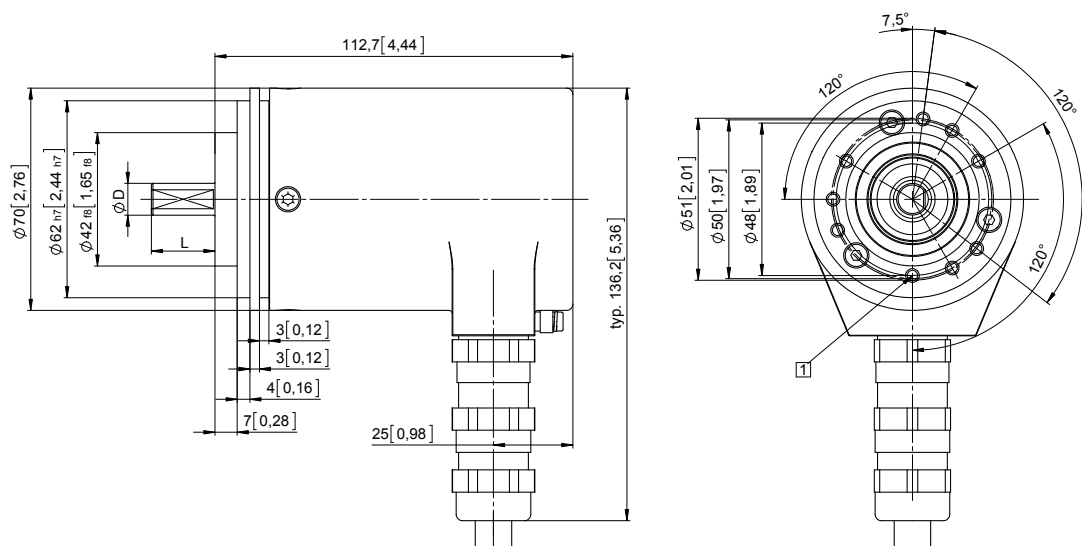
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders - singleturn

|   |   |             |
|---|---|-------------|
| Standard, ATEX/IECEX – zone 1/21<br>optical | Sendix 7058 / 7078 (shaft / hollow shaft) | PROFIBUS DP |
|---|---|-------------|



The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.


 Absolute encoders  
singleturn

|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|------------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable |

### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

|                                    |  |             |  |   |
|------------------------------------|--|-------------|--|---|
| <b>Order code</b><br>Shaft version | 8.7058   | . 1 X 3 X . | 31 11 .  | XXXX  |
|                                    | Type   | a b c d     | e  | f 1)  |
| <b>a</b> Flange                    | 1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]   |             | <b>d</b> Type of connection  | <b>f</b> Cable length in dm 1)  |
| <b>b</b> Shaft (ø x L)             | 2 = 10 x 20 mm [0.39 x 0.79"], with flat<br>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key |             | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']                                 |
| <b>c</b> Interface / Power supply  | 3 = PROFIBUS DP V0 / 10 ... 30 V DC  |             | <b>e</b> Fieldbus profile  | Optional on request<br>- special cable length<br>- stainless steel version<br>- IP65 version for T6 |
|                                    |  |             | 31 = PROFIBUS DP V0 encoder profile class 2  |   |

|  |   |             |  |   |
|--|---|-------------|--|---|
| <b>Order code</b><br>Hollow shaft                                  | 8.7078  | . X X 3 X . | 31 11 .  | XXXX  |
|  | Type  | a b c d     | e  | f 1)  |
| <b>a</b> Flange  | 1 = with spring element, short<br>5 = with stator coupling, IP67, ø 65 mm [2.56"] |             | <b>d</b> Type of connection  | <b>f</b> Cable length in dm 1)  |
| <b>b</b> Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) | 1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]  |             | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']                                 |
| <b>c</b> Interface / Power supply                                  | 3 = PROFIBUS DP V0 / 10 ... 30 V DC   |             | <b>e</b> Fieldbus profile  | Optional on request<br>- special cable length<br>- stainless steel version<br>- IP65 version for T6 |
|  |   |             | 31 = PROFIBUS DP V0 encoder profile class 2  |   |

1) Not applicable with connection types 1 and 2.

# Absolute encoders - singleturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7058 / 7078 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

|  |  |
|--|--|
| <b>Mounting accessory for shaft encoders</b> | Order no.  |
| <b>Coupling</b>                              | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] |
|  | <b>8.0000.1102.1010</b>                                  |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection Sendix 7058       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7078       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1091 X  |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0020 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 110 mA  |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

# Absolute encoders - singleturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7058 / 7078 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

| Interface characteristics PROFIBUS DP |   |
|---------------------------------------|---|
| <b>Resolution</b>                     | 1 ... 65536 (16 bit), behavior default: 8192 (13 bit)   |
| <b>Code</b>                           | binary  |
| <b>Interface</b>                      | specification according to PROFIBUS DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated     |
| <b>Protocol</b>                       | Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons                              |
| <b>Baud rate</b>                      | maximum 12 Mbit/s   |
| <b>Device address</b>                 | software controlled setting of the device address via the SSA service with a class 2 master; default address: 125 |
| <b>Termination</b>                    | active termination can only be switched on externally   |

### Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Absolute encoders singleturn

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |         |         |         |          |          |
|-----------|--------------------|---|-----|----|---------|---------|---------|---------|----------|----------|
|           |                    | Signal:   | 0 V | +V | PB_A IN | PB_B IN | BUS_GND | BUS_VDC | PB_A OUT | PB_B OUT |
| 3         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4       | 5       | 6       | 7       | 8        | 9        |

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21  
optical**

**Sendix 7058 / 7078 (shaft / hollow shaft)**

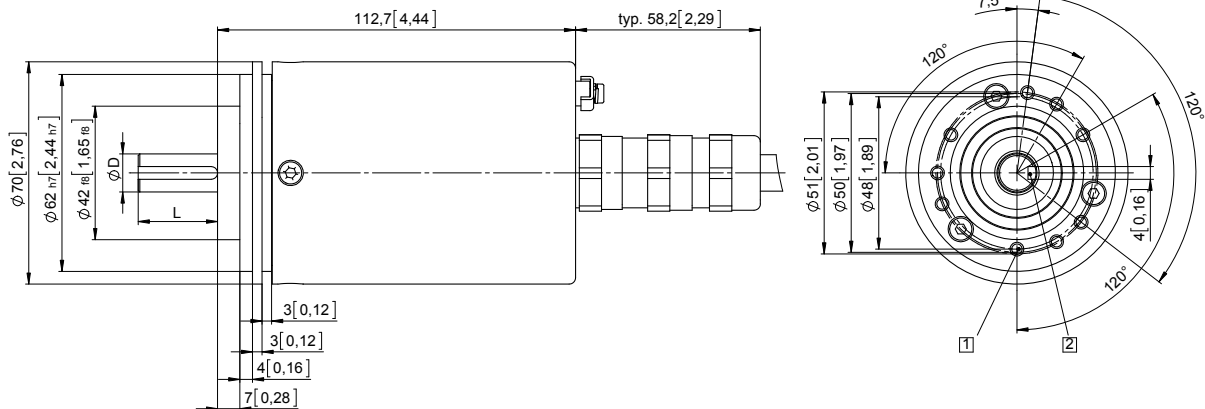
**PROFIBUS DP**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

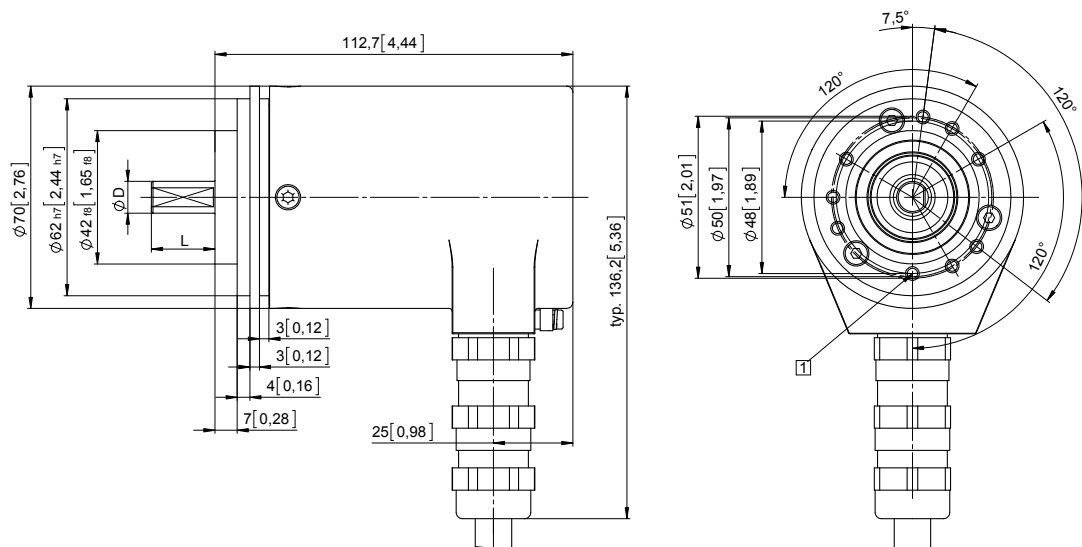
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

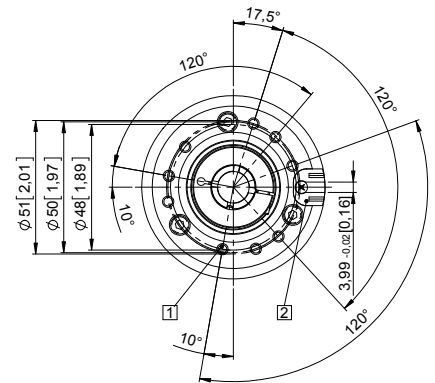
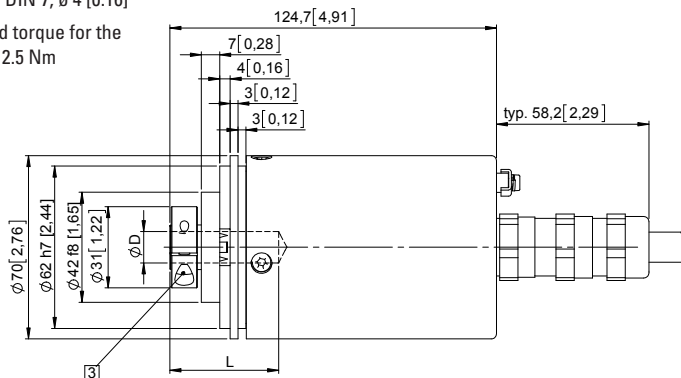
|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>optical</b> | <b>Sendix 7058 / 7078 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



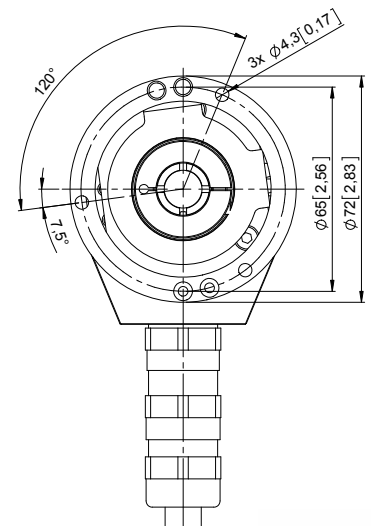
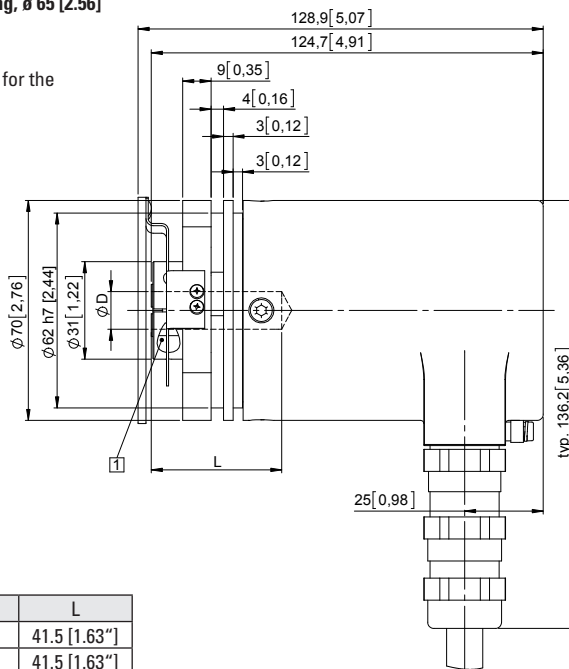
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21  
optical

Sendix 7058 / 7078 (shaft / hollow shaft)

CANopen



The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

**Order code** 8.7058 . 1 X 2 X . 21 11 . XXXX  
**Shaft version** Type a b c d e f 1)

**a** Flange  
1 = clamping / synchronous flange, IP67,  $\varnothing$  70 mm [2.76"]

**b** Shaft ( $\varnothing \times L$ )  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway  
for 4 x 4 mm [0.16 x 0.16"] key

**c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

**d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

**e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

**f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length  
- stainless steel version  
- IP65 version for T6

**Order code** 8.7078 . X X 2 X . 21 11 . XXXX  
**Hollow shaft** Type a b c d e f 1)

**a** Flange  
1 = with spring element, short  
5 = with stator coupling, IP67,  $\varnothing$  65 mm [2.56"]

**b** Blind hollow shaft  
(insertion depth max. 41.5 mm [1.63"])  
1 =  $\varnothing$  12 mm [0.47"]  
2 =  $\varnothing$  14 mm [0.55"]

**c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

**d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

**e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

**f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length  
- stainless steel version  
- IP65 version for T6

1) Not applicable with connection types 1 and 2.

# Absolute encoders - singleturn

|   |  |                |
|---|--|----------------|
| <b>Standard, ATEX/IECEX – zone 1/21 optical</b> | <b>Sendix 7058 / 7078 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

|  |  |
|--|--|
| <b>Mounting accessory for shaft encoders</b> | Order no.  |
| <b>Coupling</b>                              | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] |
|  | <b>8.0000.1102.1010</b>                                  |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection Sendix 7058       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7078       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1091 X  |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0020 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 90 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

Absolute encoders  
singleturn

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21  
optical**

**Sendix 7058 / 7078 (shaft / hollow shaft)**

**CANopen**

| Interface characteristics CANopen |  |
|-----------------------------------|--|
| <b>Resolution</b>                 | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)                             |
| <b>Code</b>                       | binary   |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                     |
| <b>Baud rate</b>                  | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>               | 1 ... 127<br>software configurable   |
| <b>Switchable termination</b>     | software configurable  |

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. measuring wheel circumference)  
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |       |       |         |       |       |         |
|-----------|--------------------|---|-----|----|-------|-------|---------|-------|-------|---------|
|           |                    | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
| 2         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4     | 5     | 6       | 7     | 8     | 9       |



# Absolute encoders - singleturn

|   |  |                |
|---|--|----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>optical</b> | <b>Sendix 7058 / 7078 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

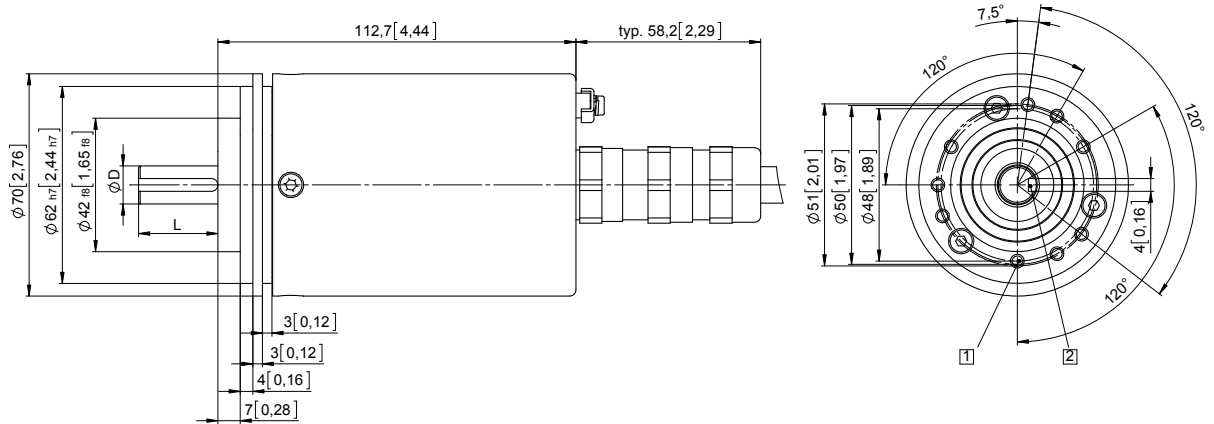
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

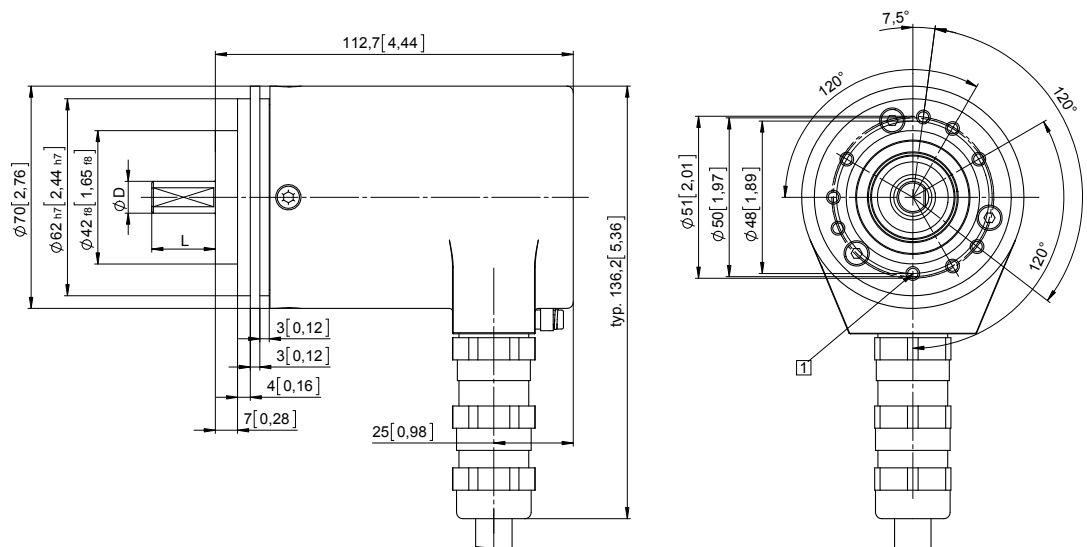


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

**Standard, ATEX/IECEx – zone 1/21  
optical**

**Sendix 7058 / 7078 (shaft / hollow shaft)**

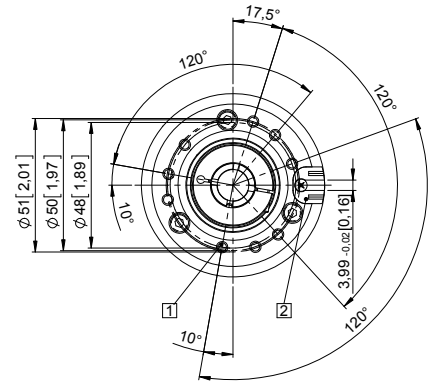
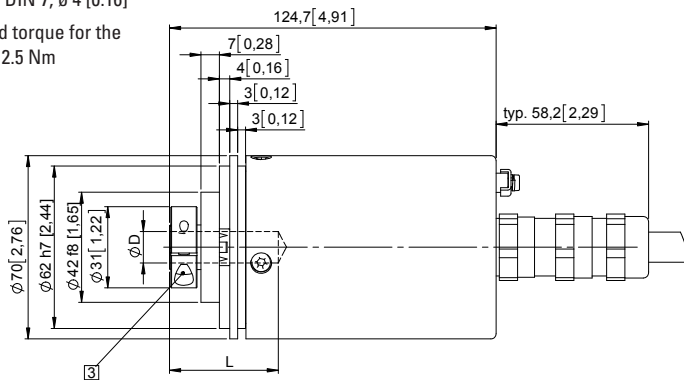
**CANopen**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



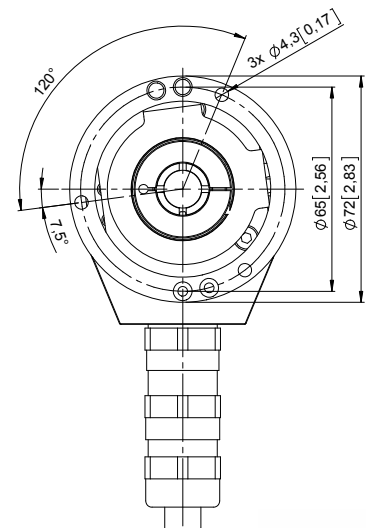
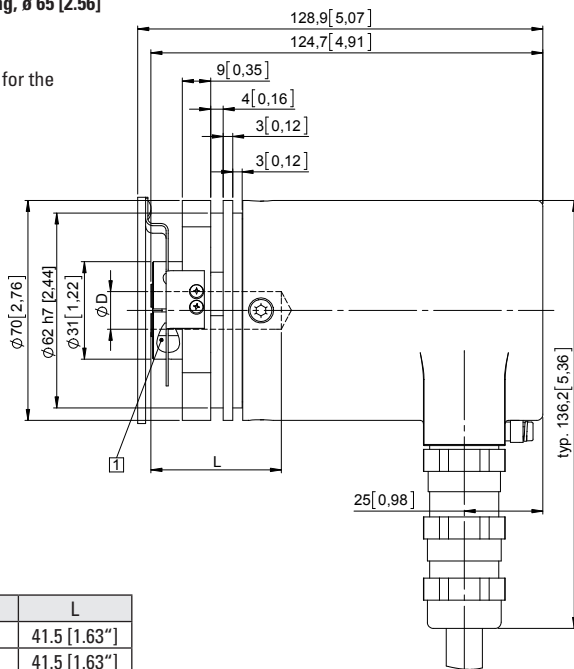
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

|  |  |                   |
|--|--|-------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7153 / 7173 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|



The Sendix 7153 / 7173 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with an SSI or BiSS interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available with axial and radial cable outlets.



Absolute encoders singleturn

|             |              |                       |                       |                          |                             |                      |                     |                             |                |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor |

### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

|                      |   |
|----------------------|---|
| <b>Order code</b>    | <b>8.7153 . 2 X 2 X . X X 2 1 . XXXX</b>    |
| <b>Shaft version</b> | Type <b>a b c d e f g h i</b> <sup>1)</sup> |

- |  |  |   |
|--|--|---|
| <p><b>a</b> Flange<br/>2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b</b> Shaft (ø x L)<br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c</b> Interface / power supply<br/>2 = SSI, BiSS / 10 ... 30 V DC</p> <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> | <p><b>e</b> Code<br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f</b> Resolution <sup>2)</sup><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> | <p><b>g</b> Inputs / outputs <sup>2)</sup><br/>2 = SET, DIR input<br/>additional status output</p> <p><b>h</b> Options<br/>1 = no option</p> <p><b>i</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>Optional on request</i><br/>- special cable length<br/>- other resolutions</p> |
|--|--|---|

1) Not applicable with connection types 1 and 2  
2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders - singleturn

|  |  |                   |
|--|--|-------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7153 / 7173 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|

|  |  |  |   |   |   |   |   |      |   |   |      |   |   |   |   |   |   |   |   |      |  |  |  |   |
|--|--|--|---|---|---|---|---|------|---|---|------|---|---|---|---|---|---|---|---|------|--|--|--|---|
| <b>Order code</b><br><b>Hollow shaft</b>   | <b>8.7173</b><br>Type  | <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">X</td><td style="padding: 2px 5px;">X</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">X</td><td style="padding: 2px 5px;">X</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">XXXX</td> </tr> <tr> <td style="padding: 2px 5px; font-size: 8px;">a</td><td style="padding: 2px 5px; font-size: 8px;">b</td><td style="padding: 2px 5px; font-size: 8px;">c</td><td style="padding: 2px 5px; font-size: 8px;">d</td> <td style="padding: 2px 5px; font-size: 8px;">e</td><td style="padding: 2px 5px; font-size: 8px;">f</td><td style="padding: 2px 5px; font-size: 8px;">g</td><td style="padding: 2px 5px; font-size: 8px;">h</td> <td style="padding: 2px 5px; font-size: 8px;">i 1)</td> </tr> </table> | X | X | 2 | X | X | X    | 2 | 1 | XXXX | a | b | c | d | e | f | g | h | i 1) | <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Interface / power supply<br/>2 = SSI, BiSS / 10 ... 30 V DC</p> <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> </td> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>e</b> Code<br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f</b> Resolution <sup>2)</sup><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> </td> <td style="width: 33%; vertical-align: top; padding: 5px;"> <p><b>g</b> Inputs / outputs <sup>2)</sup><br/>2 = SET, DIR input<br/>additional status output</p> <p><b>h</b> Options<br/>1 = no option</p> <p><b>i</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>Optional on request</i><br/>- special cable length<br/>- other resolutions</p> </td> </tr> </table> | <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Interface / power supply<br/>2 = SSI, BiSS / 10 ... 30 V DC</p> <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> | <p><b>e</b> Code<br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f</b> Resolution <sup>2)</sup><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> | <p><b>g</b> Inputs / outputs <sup>2)</sup><br/>2 = SET, DIR input<br/>additional status output</p> <p><b>h</b> Options<br/>1 = no option</p> <p><b>i</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>Optional on request</i><br/>- special cable length<br/>- other resolutions</p> |
| X  | X  | 2  | X | X | X | 2 | 1 | XXXX |   |   |      |   |   |   |   |   |   |   |   |      |  |  |  |   |
| a  | b  | c  | d | e | f | g | h | i 1) |   |   |      |   |   |   |   |   |   |   |   |      |  |  |  |   |
| <p><b>a</b> Flange<br/>2 = with spring element, short<br/>6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p><b>b</b> Blind hollow shaft<br/>(insertion depth max. 41.5 mm [1.63"])<br/>1 = ø 12 mm [0.47"]<br/>2 = ø 14 mm [0.55"]</p> <p><b>c</b> Interface / power supply<br/>2 = SSI, BiSS / 10 ... 30 V DC</p> <p><b>d</b> Type of connection<br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']</p> | <p><b>e</b> Code<br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f</b> Resolution <sup>2)</sup><br/>A = 10 bit<br/>1 = 11 bit<br/>2 = 12 bit<br/>3 = 13 bit<br/>4 = 14 bit<br/>7 = 17 bit</p> | <p><b>g</b> Inputs / outputs <sup>2)</sup><br/>2 = SET, DIR input<br/>additional status output</p> <p><b>h</b> Options<br/>1 = no option</p> <p><b>i</b> Cable length in dm <sup>1)</sup><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>Optional on request</i><br/>- special cable length<br/>- other resolutions</p>  |   |   |   |   |   |      |   |   |      |   |   |   |   |   |   |   |   |      |  |  |  |   |

## Technical data

| Explosion protection 7153              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Explosion protection 7173              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque - at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 45 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short-circuit proof outputs</b>                  | yes <sup>3)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

1) Not applicable with connection types 1 and 2  
 2) Resolution, preset value and counting direction factory-programmable.  
 3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

|  |  |                   |
|--|--|-------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7153 / 7173 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution</b>   | 10 ... 14 bit and 17 bit                                     |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | resolution ≤ 14 bit < 1 μs<br>resolution ≥ 15 bit 4 μs       |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface           |   |
|--------------------------|---|
| <b>Resolution</b>        | 10 ... 14 bit and 17 bit  |
| <b>Code</b>              | binary  |
| <b>Clock rate</b>        | up to 10 MHz  |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b> | ≤ 1 μs  |
| <b>Note:</b>             | <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull-up resistor 22 kOhm |
| <b>Permissible load</b>  | max. 20 mA  |
| <b>Signal level</b>  | HIGH +V<br>LOW < 1 V                              |
| <b>Active at</b>   | LOW   |
| The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation. |   |

| SET input   |  |
|---|--|
| <b>Input</b>  | HIGH active  |
| <b>Input type</b>   | comparator   |
| <b>Signal level</b><br>(+V = power supply)  | HIGH min. 60% of +V<br>max. +V<br>LOW max. 25% of +V |
| <b>Input current</b>  | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>  | 10 ms  |
| <b>Timeout after SET signal</b>   | 14 ms  |
| The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |  |

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |      |       |        |  |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|------|-------|--------|--|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | Stat | ⊥     | ⊥      |  |
| 2         | 1, 2, A, B         | SET, DIR | Cable marking:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9    | YE/GN | shield |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- Stat: Status output
- ⊥: Protective earth

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – mining optical**

**Sendix 7153 / 7173 (shaft / hollow shaft)**

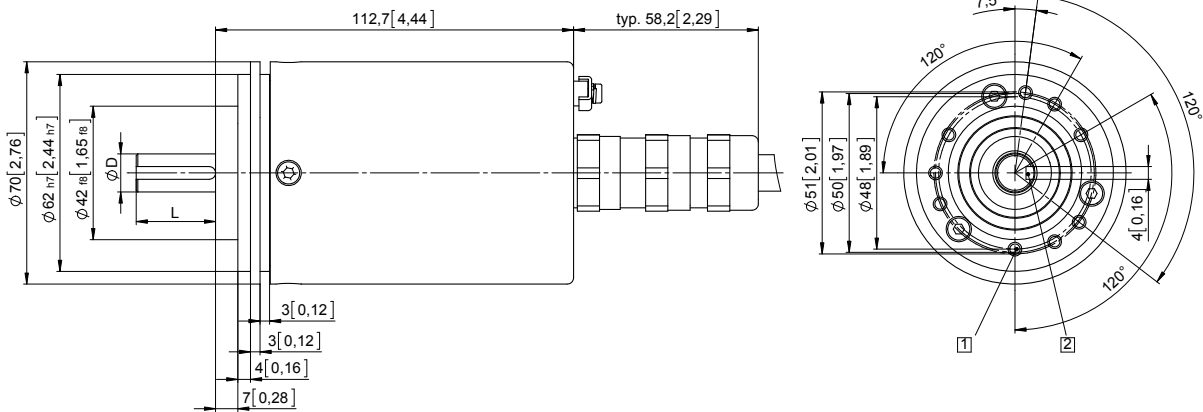
**SSI / BiSS**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

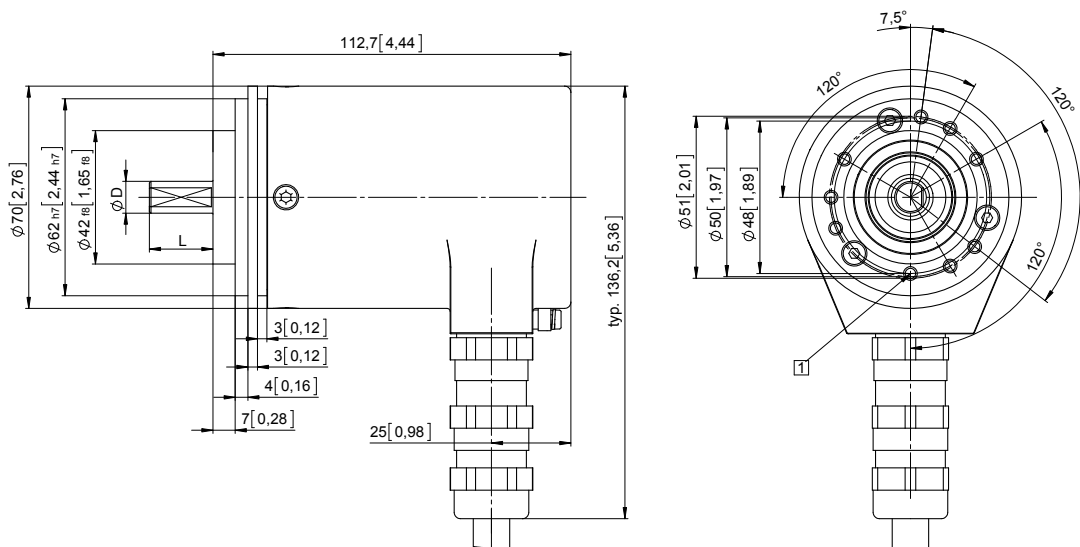
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

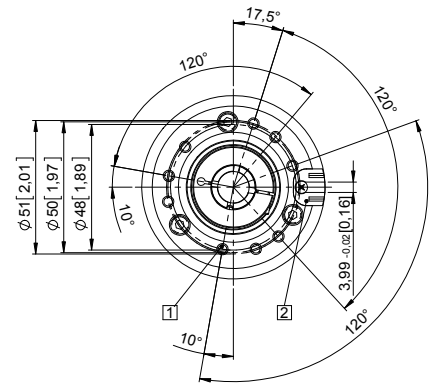
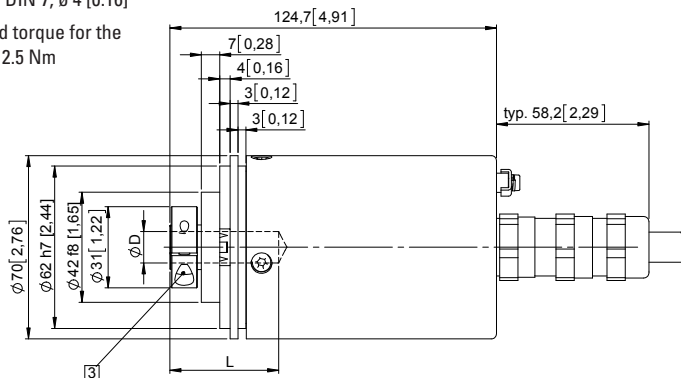
|  |  |                   |
|--|--|-------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7153 / 7173 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



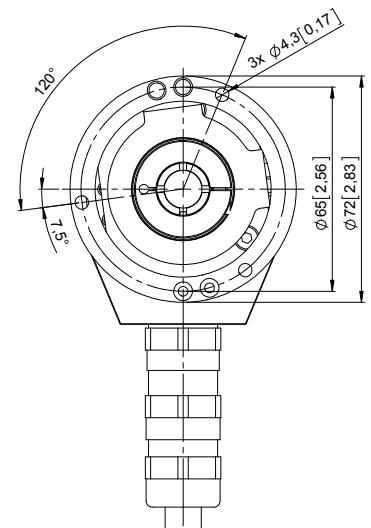
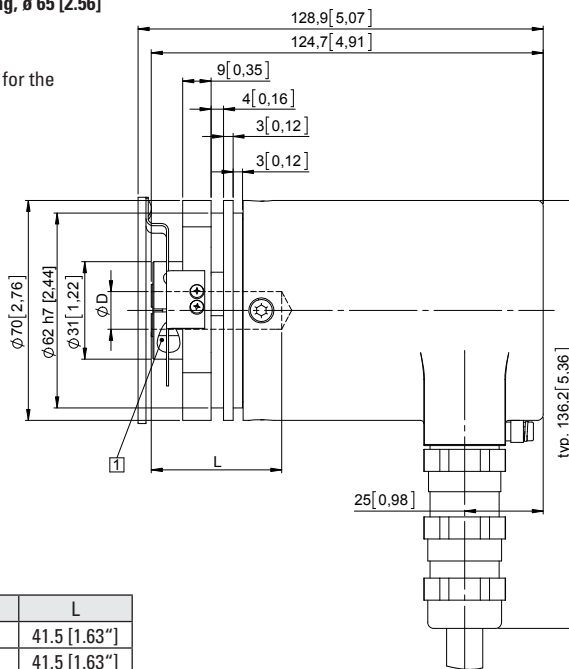
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

Standard, ATEX/IECEX – mining optical

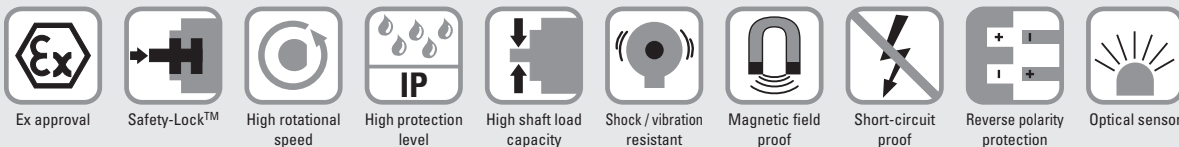
Sendix 7158 / 7178 (shaft / hollow shaft)

PROFIBUS DP



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code Shaft version

8.7158 . 2 X 3 X . 31 11 . XXXX  
Type      a b c d e      f <sup>1)</sup>

- a** Flange  
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]
- b** Shaft (ø x L)  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c** Interface / power supply  
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile  
31 = PROFIBUS DP V0 encoder profile class 2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length

## Order code Hollow shaft

8.7178 . X X 3 X . 31 11 . XXXX  
Type      a b c d e      f <sup>1)</sup>

- a** Flange  
2 = with spring element, short  
6 = with stator coupling, IP67, ø 65 mm [2.56"]
- b** Blind hollow shaft  
(insertion depth max. 41.5 mm [1.63"])  
1 = ø 12 mm [0.47"]  
2 = ø 14 mm [0.55"]
- c** Interface / power supply  
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile  
31 = PROFIBUS DP V0 encoder profile class 2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length

1) Not applicable with connection types 1 and 2.



# Absolute encoders - singleturn

|  |  |                    |
|--|--|--------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7158 / 7178 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|--|--|--------------------|

## Technical data

| Explosion protection 7158              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Explosion protection 7178              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 110 mA  |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics PROFIBUS DP |   |
|---------------------------------------|---|
| <b>Resolution</b>                     | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)  |
| <b>Code</b>                           | binary  |
| <b>Interface</b>                      | specification according to PROFIBUS DP 2.0 / standard (DIN 19245 Part 3) / RS485 driver galvanically isolated     |
| <b>Protocol</b>                       | Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons                              |
| <b>Baud rate</b>                      | maximum 12 Mbit/s   |
| <b>Device address</b>                 | software controlled setting of the device address via the SSA-service with a class 2 master; default address: 125 |
| <b>Termination</b>                    | active termination can only be switched on externally   |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

### Profibus encoder-profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |         |         |         |          |          |  |
|-----------|--------------------|---|-----|----|---------|---------|---------|---------|----------|----------|--|
| 3         | 1, 2, A, B         | Signal:   | 0 V | +V | PB_A IN | PB_B IN | BUS_GND | BUS_VDC | PB_A OUT | PB_B OUT |  |
|           |                    | Cable marking:  | 1   | 2  | 4       | 5       | 6       | 7       | 8        | 9        |  |

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – mining optical**

**Sendix 7158 / 7178 (shaft / hollow shaft)**

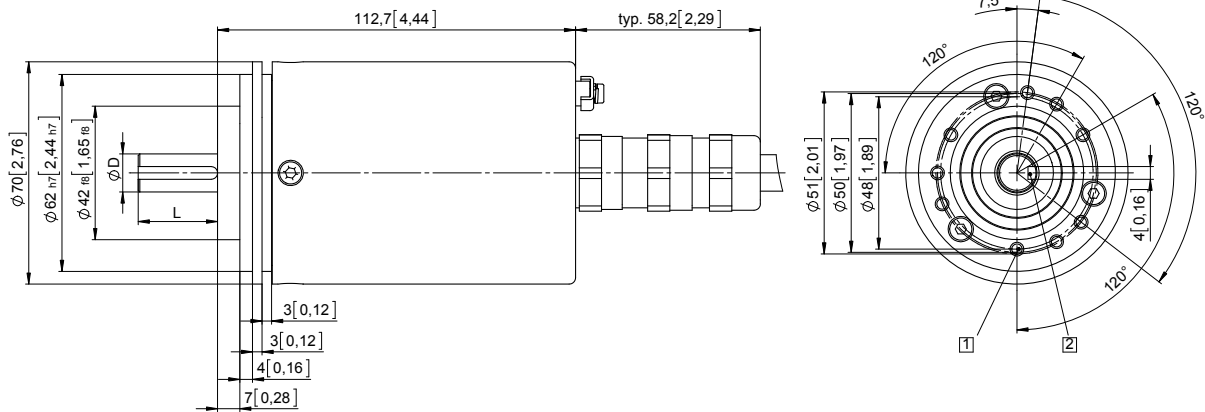
**PROFIBUS DP**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

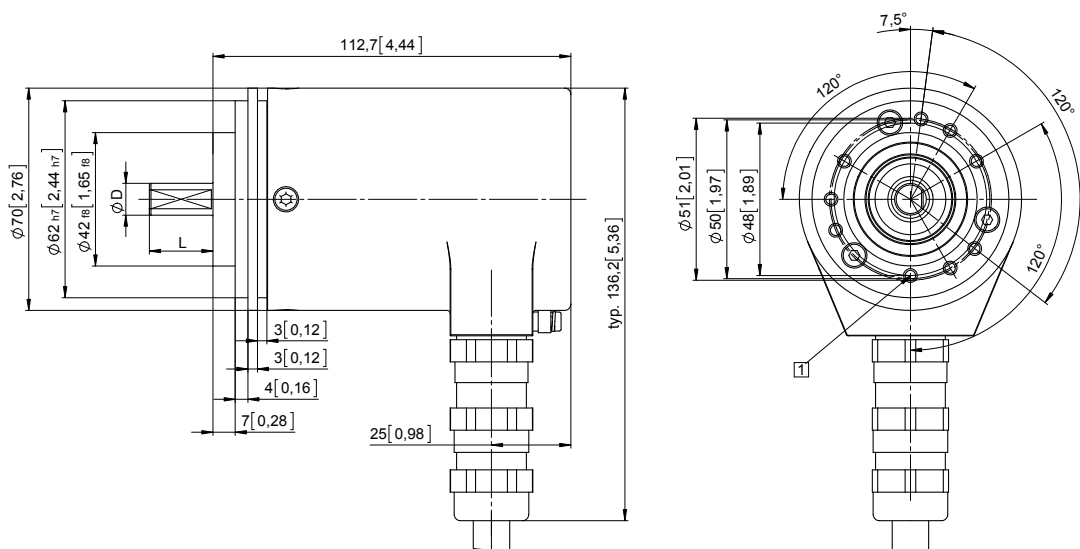
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

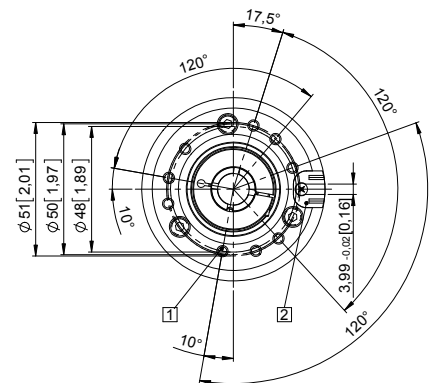
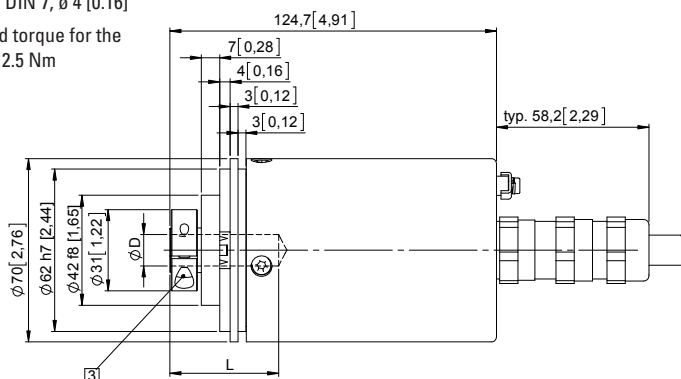
|  |  |                    |
|--|--|--------------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7158 / 7178 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|--|--|--------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



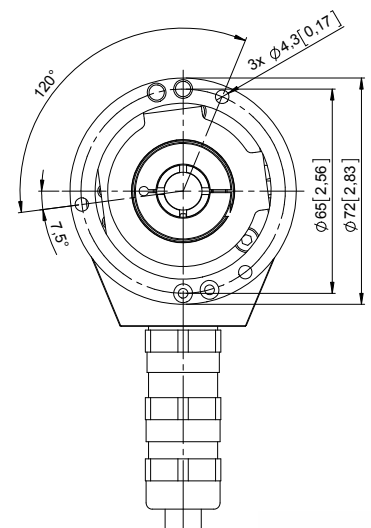
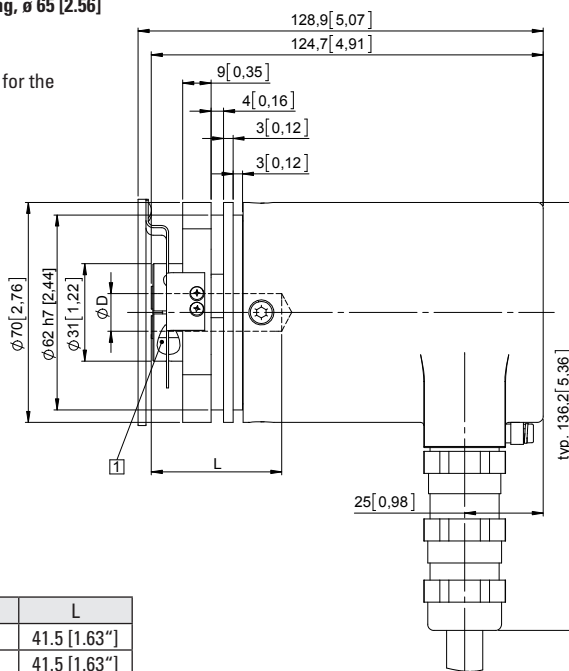
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders - singleturn

Standard, ATEX/IECEX – mining optical

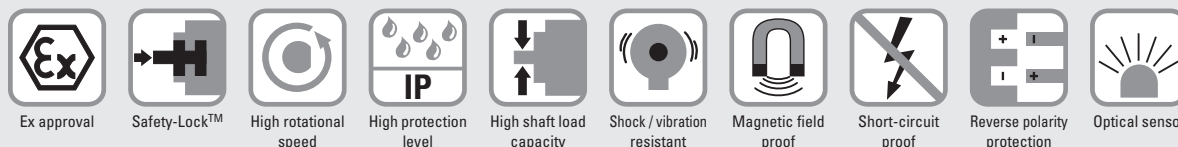
Sendix 7158 / 7178 (shaft / hollow shaft)

CANopen



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a CANOpen interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code Shaft version

8.7158 . 2 X 2 X . 21 11 . XXXX  
Type      a b c d e f <sup>1)</sup>

- a** Flange  
2 = clamping / synchronous flange, IP67,  $\varnothing$  70 mm [2.76"]
- b** Shaft ( $\varnothing \times L$ )  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length

## Order code Hollow shaft

8.7178 . X X 2 X . 21 11 . XXXX  
Type      a b c d e f <sup>1)</sup>

- a** Flange  
2 = with spring element, short  
6 = with stator coupling, IP67,  $\varnothing$  65 mm [2.56"]
- b** Blind hollow shaft  
(insertion depth max. 41.5 mm [1.63"])  
1 =  $\varnothing$  12 mm [0.47"]  
2 =  $\varnothing$  14 mm [0.55"]
- c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

Optional on request  
- special cable length

1) Not applicable with connection types 1 and 2.

# Absolute encoders - singleturn

|  |  |                |
|--|--|----------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7158 / 7178 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

## Technical data

| Explosion protection 7158              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Explosion protection 7178              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 90 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

Absolute encoders  
singleturn

# Absolute encoders - singleturn

**Standard, ATEX/IECEX – mining optical**

**Sendix 7158 / 7178 (shaft / hollow shaft)**

**CANopen**

| Interface characteristics CANopen |  |
|-----------------------------------|--|
| <b>Resolution</b>                 | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)                             |
| <b>Code</b>                       | binary   |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                     |
| <b>Baud rate</b>                  | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>               | 1 ... 127<br>software configurable   |
| <b>Switchable termination</b>     | software configurable  |

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 .

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. measuring wheel circumference)  
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |       |       |         |       |       |         |
|-----------|--------------------|---|-----|----|-------|-------|---------|-------|-------|---------|
|           |                    | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
| 2         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4     | 5     | 6       | 7     | 8     | 9       |

# Absolute encoders - singleturn

|  |  |                |
|--|--|----------------|
| <b>Standard, ATEX/IECEX – mining optical</b> | <b>Sendix 7158 / 7178 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

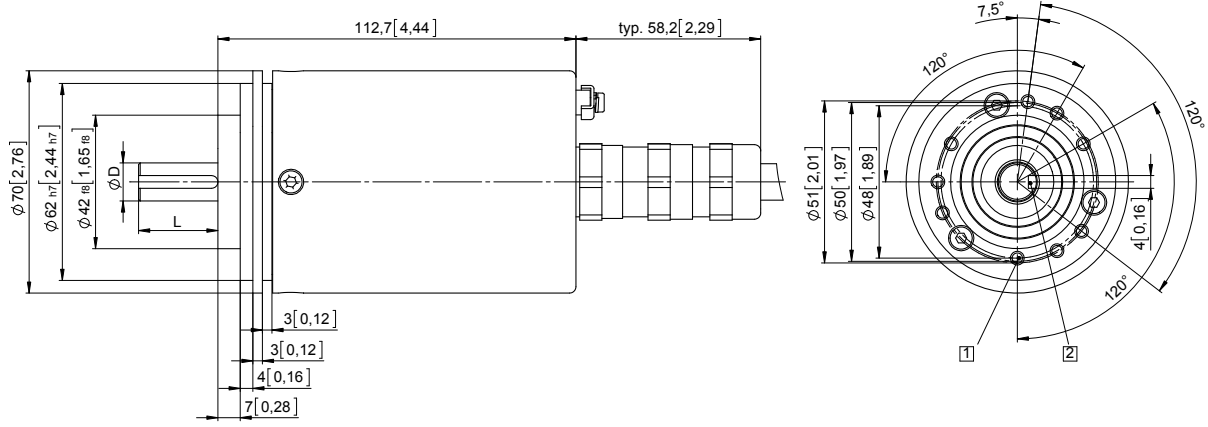
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

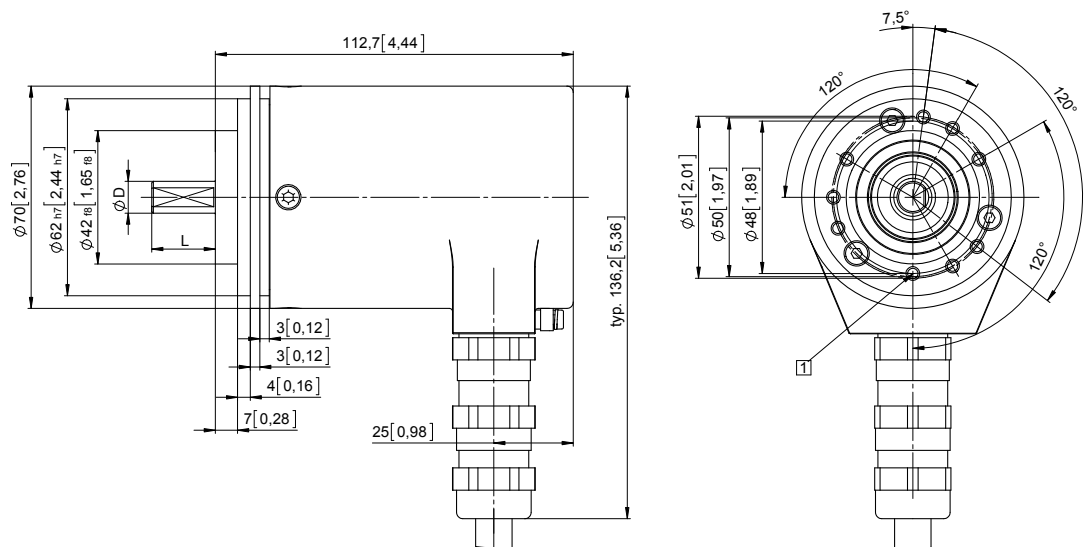


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders - singleturn

**Standard, ATEX/IECEx – mining optical**

**Sendix 7158 / 7178 (shaft / hollow shaft)**

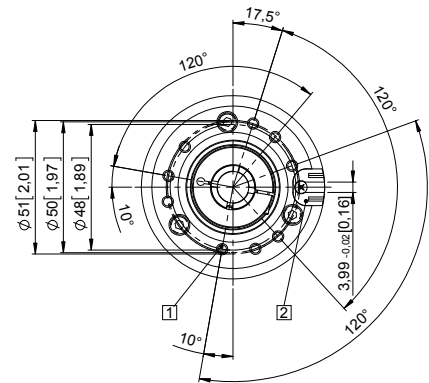
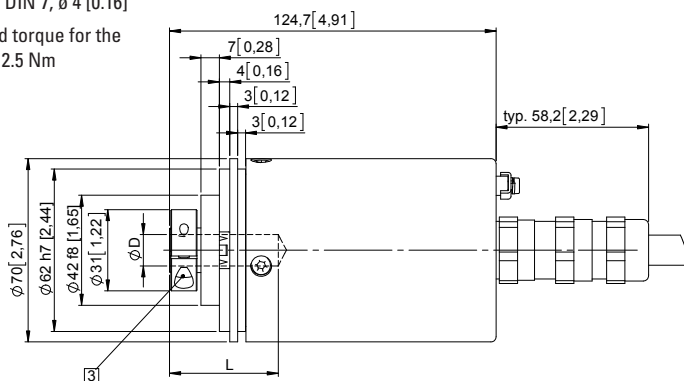
**CANopen**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



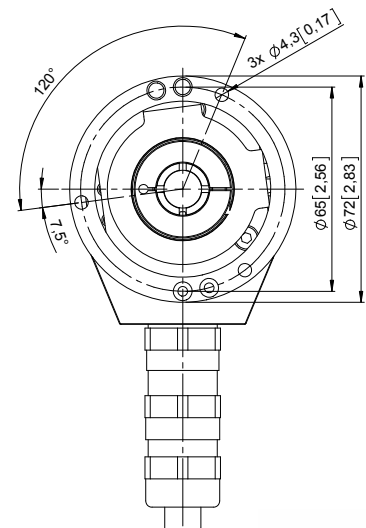
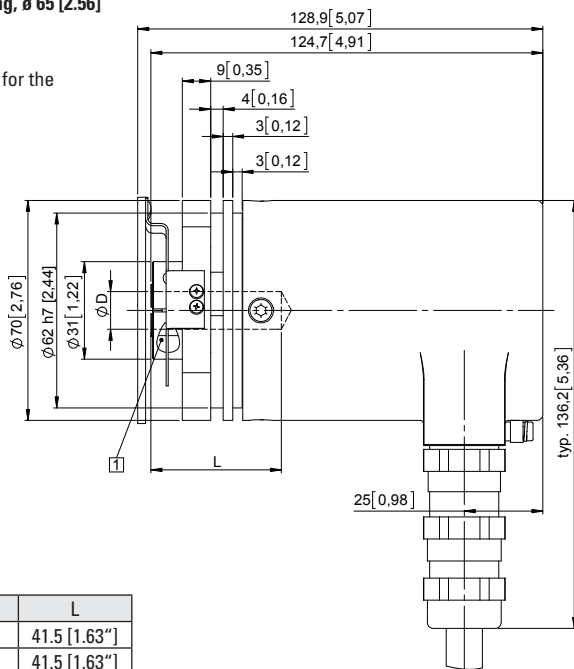
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



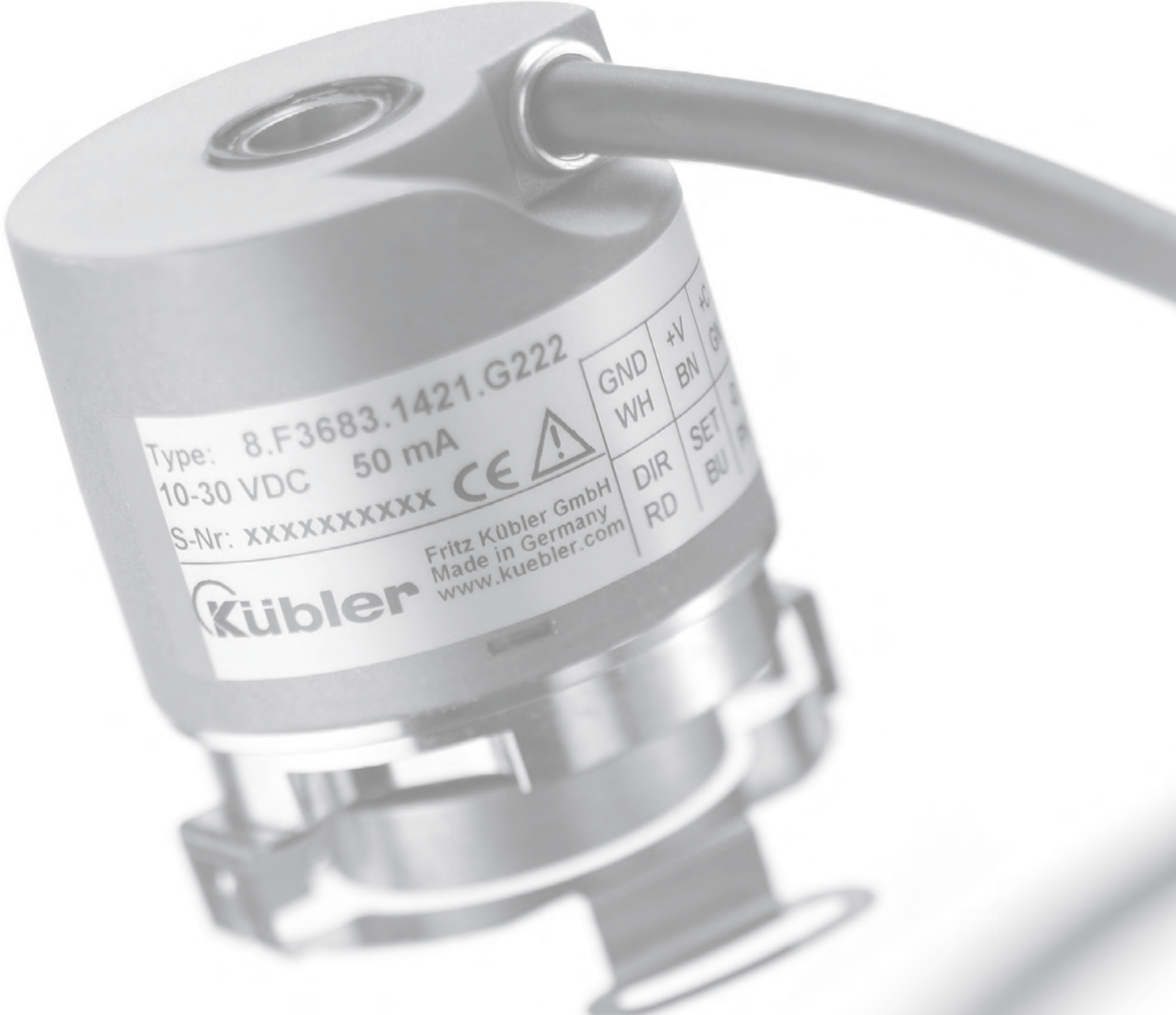
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft



## Absolute encoders - singleturn

---



Type: 8.F3683.1421.G222  
10-30 VDC 50 mA  
S-Nr: xxxxxxxxxx














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**Kübler**

|     |     |
|-----|-----|
| GND | +V  |
| WH  | BN  |
| DIR | SET |
| RD  | BU  |

# Absolute encoders – multiturn

| Series  | Type                          | Type  | Interface                   | Page       |
|---|-------------------------------|---|-----------------------------|------------|
| <b>Compact, magnetic</b>                              | Electronic multiturn          |  Sendix M3661 / M3681 (shaft / hollow shaft)   | Analog                      | <b>296</b> |
|   | Electronic multiturn          |  Sendix M3663 / M3683 (shaft / hollow shaft)   | SSI                         | <b>302</b> |
|   | Electronic multiturn          |  Sendix M3668 / M3688 (shaft / hollow shaft)   | CANopen                     | <b>307</b> |
|   | Robust, electr. multiturn     |  Sendix M3661R (shaft)                         | Analog                      | <b>312</b> |
|   | Robust, electr. multiturn     |  Sendix M3663R (shaft)                         | SSI                         | <b>316</b> |
|   | Robust, electr. multiturn     |  Sendix M3668R (shaft)                         | CANopen                     | <b>319</b> |
| <b>Compact, optical</b>                               | Electronic multiturn          | Sendix F3663 / F3683 (shaft / hollow shaft)   | SSI / BiSS<br>+ incremental | <b>323</b> |
|   | Electronic multiturn          | Sendix F3668 / F3688 (shaft / hollow shaft)   | CANopen                     | <b>329</b> |
| <b>Standard, magnetic</b>                             | Electronic multiturn          |  Sendix M5861 (shaft)                          | Analog                      | <b>334</b> |
|   | Electronic multiturn          |  Sendix M5863 (shaft)                          | SSI                         | <b>338</b> |
|   | Electronic multiturn          |  Sendix M5868 (shaft)                          | CANopen                     | <b>341</b> |
| <b>Standard, optical</b>                              | Electronic multiturn          | Sendix F5863 / F5883 (shaft / hollow shaft)   | SSI / BiSS<br>+ incremental | <b>345</b> |
|   | Motor-Line, electr. multiturn |  Sendix F5883M (hollow shaft)                | SSI / BiSS<br>+ incremental | <b>352</b> |
|   | Mechanical multiturn          | Sendix 5863 / 5883 (shaft / hollow shaft)   | SSI / BiSS<br>+ incremental | <b>356</b> |
|   | SIL2/PLd, mech. multiturn     | Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow s.)  | SSI / BiSS + SinCos         | <b>364</b> |
|   | SIL3/PLe, mech. multiturn     | Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow s.)  | SSI / BiSS + SinCos         | <b>371</b> |
|   | Electronic multiturn          | Sendix F5868 / F5888 (shaft / hollow shaft)   | CANopen                     | <b>378</b> |
|   | Electronic multiturn          |  Sendix F5868 / F5888 (shaft / hollow shaft) | EtherNet/IP                 | <b>384</b> |
|   | Electronic multiturn          | Sendix F5868 / F5888 (shaft / hollow shaft)   | Modbus                      | <b>389</b> |
|   | Mechanical multiturn          | Sendix 5868 / 5888 (shaft / hollow shaft)   | PROFIBUS DP                 | <b>394</b> |
|   | Mechanical multiturn          | Sendix 5868 / 5888 (shaft / hollow shaft)   | CANopen / CANopenLift       | <b>399</b> |
|   | Mechanical multiturn          | Sendix 5868 / 5888 (shaft / hollow shaft)   | EtherCAT                    | <b>410</b> |
|   | Mechanical multiturn          | Sendix 5868 / 5888 (shaft / hollow shaft)   | PROFINET IO                 | <b>415</b> |
| <b>Standard, optical<br/>ATEX / IECEx – zone 1/21</b> | Mechanical multiturn          | Sendix 7063 / 7083 (shaft / hollow shaft)   | SSI / BiSS                  | <b>420</b> |
|   | SIL2/PLd, mech. multiturn     | Sendix SIL 7063FS2 (shaft)  | SSI / BiSS + SinCos         | <b>425</b> |
|   | SIL3/PLe, mech. multiturn     | Sendix SIL 7063FS3 (shaft)  | SSI / BiSS + SinCos         | <b>429</b> |
|   | Mechanical multiturn          | Sendix 7068 / 7088 (shaft / hollow shaft)   | PROFIBUS DP                 | <b>433</b> |
|   | Mechanical multiturn          | Sendix 7068 / 7088 (shaft / hollow shaft)   | CANopen                     | <b>438</b> |
| <b>Standard, optical<br/>ATEX / IECEx – mining</b>    | Mechanical multiturn          | Sendix 7163 / 7183 (shaft / hollow shaft)   | SSI / BiSS                  | <b>443</b> |
|   | Mechanical multiturn          | Sendix 7168 / 7188 (shaft / hollow shaft)   | PROFIBUS DP                 | <b>448</b> |
|   | Mechanical multiturn          | Sendix 7168 / 7188 (shaft / hollow shaft)   | CANopen                     | <b>453</b> |
| <b>Large hollow shaft,<br/>optical / magnetic</b>     |                               | 9080 (hollow shaft)   | PROFIBUS DP                 | <b>458</b> |
|   |                               | 9080 (hollow shaft)   | CANopen / DeviceNet         | <b>461</b> |
|   |                               | 9081 (hollow shaft)   | SSI                         | <b>465</b> |

# Absolute encoders – multiturn

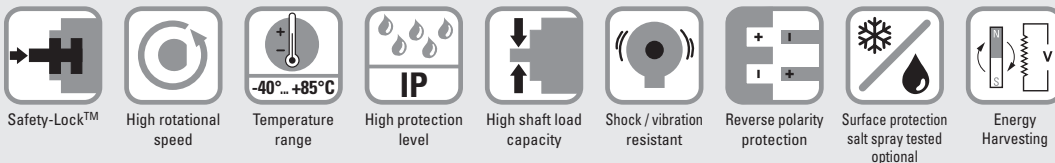
**Compact  
electronic multiturn, magnetic**

**Sendix M3661 / M3681 (shaft / hollow shaft)**

**Analog**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.



## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

## Order code Shaft version

**8.M3661 . XXXXX . XX 1 2**  
Type      a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = clamping flange, IP67, ø 36 mm [1.42"]
- 3 = clamping flange, IP65, ø 36 mm [1.42"]
- 2 = synchro flange, IP67, ø 36 mm [1.42"]
- 4 = synchro flange, IP65, ø 36 mm [1.42"]

### b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
- 3 = ø 8 x 15 mm [0.32 x 0.59"]
- 5 = ø 10 x 20 mm [0.39 x 0.79"]
- 2 = ø 1/4" x 12.5 mm [0.49"]

### c Output circuit <sup>1)</sup>

- 3 = current output
- 4 = voltage output

### d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC \*)
- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC \*)
- 3 = axial M12 connector, 5-pin
- 4 = radial M12 connector, 5-pin

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.M3661.433A.3112.0030 (for cable length 3 m)

### e Interface / resolution / power supply

- 3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
- 4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
- 5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

### f Measuring range

- 1 = 16 revolutions / cw
- 2 = 16 revolutions / ccw
- 3 = scalable up to 65,536 revolutions, with limit switch function
- 4 = scalable up to 65,536 revolutions, without limit switch function

### Optional on request

- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3661 / M3681 (shaft / hollow shaft)</b> | <b>Analog</b> |
|---|--|---------------|

|                             |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|
| <b>Order code</b>           | <b>8.M3681</b>   | <b>.XXXX</b>   | <b>.XX12</b>                             | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |  |
| <b>Hollow shaft</b>         | Type   | a b c d e f  |  |  |  |
| <b>a Flange</b>             | <b>2 = with stator coupling, IP65, ø 46 mm [1.81"]</b> | <b>c Output circuit <sup>1)</sup></b>                          | <b>3 = current output</b>                | <b>e Interface / resolution / power supply</b>   | <b>3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC</b>                         |
|                             | 3 = with spring element, long, IP65                    | <b>4 = voltage output</b>                                      |  | <b>4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC</b>  | <b>5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC</b>                           |
|                             | 5 = with stator coupling, IP67, ø 46 mm [1.81"]        | <b>d Type of connection</b>                                    | <b>1 = axial cable, 1 m [3.28'] PVC</b>  | <b>f Measuring range</b>   | <b>1 = 16 revolutions / cw</b>   |
| <b>b Blind hollow shaft</b> | <b>(insertion depth max. 18.5 mm [0.73"])</b>          | <b>A = axial cable, special length PVC *)</b>                  | <b>2 = radial cable, 1 m [3.28'] PVC</b> | <b>2 = 16 revolutions / ccw</b>  | <b>3 = scalable up to 65,536 revolutions, with limit switch function</b> |
|                             | 1 = ø 6 mm [0.24"]                                     | <b>B = radial cable, special length PVC *)</b>                 | <b>3 = axial M12 connector, 5-pin</b>    | <b>4 = scalable up to 65,536 revolutions, without limit switch function</b>  |  |
|                             | 3 = ø 8 mm [0.32"]                                     | <b>4 = radial M12 connector, 5-pin</b>                         |  | <b>Optional on request</b>   |  |
|                             | <b>4 = ø 10 mm [0.39"]</b>                             | <b>*) Available special lengths (connection types A, B):</b>   |  | - Ex 2/22 (only for connection types 3 and 4)  |  |
|                             | 2 = ø 1/4"   | 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] |  | - surface protection salt spray tested   |  |
|                             |  | order code expansion .XXXX = length in dm                      |  |  |  |
|                             |  | Ex.: 8.M3681.243A.3112.0030 (for cable length 3 m)             |  |  |  |

| Mounting accessory for shaft encoders                 | Order no.   |
|---|---|
| <b>Coupling</b>                                       | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                 |
|   | <b>8.0000.1102.0808</b>   |
| Mounting accessory for hollow shaft encoders          | Order no.   |
| <b>Cylindrical pin, long</b>                          | with fixing thread  |
| for flange with spring element<br>(flange type 3 + 6) | <b>8.0010.4700.0000</b>   |
|   |   |
| Connection technology                                 | Order no.   |
| <b>Cordset, pre-assembled</b>                         | M12 female connector with coupling nut, 5-pin,<br>2 m [6.56'] PVC cable |
|   | <b>05.00.6081.2211.002M</b>   |
| <b>Connector, self-assembly (straight)</b>            | M12 female connector with coupling nut, 5-pin                           |
|   | <b>8.0000.5116.0000</b>   |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                                   |   |
|--|---|
| Mechanical characteristics                       |   |
| <b>Maximum speed</b>                             | shaft or blind hollow shaft version 6000 min <sup>-1</sup><br>without shaft seal (IP65) 3000 min <sup>-1</sup> (continuous) |
|  | shaft or blind hollow shaft version 4000 min <sup>-1</sup><br>with shaft seal (IP67) 2000 min <sup>-1</sup> (continuous)    |
| <b>Starting torque at 20°C [68°F]</b>            | without shaft seal < 0.007 Nm<br>with shaft seal (IP67) < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial 40 N<br>axial 20 N   |
| Weight   |   |
| <b>Weight</b>                                    | approx. 0.2 kg [7.06 oz]  |
| Protection acc. to EN 60529                      |   |
| <b>Protection acc. to EN 60529</b>               | IP65 or IP67  |
| Working temperature range                        |   |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F]  |
| Materials  |   |
| <b>Materials</b>                                 | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC                               |
| Shock resistance acc. to EN 60068-2-27           |   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms  |
| Vibration resistance acc. to EN 60068-2-6        |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz   |

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Compact<br/>electronic multiturn, magnetic</b> | <b>Sendix M3661 / M3681 (shaft / hollow shaft)</b> | <b>Analog</b> |
|---|--|---------------|

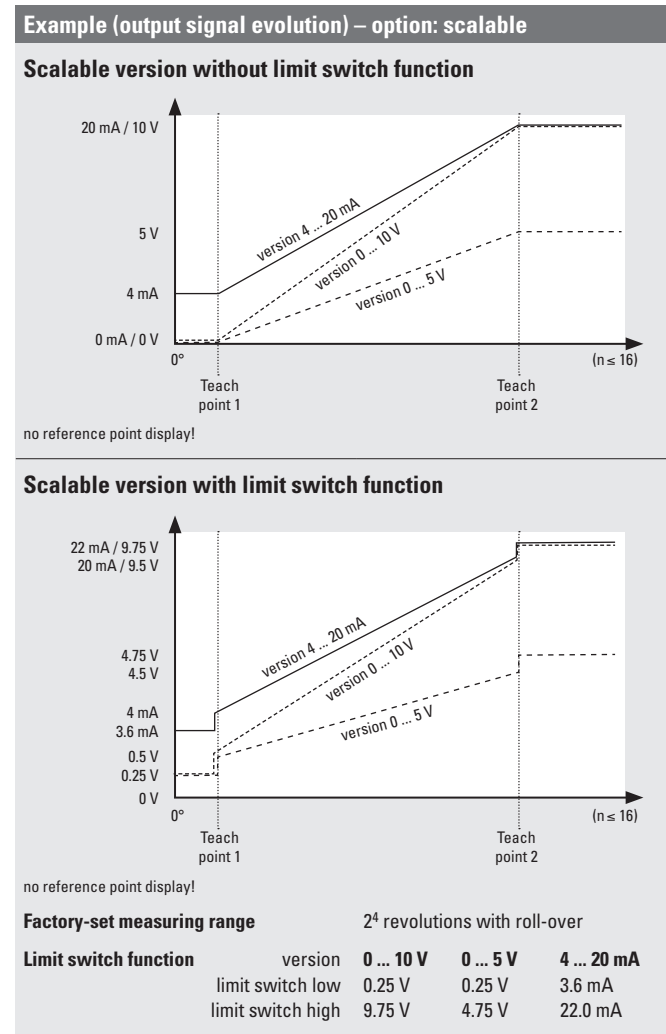
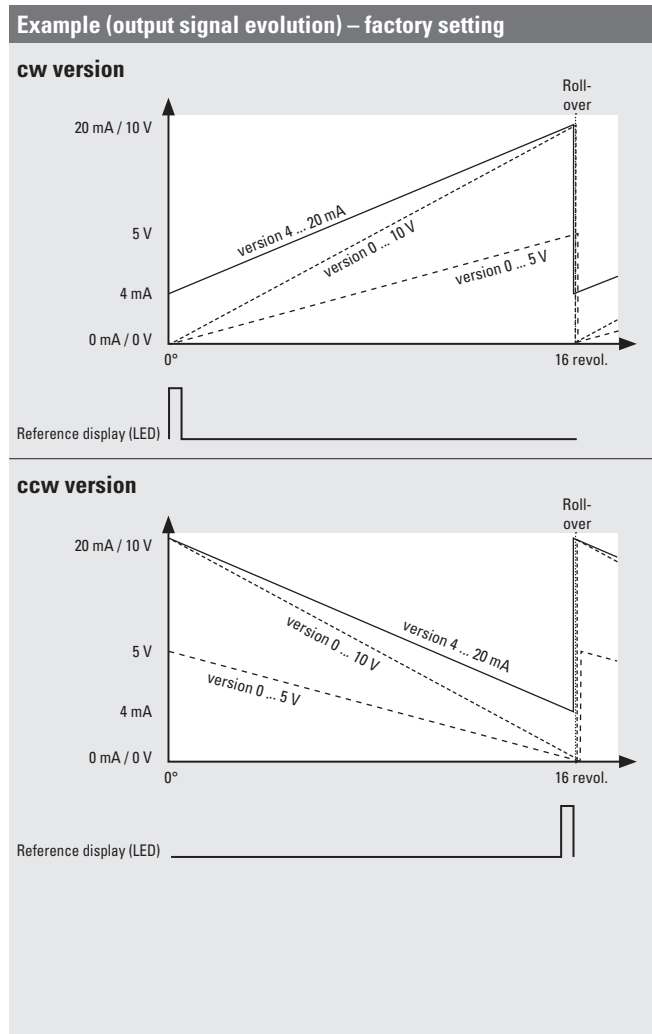
| Electrical characteristics current interface 4 ... 20 mA |  |   |
|--|--|---|
| <b>Power supply</b>                                      | 10 ... 30 V DC   |   |
| <b>Current consumption (no load)</b>                     | max. 30 mA   |   |
| <b>Reverse polarity protection of the power supply</b>   | yes  |   |
| <b>Short-circuit proof outputs</b>                       | yes <sup>1)</sup>  |   |
| <b>Measuring range</b>                                   | factory setting<br>optionally scalable   | 2 <sup>4</sup> revolutions<br>up to 2 <sup>16</sup> revolutions |
| <b>DA converter resolution</b>                           | 12 bit   |   |
| <b>Singleturn accuracy, at 25°C [77°F]</b>               | ±1°  |   |
| <b>Temperature coefficient</b>                           | < 100 ppm/K  |   |
| <b>Repeat accuracy, at 25°C [77°F]</b>                   | ±0.2°  |   |
| <b>Output load</b>                                       | at 10 V DC<br>at 24 V DC<br>at 30 V DC   | max. 200 Ohm<br>max. 900 Ohm<br>max. 1200 Ohm                   |
| <b>Setting time</b>                                      | < 1 ms, R <sub>Burden</sub> = 900 Ohm, 25°C [77°F]   |   |
| <b>LEDs (green/red)</b>                                  | <ul style="list-style-type: none"> <li>- system status</li> <li>- current loop interruption – input load too high</li> <li>- reference point display (only with factory settings)<br/>at cw: betw. 0° and 1°<br/>at ccw: betw. 0° and -1°</li> <li>- status in teach mode</li> </ul> |   |
| <b>Options</b>   | <ul style="list-style-type: none"> <li>- output signal scalable via the teach inputs</li> <li>- output signal scalable via the teach inputs + limit switch function</li> </ul>   |   |
| <b>Teach inputs</b>                                      | level = +V for 1 s min.  |   |
| <b>PowerON Time</b>                                      | < 1 s  |   |
| <b>Update rate</b>                                       | 1 ms   |   |
| <b>e1 compliant acc. to (pending)</b>                    | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)   |   |
| <b>UL approval</b>                                       | file 224618  |   |
| <b>CE compliant acc. to</b>                              | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |   |

| Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V |   |   |
|---|---|---|
| <b>Power supply</b>   | output 0 ... 5 V<br>output 0 ... 10 V   | 10 ... 30 V DC<br>15 ... 30 V DC                                |
| <b>Current consumption (no load)</b>                                | max. 30 mA  |   |
| <b>Reverse polarity protection of the power supply</b>              | yes   |   |
| <b>Short-circuit proof outputs</b>                                  | yes <sup>1)</sup>   |   |
| <b>Measuring range</b>  | factory setting<br>optionally scalable  | 2 <sup>4</sup> revolutions<br>up to 2 <sup>16</sup> revolutions |
| <b>DA converter resolution</b>                                      | 0 ... 10 V<br>0 ... 5 V   | 12 bit<br>11 bit  |
| <b>Singleturn accuracy, at 25°C [77°F]</b>                          | ±1°   |   |
| <b>Temperature coefficient</b>                                      | < 100 ppm/K   |   |
| <b>Repeat accuracy, at 25°C [77°F]</b>                              | ±0.2°   |   |
| <b>Current output</b>   | max. 10 mA  |   |
| <b>Setting time</b>   | < 1 ms, R <sub>Load</sub> = 1000 Ohm, 25°C [77°F]   |   |
| <b>LEDs (green/red)</b>   | <ul style="list-style-type: none"> <li>- system status</li> <li>- reference point display (only with factory settings)<br/>at cw: betw. 0° and 1°<br/>at ccw: betw. 0° and -1°</li> <li>- status in teach mode</li> </ul> |   |
| <b>Options</b>  | <ul style="list-style-type: none"> <li>- output signal scalable via the teach inputs</li> <li>- output signal scalable via the teach inputs + limit switch function</li> </ul>  |   |
| <b>Teach inputs</b>   | level = +V for 1 s min.   |   |
| <b>PowerON Time</b>   | < 1 s   |   |
| <b>Update rate</b>  | 1 ms  |   |
| <b>e1 compliant acc. to (pending)</b>                               | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)  |   |
| <b>UL approval</b>  | file 224618   |   |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |   |

1) When the power supply is correctly applied.  
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

# Absolute encoders – multitrurn

|  |  |               |
|--|--|---------------|
| <b>Compact electronic multitrurn, magnetic</b> | <b>Sendix M3661 / M3681 (shaft / hollow shaft)</b> | <b>Analog</b> |
|--|--|---------------|



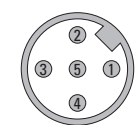
Absolute encoders multitrurn

## Terminal assignment

| Interface      | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
|----------------|--------------------|---|-----|----|----|---------------------|---------------------|
| 3 (current)    | 1, 2, A, B         | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                |                    | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface      | Type of connection | M12 connector, 5 pin  |     |    |    |                     |                     |
| 3 (current)    | 3, 4               | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                |                    | Pin:  | 3   | 2  | 1  | 5                   | 4                   |
| Interface      | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
| 4, 5 (current) | 1, 2, A, B         | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                |                    | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface      | Type of connection | M12 connector, 5 pin  |     |    |    |                     |                     |
| 4, 5 (current) | 3, 4               | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                |                    | Pin:  | 3   | 2  | 1  | 5                   | 4                   |

+V : encoder power supply +V DC      +U : voltage      SET 1 : set input for teachpoint 1  
 0 V : encoder power supply ground GND (0 V)      +I : current      SET 2 : set input for teachpoint 2

## Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3661 / M3681 (shaft / hollow shaft)</b> | <b>Analog</b> |
|---|--|---------------|

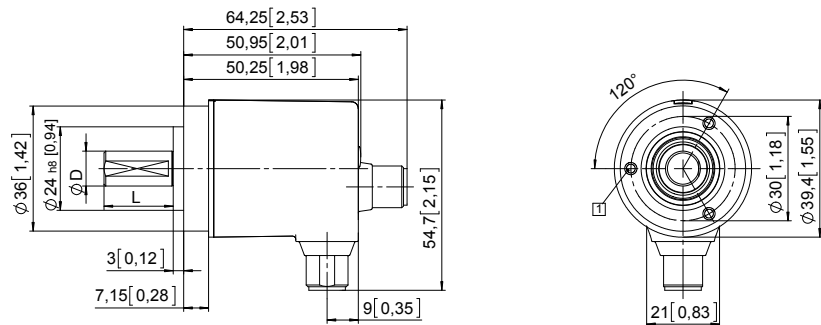
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 36 [1.42]

Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep

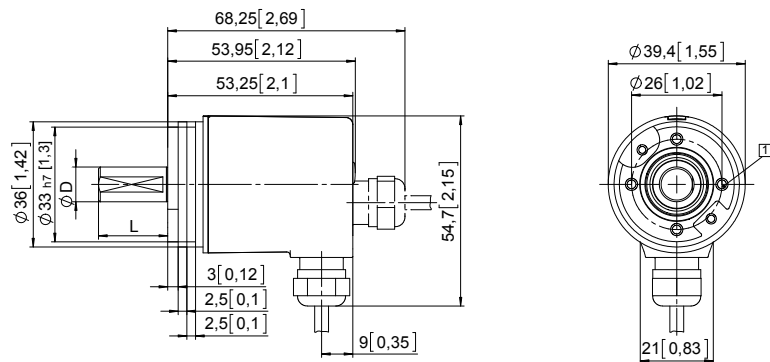


| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |

### Synchro flange, ø 36 [1.42]

Flange type 2 and 4

- 1 4 x M3, 6 [0.24] deep



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3661 / M3681 (shaft / hollow shaft)</b> | <b>Analog</b> |
|---|--|---------------|

## Dimensions hollow shaft version

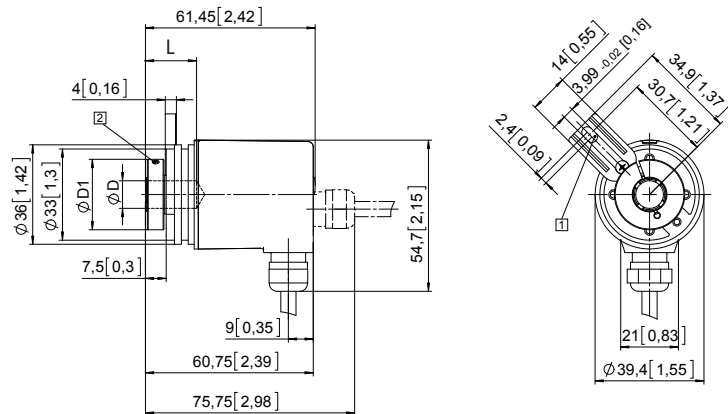
Dimensions in mm [inch]

### Flange with spring element, long Flange type 3 and 6

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft

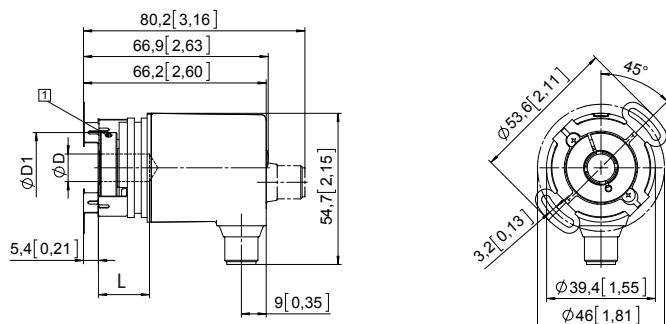


### Flange with stator coupling, $\varnothing$ 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft



# Absolute encoders – multiturn

|   |  |            |
|---|--|------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3663 / M3683 (shaft / hollow shaft)</b> | <b>SSI</b> |
|---|--|------------|



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.



|              |                       |                                      |                             |                          |                             |                             |  |                   |
|--------------|-----------------------|--------------------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|--|-------------------|
|              |                       |                                      |                             |                          |                             |                             |  |                   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°C ... +85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection<br>salt spray tested optional | Energy Harvesting |

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

### Order code Shaft version

8.M3663 . XX2X . XXXX2  
Type a b c d e f g

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP67, ø 36 mm [1.42"]
- 3 = clamping flange, IP65, ø 36 mm [1.42"]
- 2 = synchro flange, IP67, ø 36 mm [1.42"]
- 4 = synchro flange, IP65, ø 36 mm [1.42"]

#### b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
- 3 = ø 8 x 15 mm [0.32 x 0.59"]
- 5 = ø 10 x 20 mm [0.39 x 0.79"]
- 2 = ø 1/4" x 12.5 mm [0.49"]

#### c Interface / power supply

- 2 = SSI / 10 ... 30 V DC

#### d Type of connection

- 1 = axial cable, 1 m [3.28'] PUR
  - A = axial cable, special length PUR \*)
  - 2 = radial cable, 1 m [3.28'] PUR
  - B = radial cable, special length PUR \*)
  - 3 = axial M12 connector, 8-pin
  - 4 = radial M12 connector, 8-pin
- \*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.M3663.432A.G322.0030 (for cable length 3 m)

#### e Code

- B = SSI, binary
- G = SSI, gray

#### f Resolution (singleturn)

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST

#### g Resolution (multiturn)

- 2 = 12 bit MT
- 6 = 16 bit MT
- A = 20 bit MT
- 4 = 24 bit MT

#### Optional on request

- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

# Absolute encoders – multiturn

|   |  |            |
|---|--|------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3663 / M3683 (shaft / hollow shaft)</b> | <b>SSI</b> |
|---|--|------------|

|                                   |  |   |  |   |   |   |   |   |   |  |
|-----------------------------------|--|---|--|---|---|---|---|---|---|--|
| <b>Order code</b>                 | <b>8.M3683</b>   | <b>.XX2X.XXX2</b>   | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |   |   |   |   |   |   |  |
| <b>Hollow shaft</b>               | Type   | <table border="1" style="font-size: 0.7em; border-collapse: collapse; width: 100%;"> <tr> <td style="text-align: center;">a</td><td style="text-align: center;">b</td><td style="text-align: center;">c</td><td style="text-align: center;">d</td><td style="text-align: center;">e</td><td style="text-align: center;">f</td><td style="text-align: center;">g</td> </tr> </table> | a  | b | c | d | e | f | g |  |
| a                                 | b  | c   | d  | e | f | g |   |   |   |  |
| <b>a Flange</b>                   | <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u> | <b>d Type of connection</b>   | <b>f Resolution (singleturn)</b>   |   |   |   |   |   |   |  |
|                                   | 3 = with spring element, long, IP65                    | 1 = axial cable, 1 m [3.28'] PUR  | A = 10 bit ST  |   |   |   |   |   |   |  |
|                                   | 5 = with stator coupling, IP67, ø 46 mm [1.81"]        | A = axial cable, special length PUR *)  | 2 = 12 bit ST  |   |   |   |   |   |   |  |
|                                   | 6 = with spring element, long, IP67                    | 2 = radial cable, 1 m [3.28'] PUR   | <u>3 = 13 bit ST</u>   |   |   |   |   |   |   |  |
| <b>b Blind hollow shaft</b>       | (insertion depth max. 18.5 mm [0.73"])                 | B = radial cable, special length PUR *)   | 4 = 14 bit ST  |   |   |   |   |   |   |  |
|                                   | 1 = ø 6 mm [0.24"]                                     | 3 = axial M12 connector, 8-pin  | <b>g Resolution (multiturn)</b>  |   |   |   |   |   |   |  |
|                                   | 3 = ø 8 mm [0.32"]                                     | <u>4 = radial M12 connector, 8-pin</u>  | <u>2 = 12 bit MT</u>   |   |   |   |   |   |   |  |
|                                   | <u>4 = ø 10 mm [0.39"]</u>                             | *) Available special lengths (connection types A, B):   | 6 = 16 bit MT  |   |   |   |   |   |   |  |
|                                   | 2 = ø 1/4"   | 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  | A = 20 bit MT  |   |   |   |   |   |   |  |
| <b>c Interface / power supply</b> | <u>2 = SSI / 10 ... 30 V DC</u>                        | order code expansion .XXXX = length in dm   | 4 = 24 bit MT  |   |   |   |   |   |   |  |
|                                   |  | ex.: 8.M3683.242A.G322.0030 (for cable length 3 m)  |  |   |   |   |   |   |   |  |
| <b>e Code</b>                     | <u>B = SSI, binary</u>                                 | <b>g Optional on request</b>  |  |   |   |   |   |   |   |  |
| <b>g SSI, gray</b>                |  | - Ex 2/22 (only for connection types 3 and 4)   |  |   |   |   |   |   |   |  |
|                                   |  | - surface protection salt spray tested  |  |   |   |   |   |   |   |  |

| Mounting accessory for shaft encoders                 | Order no.  |
|---|--|
| <b>Coupling</b>                                       | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                |
|   | <b>8.0000.1102.0808</b>  |
| Mounting accessory for hollow shaft encoders          | Order no.  |
| <b>Cylindrical pin, long</b>                          | with fixing thread   |
| for flange with spring element<br>(flange type 3 + 6) | <b>8.0010.4700.0000</b>  |
|   |  |
| Connection technology                                 | Order no.  |
| <b>Cordset, pre-assembled</b>                         | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable |
|   | <b>05.00.6051.8211.002M</b>  |
| <b>Connector, self-assembly (straight)</b>            | M12 female connector with coupling nut, 8-pin                          |
|   | <b>05.CMB 8181-0</b>   |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                                   |                                       |
|--|---------------------------------------|
| Mechanical characteristics                       |                                       |
| <b>Maximum speed</b>                             |                                       |
| shaft or blind hollow shaft version              | 6000 min <sup>-1</sup>                |
| without shaft seal (IP65)                        | 3000 min <sup>-1</sup> (continuous)   |
| shaft or blind hollow shaft version              | 4000 min <sup>-1</sup>                |
| with shaft seal (IP67)                           | 2000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque at 20°C [68°F]</b>            |                                       |
| without shaft seal                               | < 0.007 Nm                            |
| with shaft seal (IP67)                           | < 0.01 Nm                             |
| <b>Shaft load capacity</b>                       |                                       |
| radial   | 40 N                                  |
| axial  | 20 N                                  |
| Weight   |                                       |
| <b>Weight</b>                                    | approx. 0.2 kg [7.06 oz]              |
| Protection acc. to EN 60529                      |                                       |
| <b>Protection acc. to EN 60529</b>               | IP65 or IP67                          |
| Working temperature range                        |                                       |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F]    |
| Materials  |                                       |
| <b>Materials</b>                                 | shaft / hollow shaft stainless steel  |
|  | flange aluminum                       |
|  | housing zinc die-cast                 |
|  | cable PUR                             |
| Shock resistance acc. to EN 60068-2-27           |                                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms          |
| Vibration resistance acc. to EN 60068-2-6        |                                       |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz |

# Absolute encoders – multiturn

|   |  |            |
|---|--|------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3663 / M3683 (shaft / hollow shaft)</b> | <b>SSI</b> |
|---|--|------------|

| Electrical characteristics                             |  |
|--|--|
| <b>Power supply</b>                                    | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                   | max. 40 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes  |
| <b>Short-circuit proof outputs</b>                     | yes <sup>1)</sup>  |
| <b>e1 compliant acc. to (pending)</b>                  | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637) |
| <b>UL approval</b>                                     | file 224618  |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU              |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type   |
| <b>Permissible load / channel</b>   | max. +/- 30 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW with I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit  |
| <b>Absolute accuracy <sup>2)</sup></b>  | ±1°  |
| <b>Repeat accuracy</b>  | ±0.2°  |
| <b>Number of revolutions (multiturn)</b>  | max. 24 bit  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | 2 ms   |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time. |  |

| SET input   |  |
|---|--|
| <b>Input</b>  | active HIGH  |
| <b>Input type</b>   | comparator   |
| <b>Signal level (+V = power supply)</b>   | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>  | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>  | 10 ms  |
| <b>Input delay</b>  | 1 ms   |
| <b>New position data readable after</b>   | 1 ms   |
| <b>Internal processing time</b>   | 200 ms   |
| The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. |  |
| The SET function should be carried out whilst the encoder is at rest.   |  |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |  |

| DIR input  |      |
|--|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.                                       |      |
| <b>Response time (DIR input)</b>   | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |        |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|--------|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥      |
| 2         | 1, 2, A, B         | SET, DIR | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | shield |
|           |                    |          |   |     |    |    |    |    |    |     |     |        |
| Interface | Type of connection | Features | M12 connector, 8-pin  |     |    |    |    |    |    |     |     |        |
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥      |
| 2         | 3, 4               | SET, DIR | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | PH     |
|           |                    |          |   |     |    |    |    |    |    |     |     |        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin

1) Short circuit proof to 0 V or to output when power supply correctly applied.  
2) Over the whole temperature range.

# Absolute encoders – multiturn

|   |  |            |
|---|--|------------|
| <b>Compact<br/>electronic multiturn, magnetic</b> | <b>Sendix M3663 / M3683 (shaft / hollow shaft)</b> | <b>SSI</b> |
|---|--|------------|

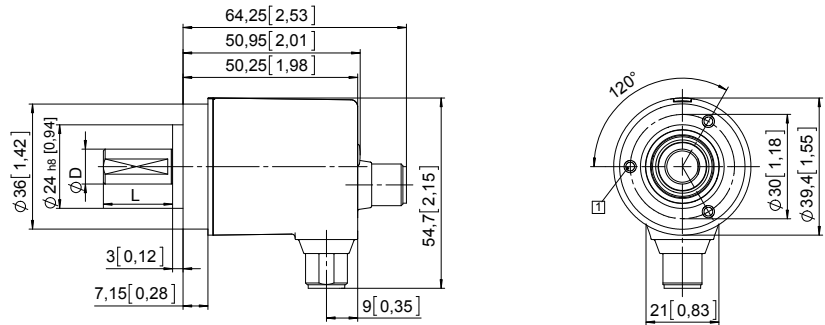
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 36 [1.42]

#### Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep

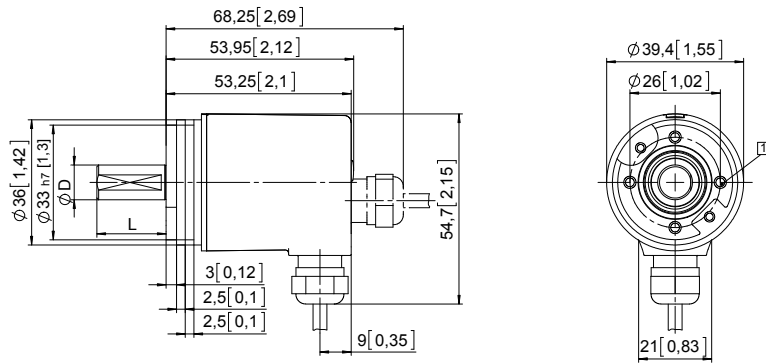


| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |

### Synchro flange, $\varnothing$ 36 [1.42]

#### Flange type 2 and 4

- 1 4 x M3, 6 [0.24] deep



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

## Compact electronic multiturn, magnetic

Sendix M3663 / M3683 (shaft / hollow shaft)

SSI

### Dimensions hollow shaft version

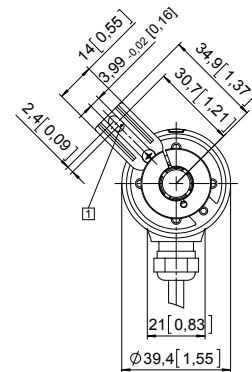
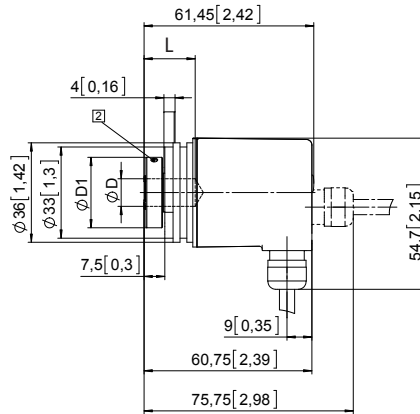
Dimensions in mm [inch]

#### Flange with spring element, long Flange type 3 and 6

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft

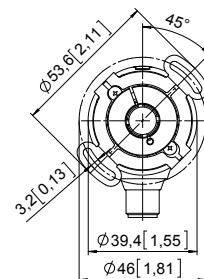
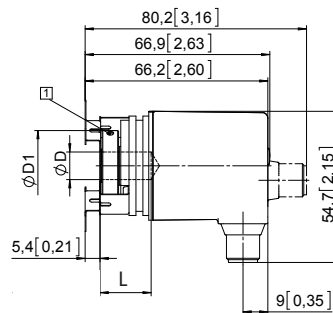


#### Flange with stator coupling, $\varnothing$ 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft



# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3668 / M3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

It is characterized by robustness, reliability and cost-efficiency.



|              |                       |                                    |                             |                          |                             |                             |   |                   |
|--------------|-----------------------|------------------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|---|-------------------|
|              |                       |                                    |                             |                          |                             |                             |   |                   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°... +85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection salt spray-tested optional | Energy Harvesting |

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Absolute encoders multiturn

**Order code** 8.M3668 . XX 2 X . 21 22  
**Shaft version** Type

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
 Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



- a Flange**  
 1 = clamping flange, IP67, ø 36 mm [1.42"]  
 3 = clamping flange, IP65, ø 36 mm [1.42"]  
 2 = synchro flange, IP67, ø 36 mm [1.42"]  
**4 = synchro flange, IP65, ø 36 mm [1.42"]**
- b Shaft (ø x L), with flat**  
 1 = ø 6 x 12.5 mm [0.24 x 0.49"]  
**3 = ø 8 x 15 mm [0.32 x 0.59"]**  
 5 = ø 10 x 20 mm [0.39 x 0.79"]  
 2 = ø 1/4" x 12.5 mm [0.49"]

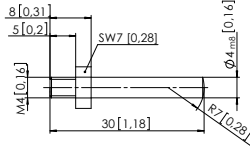
- c Interface / power supply**  
**2 = CANopen DS301 V4.2 / 10 ... 30 V DC**
- d Type of connection**  
 1 = axial cable, 1 m [3.28'] PVC  
 A = axial cable, special length PVC \*)  
 2 = radial cable, 1 m [3.28'] PVC  
 B = radial cable, special length PVC \*)  
 3 = axial M12 connector, 5-pin  
**4 = radial M12 connector, 5-pin**
- \*) Available special lengths (connection types A, B):  
 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.M3668.432A.2122.0030 (for cable length 3 m)

- e Fieldbus profile**  
**21 = CANopen encoder profile DS406 V4.0**
- Optional on request*  
 - Ex 2/22 (only for connection types 3 and 4)  
 - surface protection salt spray tested

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3668 / M3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

|   |   |  |  |  |   |
|---|---|--|--|--|---|
| <b>Order code</b><br><b>Hollow shaft</b>                              | <b>8.M3688</b><br>Type  | <b>.XX2X</b><br>a b c d  | <b>.2122</b><br>e  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. | <b>10 by 10</b>   |
| <b>a Flange</b>   | <b>2 = with stator coupling, IP65, ø 46 mm [1.81"]</b><br>3 = with spring element, long, IP65<br>5 = with stator coupling, IP67, ø 46 mm [1.81"]<br>6 = with spring element, long, IP67 | <b>c Interface / power supply</b>  | <b>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</b>   | <b>e Fieldbus profile</b>  | <b>21 = CANopen encoder profile DS406 V4.0</b>  |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 18.5 mm [0.73"]) | 1 = ø 6 mm [0.24"]<br>3 = ø 8 mm [0.32"]<br><b>4 = ø 10 mm [0.39"]</b><br>2 = ø 1/4"  | <b>d Type of connection</b>  | 1 = axial cable, 1 m [3.28'] PVC<br>A = axial cable, special length PVC *)<br>2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br>3 = axial M12 connector, 5-pin<br><b>4 = radial M12 connector, 5-pin</b> | <b>Optional on request</b>   | - Ex 2/22 (only for connection types 3 and 4)<br>- surface protection salt spray tested |
|   |   | *) Available special lengths (connection types A, B):<br>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.M3688.242A.2122.0030 (for cable length 3 m) |  |  |   |

| Mounting accessory for shaft encoders   |   | Order no.                   |
|---|---|-----------------------------|
| <b>Coupling</b>   | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]   | <b>8.0000.1102.0808</b>     |
| Mounting accessory for hollow shaft encoders  |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 3 + 6) | with fixing thread<br> | <b>8.0010.4700.0000</b>     |
| Connection technology   |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut, 5-pin<br>5 m [16.40'] PVC cable                                   | <b>05.00.6091.A211.005M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut, 5-pin   | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |   |
|--|---|
| Mechanical characteristics                             |   |
| <b>Maximum speed</b>                                   | shaft or blind hollow shaft version 6000 min <sup>-1</sup><br>without shaft seal (IP65) 3000 min <sup>-1</sup> (continuous) |
|  | shaft or blind hollow shaft version 4000 min <sup>-1</sup><br>with shaft seal (IP67) 2000 min <sup>-1</sup> (continuous)    |
| <b>Starting torque at 20°C [68°F]</b>                  | without shaft seal < 0.007 Nm<br>with shaft seal (IP67) < 0.01 Nm   |
| <b>Shaft load capacity</b>                             | radial 40 N<br>axial 20 N   |
| <b>Weight</b>  | approx. 0.2 kg [7.06 oz]  |
| <b>Protection acc. to EN 60529</b>                     | IP65 or IP67  |
| <b>Working temperature range</b>                       | -40°C ... +85°C [-40°F ... +185°F]  |
| <b>Materials</b>                                       | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC                               |
| Electrical characteristics                             |   |
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                   | max. 30 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short-circuit proof outputs</b>                     | yes <sup>1)</sup>   |
| <b>ø1 compliant acc. to (pending)</b>                  | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)  |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |

1) Short circuit proof to 0 V or to output when power supply correctly applied.



# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3668 / M3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

| Interface characteristics CANopen        |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 16384 (14 bit), scalable<br>default: 8192 (13 bit)                                     |
| <b>Absolute accuracy <sup>1)</sup></b>   | ±1°  |
| <b>Repeat accuracy</b>                   | ±0.2°  |
| <b>Number of revolutions (multiturn)</b> | max. 16.777.216 (24 bit)<br>scalable only via the total resolution                           |
| <b>Total resolution</b>                  | 1 ... 274.877.906.944 (38 bit), scalable<br>default: 33.554.432 (25 bit)                     |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B         |
| <b>Protocol</b>                          | CANopen profile DS406 V4.0<br>with manufacturer-specific add-ons,<br>LSS-Service, bootloader |

|                      |   |
|----------------------|---|
| <b>Power-ON time</b> | < 1200 ms   |
| <b>SDO timeout</b>   | < 1000 ms   |
| <b>Baud rate</b>     | 10 ... 1000 kbit/s<br>software configurable   |
| <b>Node address</b>  | 1 ... 127<br>software configurable  |
| <b>Termination</b>   | software configurable   |
| <b>LSS protocol</b>  | CIA LSS protocol DS305,<br>global command support for node<br>address and baud rate,<br>selective commands via attributes of<br>the identity object |
| <b>Bootloader</b>    | configuration management<br>CIA DS 302-3  |

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

## CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

## LSS layer setting services DS305 V2.0

- Global support of node-ID and baud rate.
- Selective protocol via identity object (1018h).

## CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

- NMT Slave.
- Heartbeat Protocol.
- Identity Object.
- Error Behavior Object.
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus / programmable termination.

## CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

## Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

1) Over the whole temperature range.

# Absolute encoders – multiturn

**Compact electronic multiturn, magnetic**

**Sendix M3668 / M3688 (shaft / hollow shaft)**

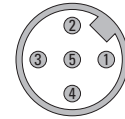
**CANopen**

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
| 2         | 1, 2, A, B         | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Cable color:  | BN | WH  | GY      | GN    | YE    |

| Interface | Type of connection | M12 connector, 5-pin |    |     |         |       |       |
|-----------|--------------------|----------------------|----|-----|---------|-------|-------|
| 2         | 3, 4               | Signal:              | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Pin:                 | 2  | 3   | 1       | 4     | 5     |

Top view of mating side, male contact base



M12 connector, 5-pin

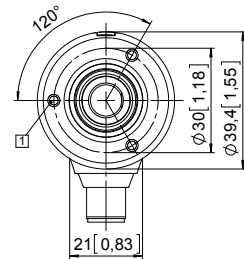
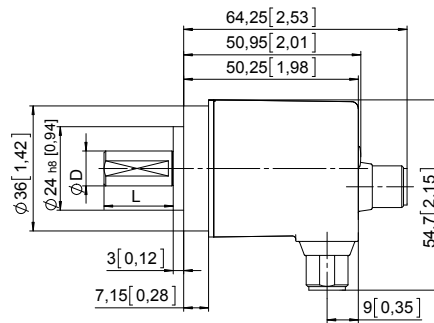
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 36 [1.42] Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

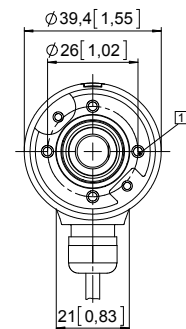
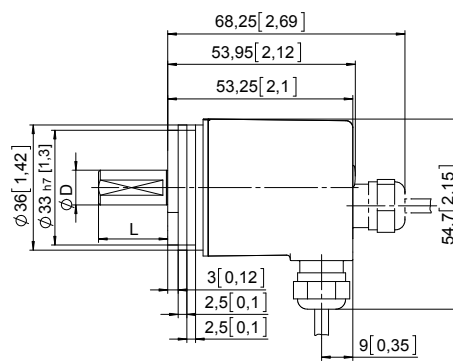
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



### Synchro flange, ø 36 [1.42] Flange type 2 and 4

1 4 x M3, 6 [0.24] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Compact electronic multiturn, magnetic</b> | <b>Sendix M3668 / M3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

## Dimensions hollow shaft version

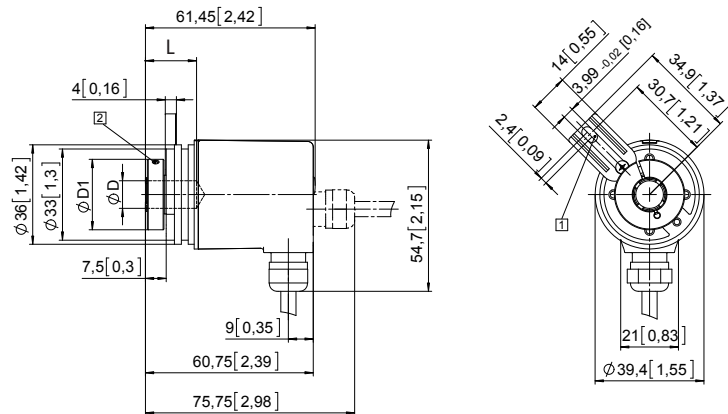
Dimensions in mm [inch]

### Flange with spring element, long Flange type 3 and 6

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft

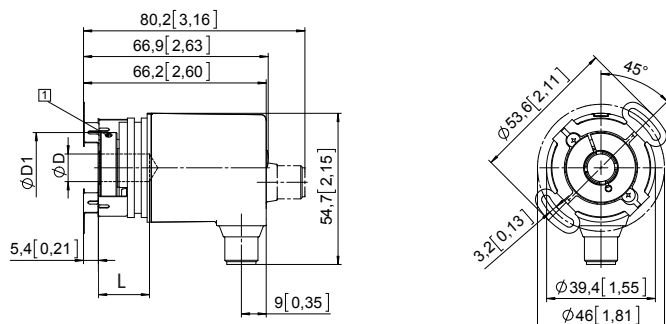


### Flange with stator coupling, $\varnothing$ 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 18.5 [0.73] | 24 [0.94]   |
| 8 [0.32]  | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 10 [0.39] | H7  | 18.5 [0.73] | 25.5 [1.00] |
| 1/4"      | H7  | 18.5 [0.73] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft



# Absolute encoders – multiturn

**Compact, robust  
electronic multiturn, magnetic**

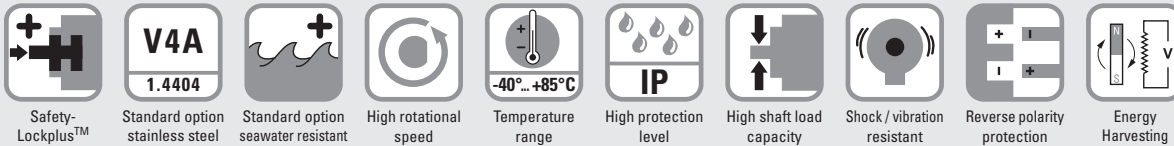
**Sendix M3661R (shaft)**

**Analog**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R" robust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



## Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

## Order code Shaft version

**8.M3661R.XXXX.XX12**  
Type      a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Version

- 1 = standard** <sup>1)</sup>  
clamping flange ø 42 mm [1.65"]  
 7 = stainless steel V4A <sup>2)</sup>  
 clamping flange ø 42 mm [1.65"]  
 all metal parts accessible from outside  
 are out of stainless steel V4A

- b Shaft (ø x L), with flat**  
 1 = ø 6 x 12.5 mm [0.24 x 0.49"]  
**3 = ø 8 x 15 mm [0.32 x 0.59"]**  
 5 = ø 10 x 20 mm [0.39 x 0.79"]  
 2 = ø 1/4" x 12.5 mm [0.49"]  
 E = ø 10 x 20 mm [0.39 x 0.79"],  
 stainless steel V4A

### c Output circuit <sup>3)</sup>

- 3 = current output**  
**4 = voltage output**

### d Type of connection

- 2 = radial cable, 1 m [3.28'] PVC  
 B = radial cable, special length PVC \*)  
**4 = radial M12 connector, 5-pin**

\*) Available special lengths (connection types B):  
 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.M3661R.133B.3112.0030 (for cable length 3 m)

### e Interface / resolution / power supply

- 3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC**  
**4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC**  
 5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

### f Measuring range

- 1 = 16 revolutions / cw**  
 2 = 16 revolutions / ccw  
 3 = scalable up to 65,536 revolutions,  
 with limit switch function  
 4 = scalable up to 65,536 revolutions,  
 without limit switch function

### Optional on request

- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".

2) Only in conjunction with shaft type "E" + type of connection "4".

3) Output circuit "3" only in conjunction with interface "3",  
 output circuit "4" only in conjunction with interface "4" or "5".

# Absolute encoders – multiturn

|   |  |   |
|---|--|---|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3661R (shaft)</b>   | <b>Analog</b>                             |
| <b>Mounting accessory for shaft encoders</b>          |  | Order no.                                 |
| <b>Coupling</b>                                       | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                | <b>8.0000.1102.0808</b> <sup>1)</sup>     |
| <b>Connection technology</b>                          |  | Order no.                                 |
| <b>Cordset, pre-assembled</b>                         | M12 female connector with coupling nut, 5-pin<br>2 m [6.56"] PVC cable | <b>05.00.6081.2211.002M</b> <sup>1)</sup> |
| <b>Connector, self-assembly (straight)</b>            | M12 female connector with coupling nut, 5-pin                          | <b>8.0000.5116.0000</b> <sup>1)</sup>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |  |
|---|--|
| Electrical characteristics current interface 4 ... 20 mA            |  |
| <b>Power supply</b>   | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                                | max. 30 mA   |
| <b>Reverse polarity protection of the power supply</b>              | yes  |
| <b>Short-circuit proof outputs</b>                                  | yes <sup>2)</sup>  |
| <b>Measuring range</b>  | factory setting 2 <sup>4</sup> revolutions<br>optionally scalable up to 2 <sup>16</sup> revolutions  |
| <b>DA converter resolution</b>                                      | 12 bit   |
| <b>Singleturn accuracy, at 25°C [77°F]</b>                          | ±1°  |
| <b>Temperature coefficient</b>                                      | < 100 ppm/K  |
| <b>Repeat accuracy, at 25°C [77°F]</b>                              | ±0.2°  |
| <b>Output load</b>  | at 10 V DC max. 200 Ohm<br>at 24 V DC max. 900 Ohm<br>at 30 V DC max. 1200 Ohm   |
| <b>Setting time</b>   | < 1 ms, R <sub>Burden</sub> = 900 Ohm, 25°C [77°F]   |
| <b>LEDs (green/red)</b>   | - system status<br>- current loop interruption – input load too high<br>- reference point display (only with factory settings)<br>at cw: betw. 0° and 1°<br>at ccw: betw. 0° and -1°<br>- status in teach mode |
| <b>Options</b>  | - output signal scalable via the teach inputs<br>- output signal scalable via the teach inputs + limit switch function   |
| <b>Teach inputs</b>   | level = +V for 1 s minimum   |
| <b>PowerON Time</b>   | < 1 s  |
| <b>Update rate</b>  | 1 ms   |
| <b>e1 compliant acc. to (pending)</b>                               | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)   |
| <b>UL approval</b>  | File 224618  |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |
| Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V |  |
| <b>Power supply</b>   | output 0 ... 5 V 10 ... 30 V DC<br>output 0 ... 10 V 15 ... 30 V DC  |
| <b>Current consumption (no load)</b>                                | max. 30 mA   |
| <b>Reverse polarity protection of the power supply</b>              | yes  |
| <b>Short-circuit proof outputs</b>                                  | yes <sup>2)</sup>  |
| <b>Measuring range</b>  | factory setting 2 <sup>4</sup> revolutions<br>optionally scalable up to 2 <sup>16</sup> revolutions  |
| <b>DA converter resolution</b>                                      | 0 ... 10 V 12 bit<br>0 ... 5 V 11 bit  |
| <b>Singleturn accuracy, at 25°C [77°F]</b>                          | ±1°  |
| <b>Temperature coefficient</b>                                      | < 100 ppm/K  |
| <b>Repeat accuracy, at 25°C [77°F]</b>                              | ±0.2°  |
| <b>Current output</b>   | max. 10 mA   |
| <b>Setting time</b>   | < 1 ms, R <sub>Load</sub> = 1000 Ohm, 25°C [77°F]  |
| <b>LEDs (green/red)</b>   | - system status<br>- reference point display (only with factory settings)<br>at cw: betw. 0° and 1°<br>at ccw: betw. 0° and -1°<br>- status in teach mode  |
| <b>Options</b>  | - output signal scalable via the teach inputs<br>- output signal scalable via the teach inputs + limit switch function   |
| <b>Teach inputs</b>   | level = +V for 1 s minimum   |
| <b>PowerON Time</b>   | < 1 s  |
| <b>Update rate</b>  | 1 ms   |
| <b>e1 compliant acc. to (pending)</b>                               | EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)   |
| <b>UL approval</b>  | File 224618  |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

1) Not for version "7" (V4A stainless steel)

2) When the power supply is correctly applied.

But not output to +V. Power supply and sensor output signal are not galvanically isolated.

# Absolute encoders – multiturn

**Compact, robust  
electronic multiturn, magnetic**

**Sendix M3661R (shaft)**

**Analog**

### Mechanical characteristics

|  |   |
|--|---|
| <b>Maximum speed</b>                           | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous) |
| <b>Starting torque at 20°C [68°F]</b>          | < 0.01 Nm   |
| <b>Shaft load capacity</b>                     | radial 80 N<br>axial 40 N                                     |
| <b>Weight</b>                                  | approx. 0.2 kg [7.06 oz]                                      |
| <b>Protection acc. to EN 60529/DIN 40050-9</b> | IP66, IP67, IP69k   |
| <b>Working temperature range</b>               | -40°C ... +85°C [-40°F ... +185°F]                            |

### Materials

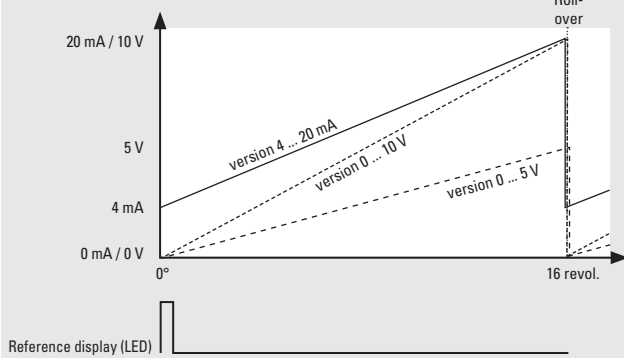
|         | version "1"<br>(standard) | version "7"<br>(stainless steel) |
|---------|---------------------------|----------------------------------|
| shaft   | V2A                       | V4A                              |
| flange  | aluminum                  | V4A                              |
| housing | zinc die-cast             | V4A                              |
| cable   | PVC                       | –                                |

**Shock resistance** acc. to EN 60068-2-27 5000 m/s<sup>2</sup>, 4 ms

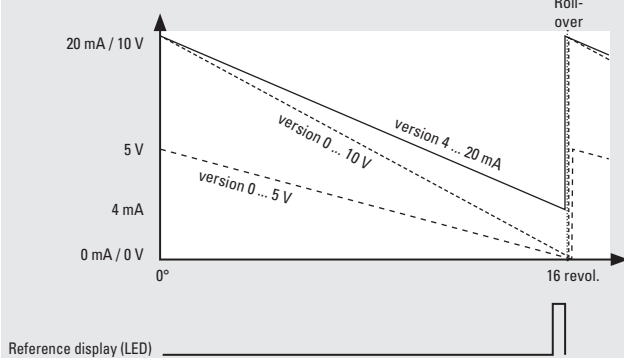
**Vibration resistance** acc. to EN 60068-2-6 300 m/s<sup>2</sup>, 10 ... 2000 Hz

### Example (output signal evolution) – factory setting

#### cw version

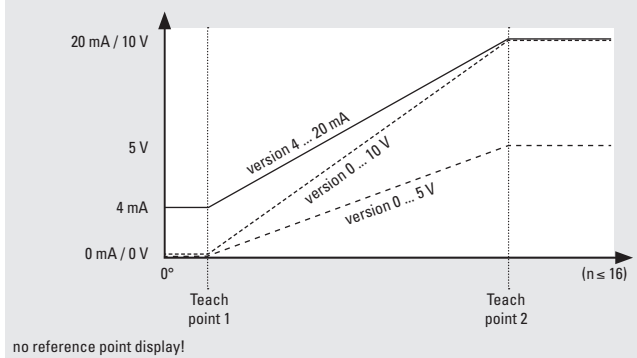


#### ccw version

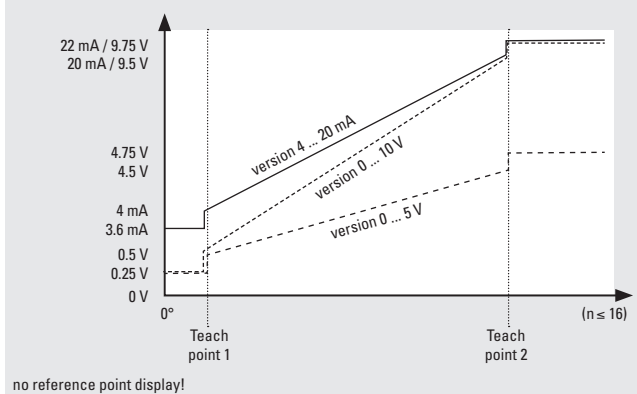


### Example (output signal evolution) – option: scalable

#### Scalable version without limit switch function



#### Scalable version with limit switch function



#### Factory-set measuring range

2<sup>4</sup> revolutions with roll-over

| Limit switch function | version | 0 ... 10 V | 0 ... 5 V | 4 ... 20 mA |
|-----------------------|---------|------------|-----------|-------------|
| limit switch low      |         | 0.25 V     | 0.25 V    | 3.6 mA      |
| limit switch high     |         | 9.75 V     | 4.75 V    | 22.0 mA     |

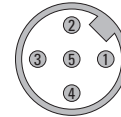
# Absolute encoders – multiturn

|   |                              |               |
|---|------------------------------|---------------|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3661R (shaft)</b> | <b>Analog</b> |
|---|------------------------------|---------------|

## Terminal assignment

|                   |                    |   |     |    |    |                     |                     |
|-------------------|--------------------|---|-----|----|----|---------------------|---------------------|
| Interface         | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
| 3<br>(current)    | 2, B               | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                   |                    | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface         | Type of connection | M12 connector, 5 pin  |     |    |    |                     |                     |
| 3<br>(current)    | 4                  | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                   |                    | Pin:  | 3   | 2  | 1  | 5                   | 4                   |
| Interface         | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
| 4, 5<br>(current) | 2, B               | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                   |                    | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface         | Type of connection | M12 connector, 5 pin  |     |    |    |                     |                     |
| 4, 5<br>(current) | 4                  | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                   |                    | Pin:  | 3   | 2  | 1  | 5                   | 4                   |

Top view of mating side, male contact base



M12 connector, 5-pin

+V : encoder power supply +V DC                      +U : voltage                      SET 1 : set input for teachpoint 1  
 0 V : encoder power supply ground GND (0 V)      +I : current                      SET 2 : set input for teachpoint 2

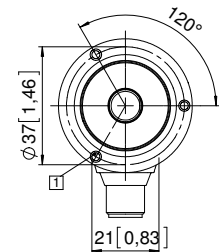
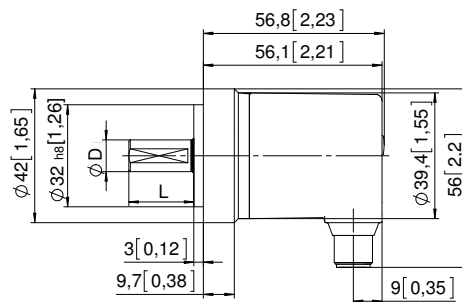
## Dimensions

Dimensions in mm [inch]

### Aluminum clamping flange, ø 42 [1.65] version 1

1) 3 x M3, 6 [0.24] deep

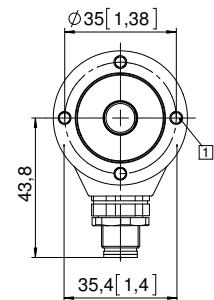
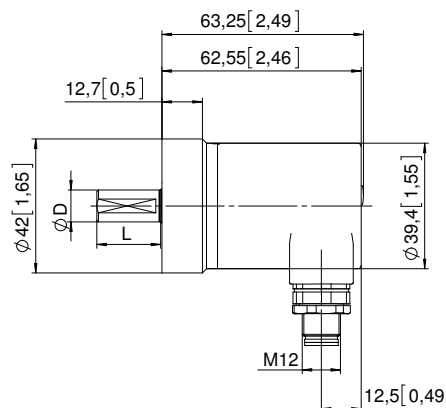
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



### Stainless steel V4A clamping flange, ø 42 [1.65] version 7

1) 4 x M4, 8 [0.31] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



1) For scalable version.

# Absolute encoders – multiturn

**Compact, robust  
electronic multiturn, magnetic**

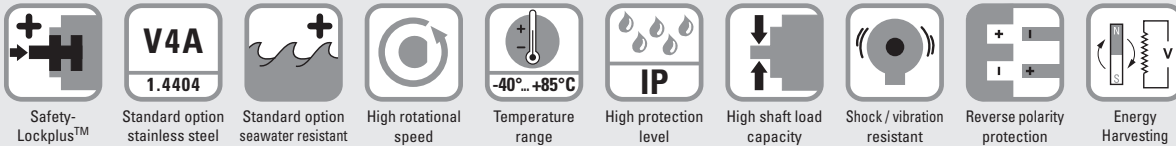
**Sendix M3663R (shaft)**

**SSI**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R" robust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



## Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Application oriented

- Absolute accuracy  $\pm 1^\circ$ .
- Repeat accuracy  $\pm 0.2^\circ$ .
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

## Order code Shaft version

**8.M3663R.XX2X.XXX2**  
Type      a b c d e f g

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Version

- 1 = standard** <sup>1)</sup>  
clamping flange  $\varnothing$  42 mm [1.65"]  
7 = stainless steel V4A <sup>2)</sup>  
clamping flange  $\varnothing$  42 mm [1.65"]  
all metal parts accessible from outside  
are out of stainless steel V4A

- ### b Shaft ( $\varnothing \times L$ ), with flat
- 1 =  $\varnothing$  6 x 12.5 mm [0.24 x 0.49"]  
**3 =  $\varnothing$  8 x 15 mm [0.32 x 0.59"]**  
5 =  $\varnothing$  10 x 20 mm [0.39 x 0.79"]  
2 =  $\varnothing$  1/4" x 12.5 mm [0.49"]  
E =  $\varnothing$  10 x 20 mm [0.39 x 0.79"],  
stainless steel V4A

### c Interface / power supply

- 2 = SSI / 10 ... 30 V DC**  
**d Type of connection**  
2 = radial cable, 1 m [3.28'] PUR  
B = radial cable, special length PUR \*)  
**4 = radial M12 connector, 8-pin**

\*) Available special lengths (connection type B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.M3663R.132B.G322.0030 (for cable length 3 m)

- ### e Code
- B = SSI, binary  
**G = SSI, gray**

### f Resolution (singleturn)

- A = 10 bit ST  
2 = 12 bit ST  
**3 = 13 bit ST**  
4 = 14 bit ST

### g Resolution (multiturn)

- 2 = 12 bit MT**  
6 = 16 bit MT  
A = 20 bit MT  
4 = 24 bit MT

### Optional on request

- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".

2) Only in conjunction with shaft type "E" + type of connection "4".



# Absolute encoders – multiturn

|   |                              |            |
|---|------------------------------|------------|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3663R (shaft)</b> | <b>SSI</b> |
|---|------------------------------|------------|

| Mounting accessory for shaft encoders      |  | Order no.                                 |
|--|--|---|
| <b>Coupling</b>                            | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                | <b>8.0000.1102.0808</b> <sup>1)</sup>     |
| Connection technology                      |  | Order no.                                 |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PUR cable | <b>05.00.6051.8211.002M</b> <sup>1)</sup> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                          | <b>05.CMB 8181-0</b> <sup>1)</sup>        |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   |   |
|--|---|---|
| <b>Maximum speed</b>                             | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous) |   |
| <b>Starting torque at 20°C [68°F]</b>            | < 0.01 Nm   |   |
| <b>Shaft load capacity</b>                       | radial  | 80 N                                    |
|  | axial   | 40 N                                    |
| <b>Weight</b>                                    | approx. 0.2 kg [7.06 oz]                                      |   |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>   | IP66, IP67, IP69k   |   |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F]                            |   |
| <b>Materials</b>                                 | <b>version "1"</b><br>(standard)                              | <b>version "7"</b><br>(stainless steel) |
|  | shaft   | V2A                                     |
|  | flange  | aluminum                                |
|  | housing   | zinc die-cast                           |
|  | cable   | PUR                                     |
|  |   | V4A                                     |
|  |   | V4A                                     |
|  |   | –                                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 5000 m/s <sup>2</sup> , 4 ms                                  |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                         |   |

| Electrical characteristics                             |  |
|--|--|
| <b>Power supply</b>                                    | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                   | max. 30 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes  |
| <b>Short-circuit proof outputs</b>                     | yes <sup>2)</sup>  |
| <b>e1 compliant acc. to (pending)</b>                  | EU guideline 2009/19/EC<br>(acc. to EN 55025,<br>ISO 11452 and ISO 7637) |
| <b>UL approval</b>                                     | File 224618  |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU                    |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type   |
| <b>Permissible load / channel</b>   | max. +/- 30 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW with I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit  |
| <b>Absolute accuracy <sup>3)</sup></b>  | ±1°  |
| <b>Repeat accuracy</b>  | ±0.2°  |
| <b>Number of revolutions (multiturn)</b>  | max. 24 bit  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | 2 ms   |
| <b>Monoflop time</b>  | ≤ 15 µs  |
| <b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time. |  |

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | active HIGH  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = power supply) | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Input delay</b>                         | 1 ms   |
| <b>New position data readable after</b>    | 1 ms   |
| <b>Internal processing time</b>            | 200 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

1) Not for version "7" (V4A stainless steel)  
2) Short circuit proof to 0 V or to output when power supply correctly applied.  
3) Over the whole temperature range.

# Absolute encoders – multiturn

|   |                              |            |
|---|------------------------------|------------|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3663R (shaft)</b> | <b>SSI</b> |
|---|------------------------------|------------|

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |
|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |
| Hot plugging of the encoder should be avoided.   |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |        |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|--------|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥      |
| 2         | 2, B               | SET, DIR | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | shield |

| Interface | Type of connection | Features | M12 connector, 8-pin |     |    |    |    |    |    |     |     |    |
|-----------|--------------------|----------|----------------------|-----|----|----|----|----|----|-----|-----|----|
|           |                    |          | Signal:              | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥  |
| 2         | 4                  | SET, DIR | Pin:                 | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | PH |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

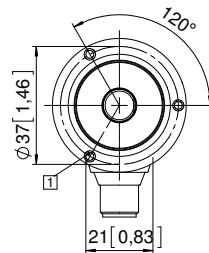
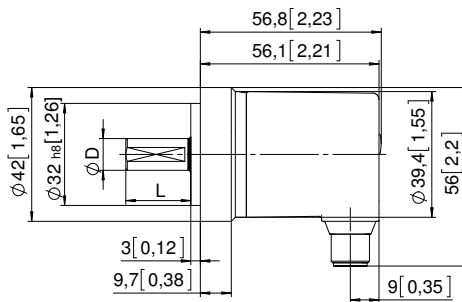
## Dimensions

Dimensions in mm [inch]

**Aluminum, clamping flange, ø 42 [1.65] version 1**

1 3 x M3, 6 [0.24] deep

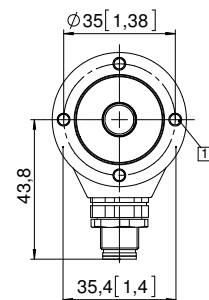
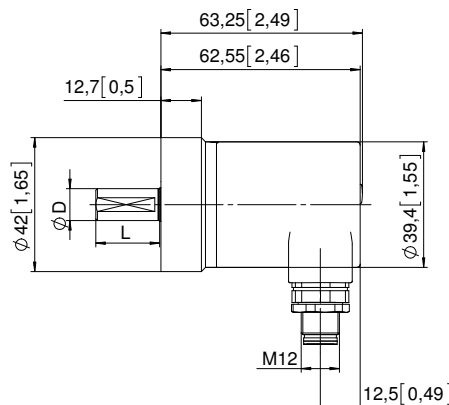
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



**Stainless steel V4A clamping flange, ø 42 [1.65] version 7**

1 4 x M4, 8 [0.31] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



# Absolute encoders – multiturn

|   |                              |                |
|---|------------------------------|----------------|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3668R (shaft)</b> | <b>CANopen</b> |
|---|------------------------------|----------------|



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. It is characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



|                  |   |                                    |                       |                                   |                             |                          |                             |                             |                   |
|------------------|---|------------------------------------|-----------------------|-----------------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|-------------------|
|                  |   |                                    |                       |                                   |                             |                          |                             |                             |                   |
| Safety-Lockplus™ | Standard option stainless steel<br>1.4404 | Standard option seawater resistant | High rotational speed | Temperature range<br>-40°...+85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Energy Harvesting |

### Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

### Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Absolute encoders multiturn

|                      |                 |             |           |           |  |  |
|----------------------|-----------------|-------------|-----------|-----------|--|--|
| <b>Order code</b>    | <b>8.M3668R</b> | <b>XX2X</b> | <b>21</b> | <b>22</b> | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>Shaft version</b> | Type            | a           | b         | c         |  |  |

|  |  |   |
|--|--|---|
| <p><b>a</b> Version</p> <p><u>1 = standard</u> <sup>1)</sup></p> <p>clamping flange <math>\varnothing</math> 42 mm [1.65"]</p> <p>7 = stainless steel V4A <sup>2)</sup></p> <p>clamping flange <math>\varnothing</math> 42 mm [1.65"]</p> <p>all metal parts accessible from outside are out of stainless steel V4A</p> <p><b>b</b> Shaft (<math>\varnothing</math> x L), with flat</p> <p>1 = <math>\varnothing</math> 6 x 12.5 mm [0.24 x 0.49"]</p> <p><u>3 = <math>\varnothing</math> 8 x 15 mm [0.32 x 0.59"]</u></p> <p>5 = <math>\varnothing</math> 10 x 20 mm [0.39 x 0.79"]</p> <p>2 = <math>\varnothing</math> 1/4" x 12.5 mm [0.49"]</p> <p>E = <math>\varnothing</math> 10 x 20 mm [0.39 x 0.79"], stainless steel V4A</p> | <p><b>c</b> Interface / power supply</p> <p><u>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</u></p> <p><b>d</b> Type of connection</p> <p>2 = radial cable, 1 m [3.28'] PVC</p> <p>B = radial cable, special length PVC *)</p> <p><u>4 = radial M12 connector, 5-pin</u></p> <p>*) Available special lengths (connection type B):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.M3668.132B.2122.0030 (for cable length 3 m)</p> | <p><b>e</b> Fieldbus profile</p> <p><u>21 = CANopen encoder profile DS406 V4.0</u></p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 (only for connection type 4)</li> <li>- other shaft diameters out of V4A stainless steel</li> </ul> |
|--|--|---|

1) Not in conjunction with shaft type "E".  
2) Only in conjunction with shaft type "E" + type of connection "4".

# Absolute encoders – multiturn

|   |   |   |
|---|---|---|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3668R (shaft)</b>  | <b>CANopen</b>                            |
| <b>Mounting accessory for shaft encoders</b>          |   | Order no.                                 |
| <b>Coupling</b>                                       | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                 | <b>8.0000.1102.0808</b> <sup>1)</sup>     |
| <b>Connection technology</b>                          |   | Order no.                                 |
| <b>Cordset, pre-assembled</b>                         | M12 female connector with coupling nut, 5-pin<br>5 m [19.69'] PVC cable | <b>05.00.6091.A211.005M</b> <sup>1)</sup> |
| <b>Connector, self-assembly (straight)</b>            | M12 female connector with coupling nut, 5-pin                           | <b>8.0000.5116.0000</b> <sup>1)</sup>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |   |   |
|--|---|---|
| Mechanical characteristics                             |   |   |
| <b>Maximum speed</b>                                   | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous)   |   |
| <b>Starting torque at 20°C [68°F]</b>                  | < 0.01 Nm   |   |
| <b>Shaft load capacity</b>                             | radial 80 N<br>axial 40 N   |   |
| <b>Weight</b>  | approx. 0.2 kg [7.06 oz]  |   |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>         | IP66, IP67, IP69k   |   |
| <b>Working temperature range</b>                       | -40°C ... +85°C [-40°F ... +185°F]  |   |
| <b>Materials</b>                                       | <b>version "1"</b><br>(standard)  | <b>version "7"</b><br>(stainless steel) |
|  | shaft V2A   | V4A                                     |
|  | flange aluminum   | V4A                                     |
|  | housing zinc die-cast   | V4A                                     |
|  | cable PVC   | –                                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>          | 5000 m/s <sup>2</sup> , 4 ms  |   |
| <b>Vibration resistance acc. to EN 60068-2-6</b>       | 300 m/s <sup>2</sup> , 10 ... 2000 Hz   |   |
| Electrical characteristics                             |   |   |
| <b>Power supply</b>                                    | 10 ... 30 V DC  |   |
| <b>Current consumption (no load)</b>                   | max. 30 mA  |   |
| <b>Reverse polarity protection of the power supply</b> | yes   |   |
| <b>Short-circuit proof outputs</b>                     | yes <sup>2)</sup>   |   |
| <b>e1 compliant acc. to (pending)</b>                  | EU guideline 2009/19/EC<br>(acc. to EN 55025,<br>ISO 11452 and ISO 7637)  |   |
| <b>UL approval</b>                                     | File 224618   |   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |   |
| Interface characteristics CANopen                      |   |   |
| <b>Resolution singleturn</b>                           | 1 ... 16384 (14 bit), scalable<br>default: 8192 (13 bit)  |   |
| <b>Absolute accuracy <sup>3)</sup></b>                 | ±1°   |   |
| <b>Repeat accuracy</b>                                 | ±0.2°   |   |
| <b>Number of revolutions (multiturn)</b>               | max. 16.777.216 (24 bit)<br>scalable only via the total resolution  |   |
| <b>Total resolution</b>                                | 1 ... 274.877.906.944 (38 bit), scalable<br>default: 33.554.432 (25 bit)  |   |
| <b>Code</b>  | binary  |   |
| <b>Interface</b>                                       | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B  |   |
| <b>Protocol</b>  | CANopen profile DS406 V4.0<br>with manufacturer-specific add-ons,<br>LSS-Service, bootloader  |   |
| <b>Power-ON time</b>                                   | < 1200 ms   |   |
| <b>SDO timeout</b>                                     | < 1000 ms   |   |
| <b>Baud rate</b>                                       | 10 ... 1000 kbit/s<br>software configurable   |   |
| <b>Node address</b>                                    | 1 ... 127<br>software configurable  |   |
| <b>Termination</b>                                     | software configurable   |   |
| <b>LSS protocol</b>                                    | CIA LSS protocol DS305,<br>global command support for node<br>address and baud rate,<br>selective commands via attributes of<br>the identity object |   |
| <b>Bootloader</b>                                      | configuration management<br>CIA DS 302-3  |   |

1) Not for version "7" (V4A stainless steel)

2) Short circuit proof to 0 V or to output when power supply correctly applied.

3) Over the whole temperature range.

# Absolute encoders – multiturn

|   |                              |                |
|---|------------------------------|----------------|
| <b>Compact, robust electronic multiturn, magnetic</b> | <b>Sendix M3668R (shaft)</b> | <b>CANopen</b> |
|---|------------------------------|----------------|

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

## CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

## LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

## CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

- NMT Slave.
- Heartbeat Protocol.
- Identity Object.
- Error Behavior Object.
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus / programmable termination.

## CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

## Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
| 2         | 2, B               | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Cable color:  | BN | WH  | GY      | GN    | YE    |
| Interface | Type of connection | M12 connector, 5-pin  |    |     |         |       |       |
| 2         | 4                  | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Pin:  | 2  | 3   | 1       | 4     | 5     |

Top view of mating side, male contact base



M12 connector, 5-pin

1) Over the whole temperature range.

# Absolute encoders – multiturn

|   |                              |                |
|---|------------------------------|----------------|
| <b>Compact, robust<br/>electronic multiturn, magnetic</b> | <b>Sendix M3668R (shaft)</b> | <b>CANopen</b> |
|---|------------------------------|----------------|

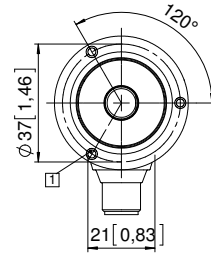
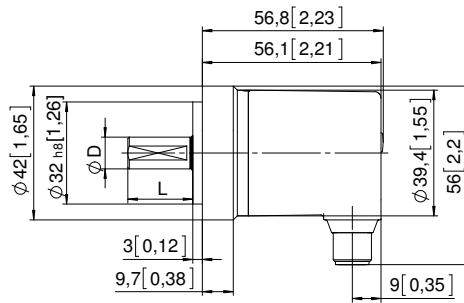
## Dimensions

Dimensions in mm [inch]

**Aluminum,  
clamping flange, ø 42 [1.65]  
version 1**

1 3 x M3, 6 [0.24] deep

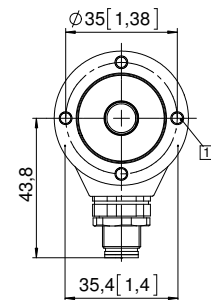
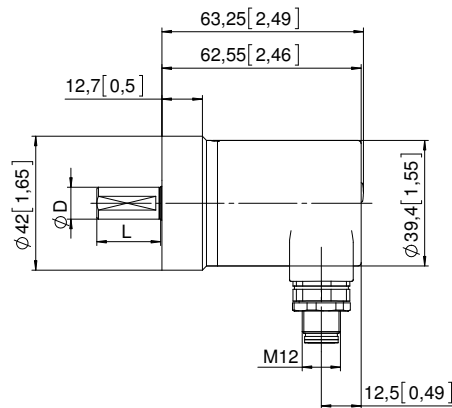
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



**Stainless steel V4A  
clamping flange, ø 42 [1.65]  
version 7**

1 4 x M4, 8 [0.31] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |



# Absolute encoders – multiturn

|  |  |                                 |
|--|--|---------------------------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3663 / F3683 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|--|--|---------------------------------|



The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.



|              |                       |                                    |                             |                          |                             |                      |                             |        |                              |   |
|--------------|-----------------------|------------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------|-----------------------------|--------|------------------------------|---|
|              |                       |                                    |                             |                          |                             |                      |                             |        |                              |   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°... +90°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Intelligent Scan Technology™ | Surface protection salt spray-tested optional |

### Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +90°C.
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoASIC) - offering highest reliability, a high resolution up to 41 bits and 100% magnetic field insensitivity.

### Optimized performance

- High precision with data refresh rate of the position value ≤ 1µs.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

|                      |                |                   |
|----------------------|----------------|-------------------|
| <b>Order code</b>    | <b>8.F3663</b> | <b>.XXXX.XXX2</b> |
| <b>Shaft version</b> | Type           | a b c d e f g     |

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



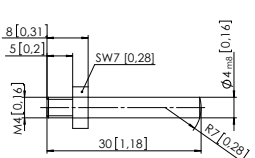
|   |  |   |  |
|---|--|---|--|
| <p><b>a Flange</b></p> <p>1 = clamping flange, IP67, ø 36 mm [1.42"]</p> <p>3 = clamping flange, IP65, ø 36 mm [1.42"]</p> <p>2 = synchro flange, IP67, ø 36 mm [1.42"]</p> <p><u>4 = synchro flange, IP65, ø 36 mm [1.42"]</u></p> | <p><b>c Interface / power supply</b></p> <p>1 = SSI, BiSS / 5 V DC</p> <p><u>2 = SSI, BiSS / 10 ... 30 V DC</u></p> <p>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC</p> <p>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p>5 = SSI, BiSS / 5 V DC, with sensor output</p> <p>6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output</p> <p>7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC</p> <p>8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC</p> | <p><b>e Code</b></p> <p>B = SSI, binary</p> <p>C = BiSS, binary</p> <p><u>G = SSI, gray</u></p>   | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- surface protection salt spray tested</li> <li>- other singleturn resolutions</li> </ul> |
| <p><b>b Shaft (ø x L), with flat</b></p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"]</p> <p><u>3 = ø 8 x 15 mm [0.32 x 0.59"]</u></p> <p>5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p>2 = ø 1/4" x 12.5 mm [0.49"]</p> <p>4 = ø 3/8" x 5/8"</p>   | <p><b>d Type of connection</b></p> <p><u>1 = tangential cable, 1 m [3.28'] PUR</u></p> <p>3 = tangential cable, 5 m [16.40'] PUR</p> <p>U = tangential cable, 10 m [32.81'] PUR</p> <p>5 = tangential cable, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin<sup>1)</sup></p>  | <p><b>f Resolution (singleturn)</b></p> <p>B = 9 bit ST</p> <p>A = 10 bit ST</p> <p>2 = 12 bit ST</p> <p><u>3 = 13 bit ST</u></p> <p>4 = 14 bit ST</p> <p>7 = 17 bit ST</p> |  |
|   |  | <p><b>g Resolution (multiturn)</b></p> <p><u>2 = 12 bit MT</u></p> <p>6 = 16 bit MT</p> <p>4 = 24 bit MT</p>  |  |

1) Only with interface 1 and 2.

# Absolute encoders – multiturn

|  |  |                                 |
|--|--|---------------------------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3663 / F3683 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|--|--|---------------------------------|

|   |   |  |   |   |
|---|---|--|---|---|
| <b>Order code</b>   | <b>8.F3683</b>  | <b>.XXXX.XXX2</b>  | <b>XXXX2</b>  | <p>If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.</p> <p style="font-size: small;">Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |
| <b>Hollow shaft</b>   | Type  | <b>a</b>   | <b>b</b>  | <b>10 by 10</b>   |
| <p><b>a</b> Flange</p> <p>1 = with spring element, short, IP65</p> <p>3 = with spring element, long, IP65</p> <p><u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u></p> <p><b>b</b> Through hollow shaft</p> <p>1 = ø 6 mm [0.24"]</p> <p>3 = ø 8 mm [0.32"]</p> <p>2 = ø 1/4"</p> <p style="padding-left: 20px;">Blind hollow shaft<br/>(insertion depth max. 14.5 mm [0.57"])</p> <p><u>4 = ø 10 mm [0.39"]</u></p> | <p><b>c</b> Interface / power supply</p> <p>1 = SSI, BiSS / 5 V DC</p> <p><u>2 = SSI, BiSS / 10 ... 30 V DC</u></p> <p>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC</p> <p>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p>5 = SSI, BiSS / 5 V DC, with sensor output</p> <p>6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output</p> <p>7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC</p> <p>8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC</p> <p><b>d</b> Type of connection</p> <p><u>1 = tangential cable, 1 m [3.28'] PUR</u></p> <p>3 = tangential cable, 5 m [16.40'] PUR</p> <p>U = tangential cable, 10 m [32.81'] PUR</p> <p>5 = tangential cable, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin <sup>1)</sup></p> | <p><b>e</b> Code</p> <p>B = SSI, binary</p> <p>C = BiSS, binary</p> <p><u>G = SSI, gray</u></p> <p><b>f</b> Resolution (singleturn)</p> <p>B = 9 bit ST</p> <p>A = 10 bit ST</p> <p>2 = 12 bit ST</p> <p><u>3 = 13 bit ST</u></p> <p>4 = 14 bit ST</p> <p>7 = 17 bit ST</p> <p><b>g</b> Resolution (multiturn)</p> <p><u>2 = 12 bit MT</u></p> <p>6 = 16 bit MT</p> <p>4 = 24 bit MT</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- surface protection</li> <li>- salt spray tested</li> <li>- other singleturn resolutions</li> </ul> |   |

| Mounting accessory for shaft encoders              | Order no.   |
|--|---|
| <b>Coupling</b>                                    | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]                             |
| <b>8.0000.1102.0808</b>                            |   |
| Mounting accessory for hollow shaft encoders       | Order no.   |
| <b>Cylindrical pin, long</b>                       | Dimensions in mm [inch]   |
| for flange with spring element (flange type 1 + 3) | with fixing thread  |
| <b>8.0010.4700.0000</b>                            |  |
| Connection technology                              | Order no.   |
| <b>Cordset, pre-assembled</b>                      | M12 female connector with coupling nut, 8-pin                                       |
| <b>05.00.6051.8211.002M</b>                        | 2 m [6.56'] PUR cable   |
| <b>Connector, self-assembly (straight)</b>         | M12 female connector with coupling nut, 8-pin                                       |
| <b>05.CMB 8181-0</b>                               |   |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |                                       |                                      |
|---|---------------------------------------|--------------------------------------|
| Mechanical characteristics  |                                       |                                      |
| <b>Maximum speed</b>  |                                       |                                      |
| shaft version without shaft seal (IP65) or blind hollow shaft version | 12000 min <sup>-1</sup>               | 10000 min <sup>-1</sup> (continuous) |
| shaft version with shaft seal (IP67) or hollow shaft version          | 10000 min <sup>-1</sup>               | 8000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque at 20°C [68°F]</b>                                 |                                       |                                      |
| without shaft seal  | < 0.007 Nm                            |                                      |
| with shaft seal (IP67)  | < 0.01 Nm                             |                                      |
| <b>Shaft load capacity</b>  | radial                                | 40 N                                 |
|   | axial                                 | 20 N                                 |
| <b>Weight</b>   | approx. 0.2 kg [7.06 oz]              |                                      |
| <b>Protection</b>   | housing side                          | IP67                                 |
| acc. to EN 60529  | shaft side                            | IP65 (solid shaft version opt. IP67) |
| <b>Working temperature range</b>                                      | -40°C ... +90°C [-40°F ... +194°F]    |                                      |
| <b>Materials</b>  | shaft / hollow shaft                  | stainless steel                      |
|   | flange                                | aluminum                             |
|   | housing                               | zinc die-cast                        |
|   | cable                                 | PUR                                  |
| <b>Shock resistance</b> acc. to EN 60068-2-27                         | 2500 m/s <sup>2</sup> , 6 ms          |                                      |
| <b>Vibration resistance</b> acc. to EN 60068-2-6                      | 100 m/s <sup>2</sup> , 55 ... 2000 Hz |                                      |

1) Only with output circuits 1 and 2.



# Absolute encoders – multiturn

|  |  |                                 |
|--|--|---------------------------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3663 / F3683 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|--|--|---------------------------------|

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC ( $\pm 5\%$ ) or 10 ... 30 V DC                |
| <b>Current consumption (no load)</b>                   | 5 V DC max. 60 mA<br>10 ... 30 V DC max. 30 mA        |
| <b>Reverse polarity protection of the power supply</b> | yes (only with 10 ... 30 V DC)                        |
| <b>Short-circuit proof outputs</b>                     | yes <sup>1)</sup>                                     |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SSI interface   |   |
|---|---|
| <b>Output driver</b>  | RS485 transceiver type  |
| <b>Permissible load / channel</b>   | max. +/- 30 mA  |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW with $I_{Load} = 20$ mA typ 1.3 V                               |
| <b>Resolution singleturn</b>  | 10 ... 17 bit   |
| <b>Number of revolutions (multiturn)</b>  | max. 24 bit   |
| <b>Code</b>   | binary or gray  |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz  |
| <b>Data refresh rate</b>  | ST resolution $\leq 14$ bit $\leq 1$ $\mu$ s<br>ST resolution $\geq 15$ bit 4 $\mu$ s |
| <b>Monoflop time</b>  | $\leq 15$ $\mu$ s   |
| <b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time. |   |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 17 bit   |
| <b>Number of revolutions (multiturn)</b> | max. 24 bit   |
| <b>Code</b>                              | binary  |
| <b>BiSS Clock rate</b>                   | 50 kHz ... 10 MHz   |
| <b>Max. update rate</b>                  | $< 10$ $\mu$ s, depends on the clock rate and the data length   |
| <b>Data refresh rate</b>                 | $\leq 1$ $\mu$ s  |
| <b>Note:</b>                             | - bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings<br>- CRC data verification |

| Incremental outputs (A/B), 2048 ppr |                      |                                     |
|-------------------------------------|----------------------|-------------------------------------|
|                                     | SinCos               | RS422 TTL-compatible                |
| <b>Max. frequency -3dB</b>          | 400 kHz              | 400 kHz                             |
| <b>Signal level</b>                 | 1 Vpp ( $\pm 20\%$ ) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>          | yes <sup>1)</sup>    | yes <sup>1)</sup>                   |

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull up resistor 22 kOhm |
| <b>Permissible load</b>  | max. 20 mA  |
| <b>Signal level</b>  | HIGH +V<br>LOW $< 1$ V                            |
| <b>Active</b>  | LOW   |
| The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).   |   |
| An active status output (LOW) displays:<br>LED fault (failure or ageing) – over-temperature – undervoltage<br>In the SSI mode, the fault indication can only be reset by switching off the power supply to the device. |   |

| SET input  |  |
|--|--|
| <b>Input</b>   | active HIGH  |
| <b>Input type</b>  | comparator   |
| <b>Signal level (+V = power supply)</b>  | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>   | $< 0.5$ mA   |
| <b>Min. pulse duration (SET)</b>   | 10 ms  |
| <b>Input delay</b>   | 1 ms   |
| <b>New position data readable after</b>  | 1 ms   |
| <b>Internal processing time</b>  | 200 ms   |
| The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.<br>The SET function should be carried out whilst the encoder is at rest.<br>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |  |

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to c.cw. This inverted function can also be factory-programmed.<br>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

1) Short circuit proof to 0 V or to output when power supply correctly applied.

# Absolute encoders – multiturn

|  |  |                   |
|--|--|-------------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3663 / F3683 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|

## Terminal assignment

| Interface | Type of connection | Features                   | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|-----------|--------------------|----------------------------|---|-----|----|----|----|----|----|---------------------|--------------------|---------------------|--------------------|--------|-----------|--------|
| 1, 2      | 1, 3, U            | SET, DIR, Status           | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | Stat                | ⊥                  |        |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | VT                  | shield             |        |           |        |
| 1, 2      | 5                  | SET, DIR                   | M12 connector, 8-pin  |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | ⊥                   |                    |        |           |        |
|           |                    |                            | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7                   | 8                  | PH                  |                    |        |           |        |
| 3, 4      | 1, 3, U            | SET, DIR, 2048 SinCos      | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | A                   | $\bar{A}$          | B      | $\bar{B}$ | ⊥      |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | BK                  | VT                 | GY-PK  | RD-BU     | shield |
| 5         | 1, 3, U            | SET, DIR, Sensor output    | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | 0 V <sub>sens</sub> | +V <sub>sens</sub> | ⊥      |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | VT                  | RD-BU              | shield |           |        |
| 6         | 1, 3, U            | 2048 SinCos, Sensor output | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | 0 V <sub>sens</sub> | +V <sub>sens</sub> | A                   | $\bar{A}$          | B      | $\bar{B}$ | ⊥      |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | BK                  | VT                 | GY-PK  | RD-BU     | shield |
| 7, 8      | 1, 3, U            | 2048 incr. RS422           | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A                   | $\bar{A}$          | B                   | $\bar{B}$          | ⊥      |           |        |
|           |                    |                            | Cable color:  | WH  | BN | GN | YE | GY | PK | BK                  | VT                 | GY-PK               | RD-BU              | shield |           |        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

# Absolute encoders – multiturn

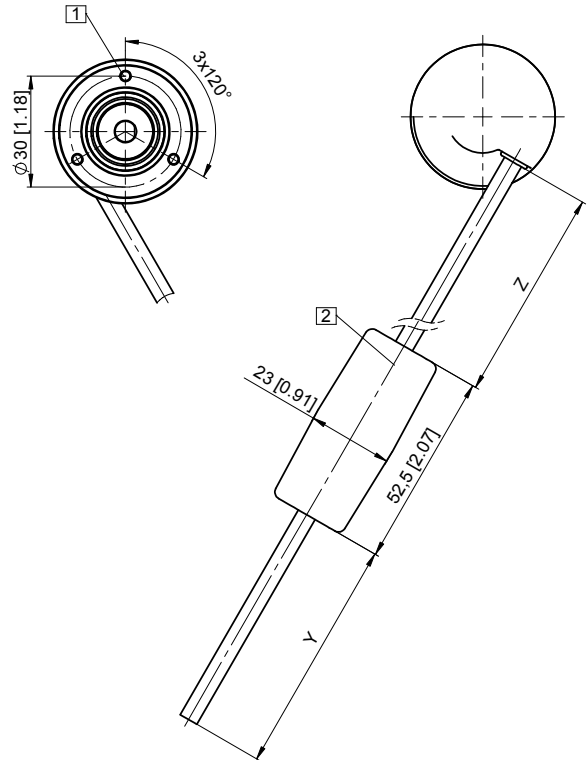
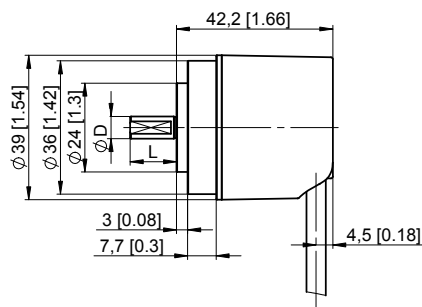
|  |  |                   |
|--|--|-------------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3663 / F3683 (shaft / hollow shaft)</b> | <b>SSI / BiSS</b> |
|--|--|-------------------|

## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing 36$ [1.42] Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



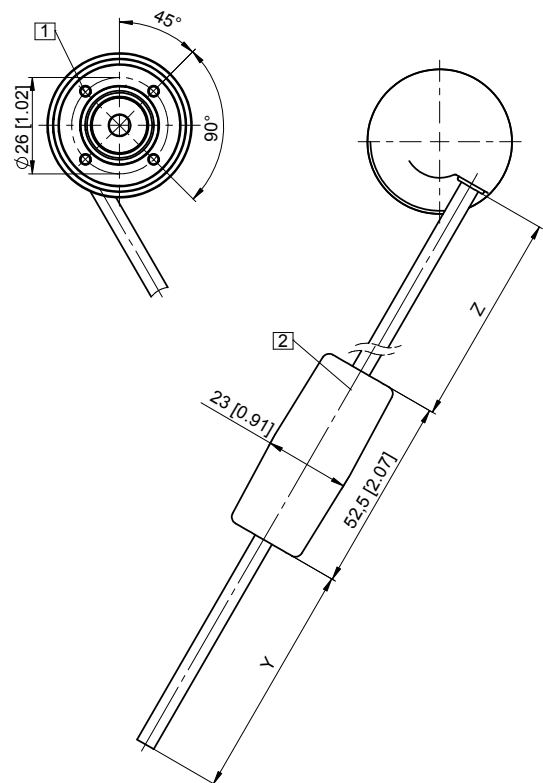
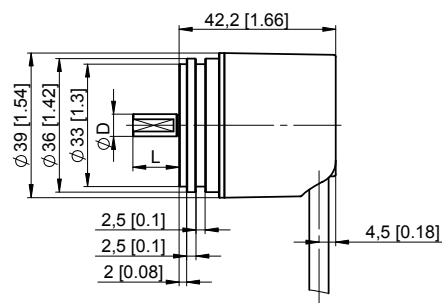
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

### Synchro flange, $\varnothing 36$ [1.42]

#### Flange type 2 and 4 (drawing with cable)

- 1 4 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

# Absolute encoders – multiturn

## Compact electronic multiturn, optical

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS

### Dimensions hollow shaft version

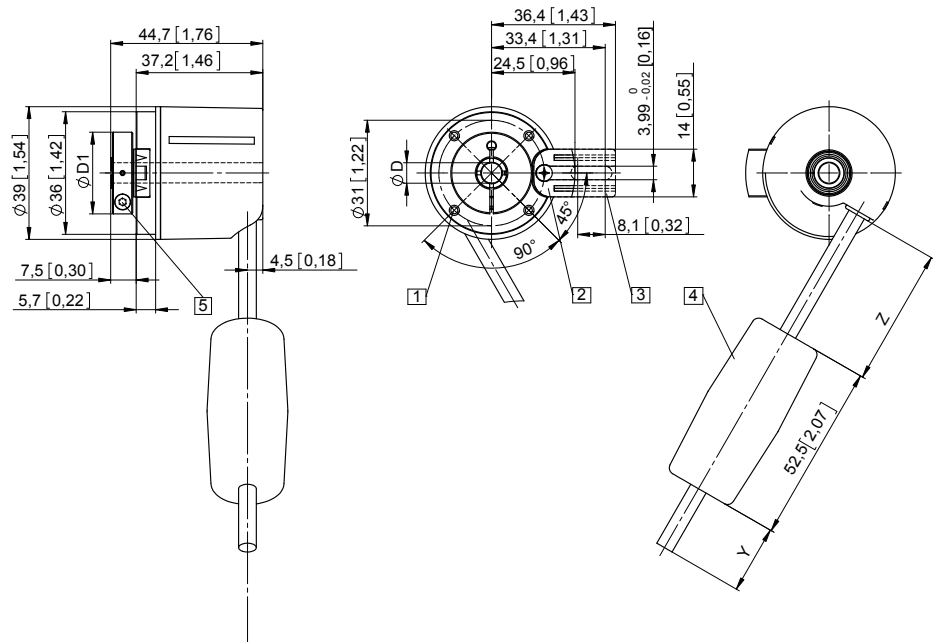
Dimensions in mm [inch]

#### Flange with spring element

##### Flange type 1 and 3

(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.20] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 4 Battery (in the cable)
- 5 Recommended torque for the clamping ring 0.6 Nm



| D            | Fit | D1          |
|--------------|-----|-------------|
| 6 [0.24]     | H7  | 24 [0.94]   |
| 8 [0.32]     | H7  | 25.5 [1.00] |
| 10 [0.39] *) | H7  | 25.5 [1.00] |
| 1/4"         | H7  | 24 [0.94]   |

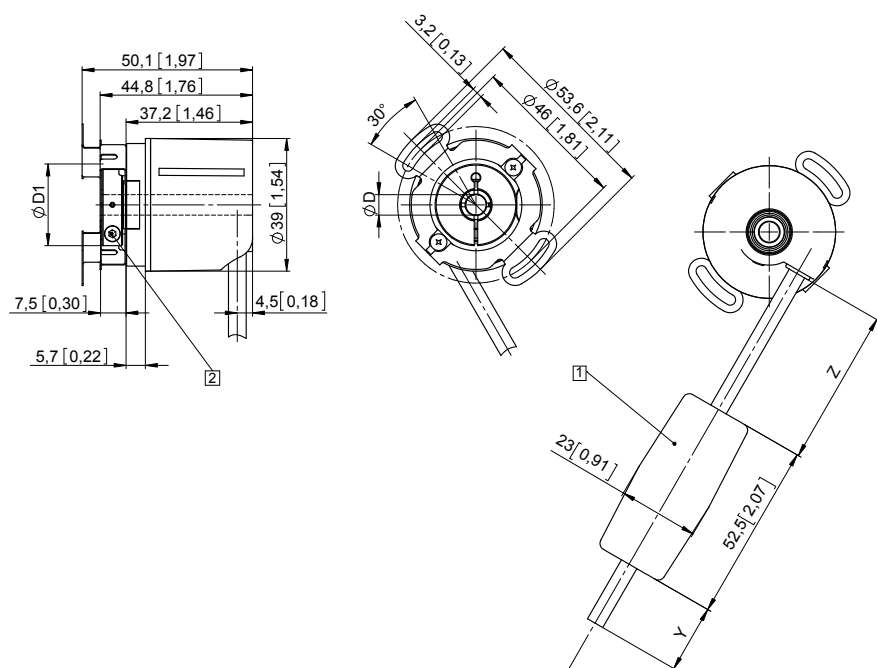
\*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

#### Flange with stator coupling, $\varnothing$ 46 [1.81]

##### Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



| D            | Fit | D1          |
|--------------|-----|-------------|
| 6 [0.24]     | H7  | 24 [0.94]   |
| 8 [0.32]     | H7  | 25.5 [1.00] |
| 10 [0.39] *) | H7  | 25.5 [1.00] |
| 1/4"         | H7  | 24 [0.94]   |

\*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

# Absolute encoders – multiturn

|  |  |                |
|--|--|----------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3668 / F3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|



The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.



|              |                       |                                    |                             |                          |                             |                      |                     |                             |                              |   |
|--------------|-----------------------|------------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|------------------------------|---|
|              |                       |                                    |                             |                          |                             |                      |                     |                             |                              |   |
| Safety-Lock™ | High rotational speed | Temperature range<br>-40°... +85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional |

### Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C [-40°F ... +185°F].
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoAsic) - offering highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.

### Up-to-the-minute fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.

Absolute encoders multiturn

|                      |                |              |              |   |  |
|----------------------|----------------|--------------|--------------|---|--|
| <b>Order code</b>    | <b>8.F3668</b> | <b>.XX2X</b> | <b>.2122</b> | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>Shaft version</b> | Type           | a b c d      | e            |   |  |

|  |  |  |  |
|--|--|--|--|
| <b>a Flange</b><br>1 = clamping flange, IP67, ø 36 mm [1.42"]<br>3 = clamping flange, IP65, ø 36 mm [1.42"]<br>2 = synchro flange, IP67, ø 36 mm [1.42"]<br><b>4 = synchro flange, IP65, ø 36 mm [1.42"]</b> | <b>b Shaft (ø x L), with flat</b><br>1 = ø 6 x 12.5 mm [0.24 x 0.49"]<br><b>3 = ø 8 x 15 mm [0.32 x 0.49"]</b><br>5 = ø 10 x 20 mm [0.39 x 0.79"]<br>2 = ø 1/4" x 12.5 mm [0.49"]<br>4 = ø 3/8" x 5/8" | <b>c Interface / power supply</b><br><b>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</b> | <i>Optional on request</i><br>- surface protection salt spray tested |
| <b>d Type of connection</b><br><b>1 = tangential cable, 1 m [3.28'] PUR</b><br>3 = tangential cable, 5 m [16.40'] PUR<br>U = tangential cable, 10 m [32.81'] PUR   |  |  |  |
| <b>e Fieldbus profile</b><br><b>21 = CANopen encoder profile DS406 V3.2</b>  |  |  |  |

|                     |                |              |              |   |  |
|---------------------|----------------|--------------|--------------|---|--|
| <b>Order code</b>   | <b>8.F3688</b> | <b>.XX2X</b> | <b>.2122</b> | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>Hollow shaft</b> | Type           | a b c d      | e            |   |  |

|  |  |  |  |
|--|--|--|--|
| <b>a Flange</b><br>1 = with spring element, short, IP65<br>3 = with spring element, long, IP65<br><b>2 = with stator coupling, IP65, ø 46 mm [1.81"]</b>         | <b>b Blind hollow shaft (insertion depth max. 14.5 mm [0.57"])</b><br>5 = ø 6 mm [0.24"]<br>7 = ø 8 mm [0.32"]<br><b>4 = ø 10 mm [0.39"]</b><br>6 = ø 1/4" | <b>c Interface / power supply</b><br><b>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</b> | <i>Optional on request</i><br>- surface protection salt spray tested |
| <b>d Type of connection</b><br><b>1 = tangential cable, 1 m [3.28'] PUR</b><br>3 = tangential cable, 5 m [16.40'] PUR<br>U = tangential cable, 10 m [32.81'] PUR |  |  |  |
| <b>e Fieldbus profile</b><br><b>21 = CANopen encoder profile DS406 V3.2</b>  |  |  |  |

# Absolute encoders – multiturn

|  |  |                |
|--|--|----------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3668 / F3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

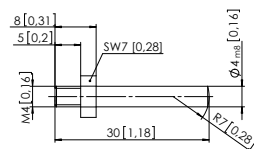
| Mounting accessory for shaft encoders |  | Order no. |
|---------------------------------------|--|-----------|
|---------------------------------------|--|-----------|

|                 |   |                         |
|-----------------|---|-------------------------|
| <b>Coupling</b> | bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"] | <b>8.0000.1102.0808</b> |
|-----------------|---|-------------------------|

| Mounting accessory for hollow shaft encoders |  | Order no. |
|--|--|-----------|
|--|--|-----------|

|                              |                    |                         |
|------------------------------|--------------------|-------------------------|
| <b>Cylindrical pin, long</b> | with fixing thread | <b>8.0010.4700.0000</b> |
|------------------------------|--------------------|-------------------------|

for flange with spring element  
(flange type 1 + 3)



| Connection technology |  | Order no. |
|-----------------------|--|-----------|
|-----------------------|--|-----------|

|  |   |                         |
|--|---|-------------------------|
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 5-pin | <b>8.0000.5111.0000</b> |
|--|---|-------------------------|

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

### Mechanical characteristics

|  |                                      |                                       |
|--|--------------------------------------|---------------------------------------|
| <b>Maximum speed</b>                             |                                      |                                       |
| shaft version without shaft seal (IP65)          | 12000 min <sup>-1</sup>              |                                       |
| or blind hollow shaft version                    | 10000 min <sup>-1</sup> (continuous) |                                       |
| shaft version with shaft seal (IP67)             | 10000 min <sup>-1</sup>              |                                       |
|  | 8000 min <sup>-1</sup> (continuous)  |                                       |
| <b>Starting torque at 20°C [68°F]</b>            |                                      |                                       |
| without shaft seal                               | < 0.007 Nm                           |                                       |
| with shaft seal (IP67)                           | < 0.01 Nm                            |                                       |
| <b>Shaft load capacity</b>                       | radial                               | 40 N                                  |
|  | axial                                | 20 N                                  |
| <b>Weight</b>                                    |                                      | approx. 0.2 kg [7.06 oz]              |
| <b>Protection acc. to EN 60529</b>               | housing side                         | IP67                                  |
|  | shaft side                           | IP65 (solid shaft version opt. IP67)  |
| <b>Working temperature range</b>                 |                                      | -40°C ... +85°C [-40°F ... +185°F]    |
| <b>Materials</b>                                 | shaft / hollow shaft                 | stainless steel                       |
|  | flange                               | aluminum                              |
|  | housing                              | zinc die-cast                         |
|  | cable                                | PUR                                   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                                      | 2500 m/s <sup>2</sup> , 6 ms          |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                                      | 100 m/s <sup>2</sup> , 55 ... 2000 Hz |

### Electrical characteristics

|  |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                   | max. 80 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

### Interface characteristics CANopen

|  |   |
|--|---|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)  |
| <b>Number of revolutions (multiturn)</b> | max. 65536 (16 bit)<br>scalable only via the total resolution   |
| <b>Total resolution</b>                  | 1 ... 4.294.967.296 (32 bit), scalable<br>default: 33.554.432 (25 bit)  |
| <b>Code</b>                              | binary  |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B  |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons,<br>LSS-Service DS305 V2.0   |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable   |
| <b>Node address</b>                      | 1 ... 127<br>software configurable  |
| <b>Termination</b>                       | software configurable   |
| <b>LSS protocol</b>                      | CIA LSS protocol DS305,<br>global command support for node<br>address and baud rate,<br>selective commands via attributes of<br>the identity object |

### Diagnostic LED (two-color, red/green)

|                           |       |                |
|---------------------------|-------|----------------|
| <b>LED ON or blinking</b> | red   | error display  |
|                           | green | status display |

|  |  |                |
|--|--|----------------|
| <b>Compact electronic multiturn, optical</b> | <b>Sendix F3668 / F3688 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

## CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

**Lu** < 5 m [16.40'] cable length for 125 Kbit

**Lu** < 2 m [6.56'] cable length for 250 Kbit

**Lu** < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/encoder must not exceed 70 cm.

## Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

## LSS layer setting services DS305 V2.0

- Global support of node-ID and baud rate.
- Selective protocol via identity object (1018h).

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated. (Class C2 functionality):

- NMT Slave.
- Heartbeat Protocol.
- Identity Object.
- Error Behavior Object.
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus / programmable termination.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific memory - 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

Absolute encoders multiturn

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
|           |                    | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
| 2         | 1, 3, U            | Cable color:  | BN | WH  | GY      | GN    | YE    |

# Absolute encoders – multiturn

**Compact electronic multiturn, optical**

**Sendix F3668 / F3688 (shaft / hollow shaft)**

**CANopen**

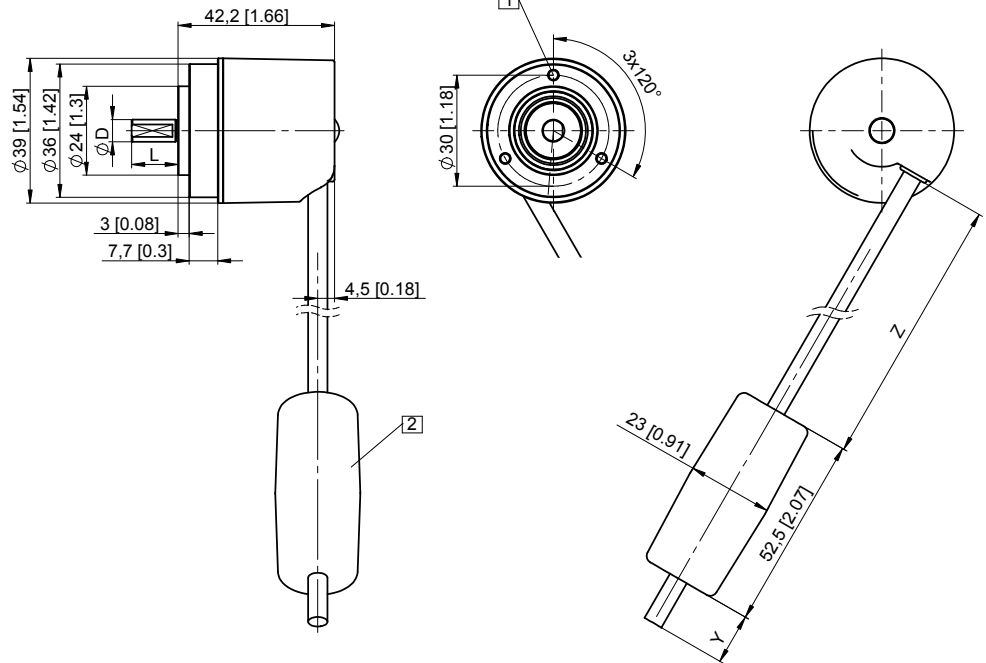
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing 36$ [1.42]

Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

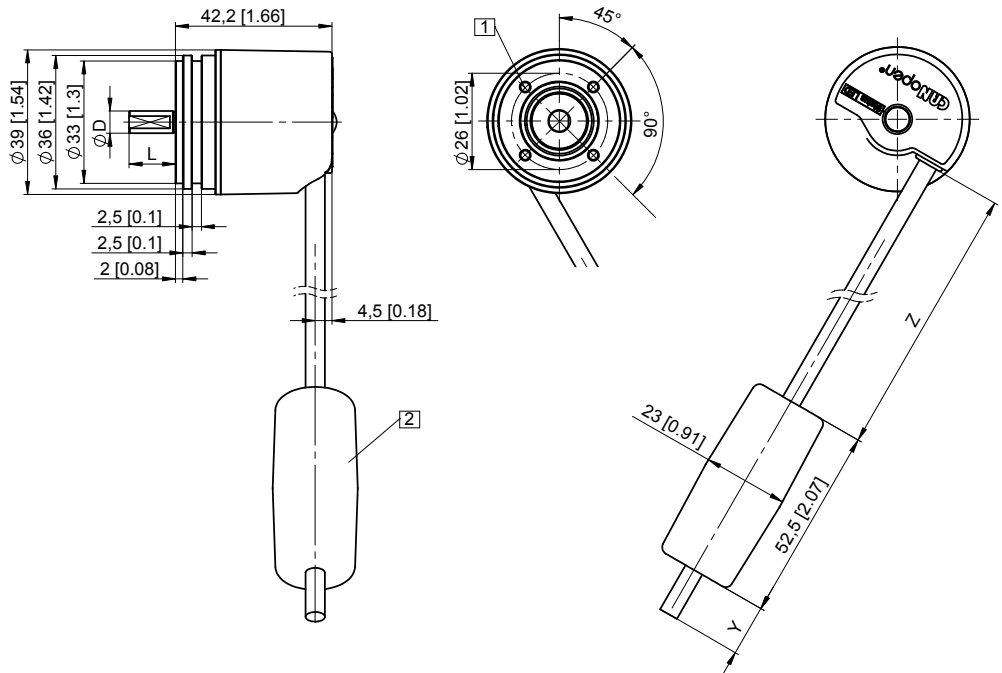
| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

### Synchro flange, $\varnothing 36$ [1.42]

Flange type 2 and 4

(drawing with cable)

- 1 4 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |



# Absolute encoders – multiturn

**Compact  
electronic multiturn, optical**

**Sendix F3668 / F3688 (shaft / hollow shaft)**

**CANopen**

## Dimensions hollow shaft version

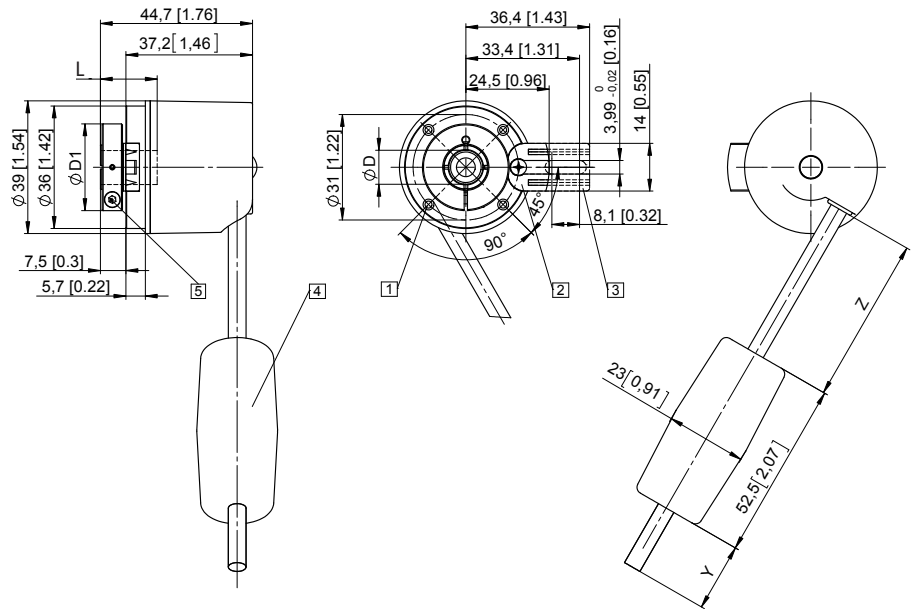
Dimensions in mm [inch]

### Flange with spring element

#### Flange type 1 and 3

(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.20] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 4 Battery (in the cable)
- 5 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 14.5 [0.57] | 24 [0.94]   |
| 8 [0.32]  | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 10 [0.39] | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 1/4"      | H7  | 14.5 [0.57] | 24 [0.94]   |

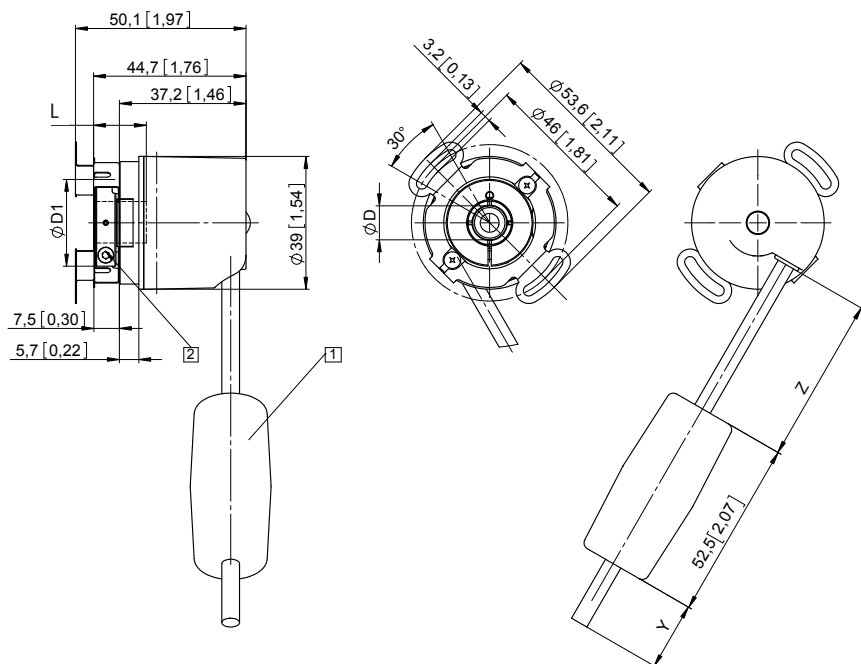
L = insertion depth max. blind hollow shaft

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

### Flange with stator coupling, $\varnothing$ 46 [1.81"]

#### Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 14.5 [0.57] | 24 [0.94]   |
| 8 [0.32]  | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 10 [0.39] | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 1/4"      | H7  | 14.5 [0.57] | 24 [0.94]   |

L = insertion depth max. blind hollow shaft

| Y            | Z              |
|--------------|----------------|
| 1 m [3.28']  | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

# Absolute encoders – multiturn

**Standard  
electronic multiturn, magnetic**

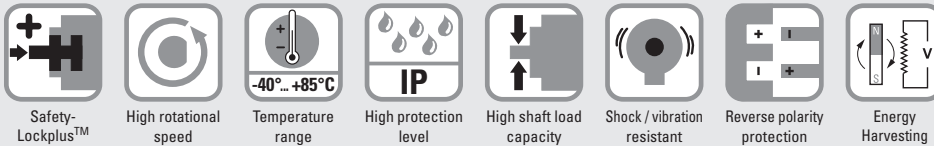
**Sendix M5861 (shaft)**

**Analog**



The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



### Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

### Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

### Order code Shaft version

**8.M5861** . **XXXX.XX12**  
Type

- |   |   |   |
|---|---|---|
| <p><b>a</b> <i>Version</i><br/>3 = clamping flange, IP65, ø 58 mm [2.28"]<br/>4 = synchro flange, IP65, ø 58 mm [2.28"]</p> <p><b>b</b> <i>Shaft (ø x L), with flat</i><br/>1 = ø 6 x 12.5 mm [0.24 x 0.49"]<br/>5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p><b>c</b> <i>Output circuit<sup>1)</sup></i><br/>3 = current output<br/>4 = voltage output</p> | <p><b>d</b> <i>Type of connection</i><br/>2 = radial cable, 1 m [3.28'] PVC<br/>B = radial cable, special length PVC *)<br/>4 = radial M12 connector, 5-pin</p> <p>*) Available special lengths (connection types B):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.M5861.3132.3112.0030 (for cable length 3 m)</p> <p><b>e</b> <i>Interface / resolution / power supply</i><br/>3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC<br/>4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC<br/>5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC</p> | <p><b>f</b> <i>Measuring range</i><br/>1 = 16 revolutions / cw<br/>2 = 16 revolutions / ccw<br/>3 = scalable up to 65,536 revolutions, with limit switch function<br/>4 = scalable up to 65,536 revolutions, without limit switch function</p> <p><i>Optional on request</i><br/>- Ex 2/22 (only for connection type 4)</p> |
|---|---|---|

| Connection technology                      |  | Order no.                   |
|--|--|-----------------------------|
| <b>Coupling</b>                            | Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]             | <b>8.0000.1102.1010</b>     |
| Connection technology                      |  | Order no.                   |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 5-pin, 2 m [6.56'] PVC cable | <b>05.00.6081.2211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 5-pin                        | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Output circuit "3" only in conjunction with interface "3",  
output circuit "4" only in conjunction with interface "4" or "5".

# Absolute encoders – multitrurn

|   |                             |               |
|---|-----------------------------|---------------|
| <b>Standard electronic multitrurn, magnetic</b> | <b>Sendix M5861 (shaft)</b> | <b>Analog</b> |
|---|-----------------------------|---------------|

## Technical data

| Electrical characteristics current interface 4 ... 20 mA |  |
|--|--|
| <b>Power supply</b>                                      | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                     | max. 30 mA   |
| <b>Reverse polarity protection of the power supply</b>   | yes  |
| <b>Short-circuit proof outputs</b>                       | yes <sup>1)</sup>  |
| <b>Measuring range</b>                                   | factory setting 2 <sup>4</sup> revolutions<br>optionally scalable up to 2 <sup>16</sup> revolutions  |
| <b>DA converter resolution</b>                           | 12 bit   |
| <b>Singleturn accuracy, at 25°C [77°F]</b>               | ±1°  |
| <b>Temperature coefficient</b>                           | < 100 ppm/K  |
| <b>Repeat accuracy, at 25°C [77°F]</b>                   | ±0.2°  |
| <b>Output load</b>                                       | at 10 V DC max. 200 Ohm<br>at 24 V DC max. 900 Ohm<br>at 30 V DC max. 1200 Ohm   |
| <b>Setting time</b>                                      | < 1 ms, R <sub>Burden</sub> = 900 Ohm, 25°C [77°F]   |
| <b>LEDs (green/red)</b>                                  | - system status<br>- current loop interruption – input load too high<br>- reference point display (only with factory settings)<br>at cw: betw. 0° and 1°<br>at ccw: betw. 0° and -1°<br>- status in teach mode |
| <b>Options</b>   | - output signal scalable via the teach inputs<br>- output signal scalable via the teach inputs + limit switch function   |
| <b>Teach inputs</b>                                      | level = +V for 1 s minimum   |
| <b>PowerON Time</b>                                      | < 1 s  |
| <b>Update rate</b>                                       | 1 ms   |
| <b>UL approval</b>                                       | File 224618  |
| <b>CE compliant acc. to</b>                              | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous)      |
| <b>Starting torque at 20°C [68°F]</b>            | < 0.01 Nm  |
| <b>Shaft load capacity</b>                       | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.2 kg [7.06 oz]   |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>   | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F]                                 |
| <b>Materials</b>                                 | shaft V2A<br>flange aluminum<br>housing zinc die-cast<br>cable PVC |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 5000 m/s <sup>2</sup> , 4 ms                                       |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                              |

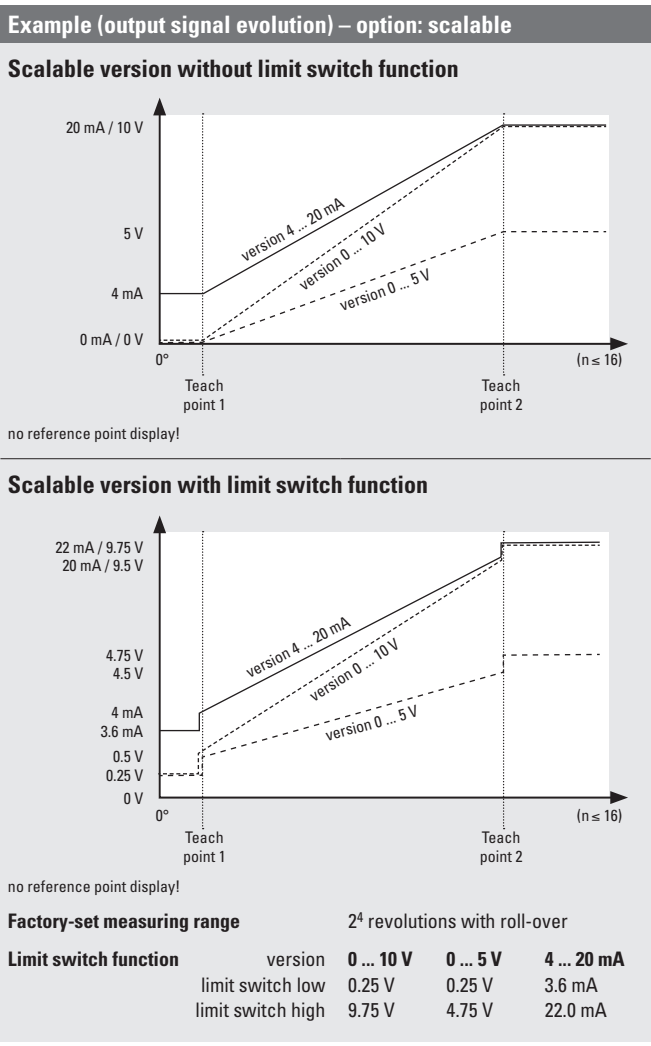
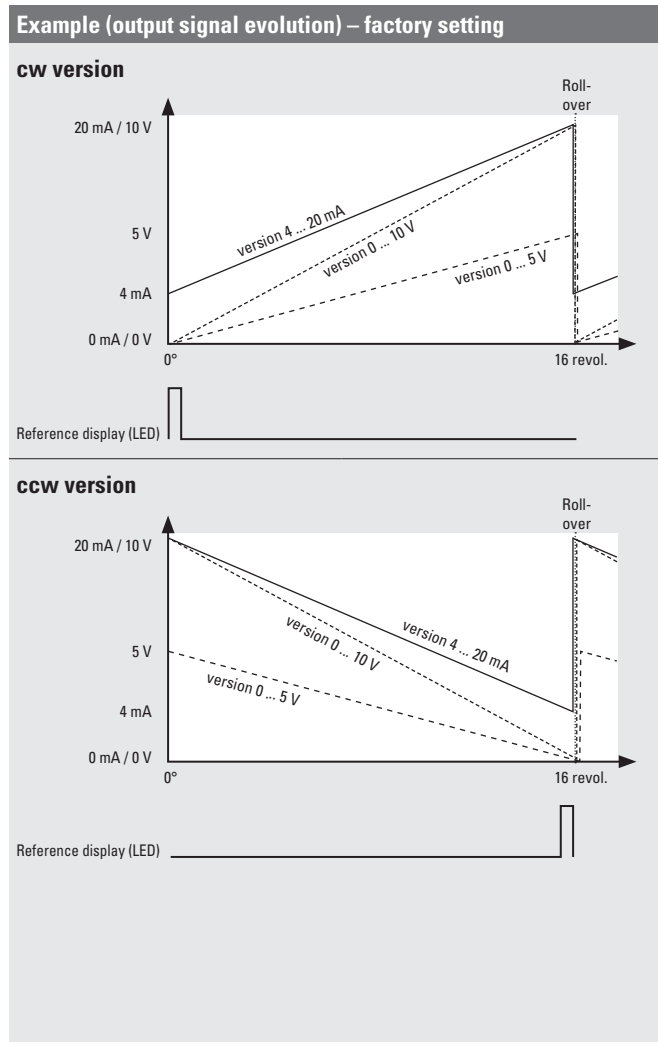
| Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V |   |
|---|---|
| <b>Power supply</b>   | output 0 ... 5 V 10 ... 30 V DC<br>output 0 ... 10 V 15 ... 30 V DC   |
| <b>Current consumption (no load)</b>                                | max. 30 mA  |
| <b>Reverse polarity protection of the power supply</b>              | yes   |
| <b>Short-circuit proof outputs</b>                                  | yes <sup>1)</sup>   |
| <b>Measuring range</b>  | factory setting 2 <sup>4</sup> revolutions<br>optionally scalable up to 2 <sup>16</sup> revolutions   |
| <b>DA converter resolution</b>                                      | 0 ... 10 V 12 bit<br>0 ... 5 V 11 bit   |
| <b>Singleturn accuracy, at 25°C [77°F]</b>                          | ±1°   |
| <b>Temperature coefficient</b>                                      | < 100 ppm/K   |
| <b>Repeat accuracy, at 25°C [77°F]</b>                              | ±0.2°   |
| <b>Current output</b>   | max. 10 mA  |
| <b>Setting time</b>   | < 1 ms, R <sub>Load</sub> = 1000 Ohm, 25°C [77°F]   |
| <b>LEDs (green/red)</b>   | - system status<br>- reference point display (only with factory settings)<br>at cw: betw. 0° and 1°<br>at ccw: betw. 0° and -1°<br>- status in teach mode |
| <b>Options</b>  | - output signal scalable via the teach inputs<br>- output signal scalable via the teach inputs + limit switch function                                    |
| <b>Teach inputs</b>   | level = +V for 1 s minimum  |
| <b>PowerON Time</b>   | < 1 s   |
| <b>Update rate</b>  | 1 ms  |
| <b>UL approval</b>  | File 224618   |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |

Absolute encoders multitrurn

1) When the power supply is correctly applied.  
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

# Absolute encoders – multiturn

|  |                             |               |
|--|-----------------------------|---------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5861 (shaft)</b> | <b>Analog</b> |
|--|-----------------------------|---------------|

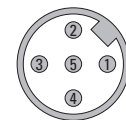


## Terminal assignment

|                                |                            |   |     |    |    |                     |                     |
|--------------------------------|----------------------------|---|-----|----|----|---------------------|---------------------|
| Interface<br>3<br>(current)    | Type of connection<br>2, B | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
|                                |                            | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                                |                            | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface<br>3<br>(current)    | Type of connection<br>4    | M12 connector, 5 pin  |     |    |    |                     |                     |
|                                |                            | Signal:   | 0 V | +V | +I | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                                |                            | Pin:  | 3   | 2  | 1  | 5                   | 4                   |
| Interface<br>4, 5<br>(current) | Type of connection<br>2, B | Cable (isolate unused wires individually before initial start-up) |     |    |    |                     |                     |
|                                |                            | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                                |                            | Cable color:  | WH  | BN | GN | GY                  | PK                  |
| Interface<br>4, 5<br>(current) | Type of connection<br>4    | M12 connector, 5 pin  |     |    |    |                     |                     |
|                                |                            | Signal:   | 0 V | +V | +U | SET 1 <sup>1)</sup> | SET 2 <sup>1)</sup> |
|                                |                            | Pin:  | 3   | 2  | 1  | 5                   | 4                   |

+V: encoder power supply +V DC      +U: voltage      SET 1: set input for teachpoint 1  
 0 V: encoder power supply ground GND (0 V)      +I: current      SET 2: set input for teachpoint 2

## Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

# Absolute encoders – multiturn

|  |                             |               |
|--|-----------------------------|---------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5861 (shaft)</b> | <b>Analog</b> |
|--|-----------------------------|---------------|

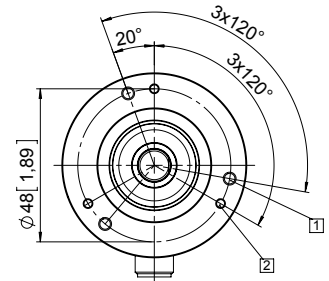
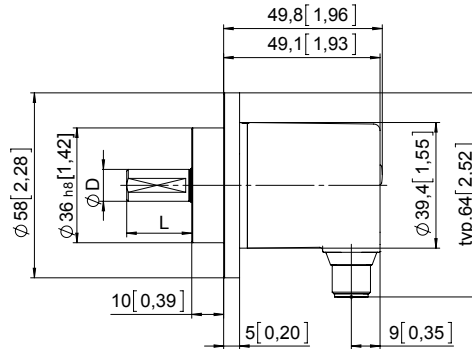
## Dimensions

Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28] Flange type 3

- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep

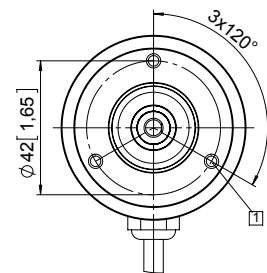
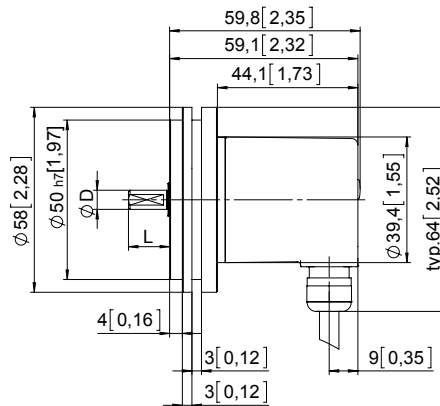
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |



### Synchro flange, ø 58 [2.28] Flange type 4

- 1 3 x M4, 10 [0.39] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |



Absolute encoders  
multiturn

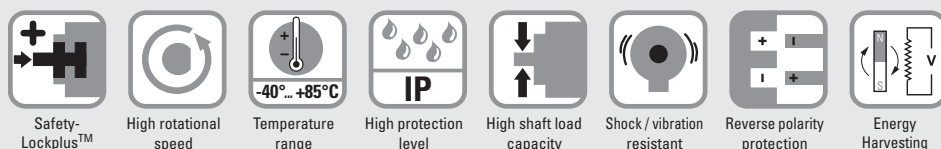
# Absolute encoders – multiturn

|  |                             |            |
|--|-----------------------------|------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5863 (shaft)</b> | <b>SSI</b> |
|--|-----------------------------|------------|



The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



## Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

|                      |                |                   |
|----------------------|----------------|-------------------|
| <b>Order code</b>    | <b>8.M5863</b> | <b>.XX2X.XXX2</b> |
| <b>Shaft version</b> | Type           | a b c d e f g     |

|  |  |   |
|--|--|---|
| <p><b>a</b> Version</p> <p>3 = clamping flange, IP65, ø 58 mm [2.28"]</p> <p>4 = synchro flange, IP65, ø 58 mm [2.28"]</p> | <p><b>d</b> Type of connection</p> <p>2 = radial cable, 1 m [3.28'] PUR</p> <p>B = radial cable, special length PUR *)</p> <p>4 = radial M12 connector, 8-pin</p> <p>*) Available special lengths (connection types B):</p> <p>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']</p> <p>order code expansion .XXXX = length in dm</p> <p>ex.: 8.M5863.3524.G322.0030 (for cable length 3 m)</p> | <p><b>f</b> Resolution (singleturn)</p> <p>A = 10 bit ST</p> <p>2 = 12 bit ST</p> <p>3 = 13 bit ST</p> <p>4 = 14 bit ST</p> |
| <p><b>b</b> Shaft (ø x L), with flat</p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"]</p> <p>5 = ø 10 x 20 mm [0.39 x 0.79"]</p>    | <p><b>e</b> Code</p> <p>B = SSI, binary</p> <p>G = SSI, gray</p>   | <p><b>g</b> Resolution (multiturn)</p> <p>2 = 12 bit MT</p> <p>6 = 16 bit MT</p> <p>A = 20 bit MT</p> <p>4 = 24 bit MT</p>  |
| <p><b>c</b> Interface / power supply</p> <p>2 = SSI / 10 ... 30 V DC</p>   |  | <p><i>Optional on request</i></p> <p>- Ex 2/22 (only for connection type 4)</p>   |

| Connection technology                      |  | Order no.                   |
|--|--|-----------------------------|
| <b>Coupling</b>                            | Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]             | <b>8.0000.1102.1010</b>     |
| Connection technology                      |  | Order no.                   |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 8-pin, 2 m [6.56'] PUR cable | <b>05.00.6051.8211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 8-pin                        | <b>05.CMB 8181-0</b>        |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

# Absolute encoders – multiturn

|  |                             |            |
|--|-----------------------------|------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5863 (shaft)</b> | <b>SSI</b> |
|--|-----------------------------|------------|

## Technical data

| Mechanical characteristics                       |                                     |   |
|--|-------------------------------------|---|
| <b>Maximum speed</b>                             |                                     | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous) |
| <b>Starting torque at 20°C [68°F]</b>            |                                     | < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial<br>axial                     | 80 N<br>40 N  |
| <b>Weight</b>                                    |                                     | approx. 0.2 kg [7.06 oz]                                      |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>   |                                     | IP65  |
| <b>Working temperature range</b>                 |                                     | -40°C ... +85°C [-40°F ... +185°F]                            |
| <b>Materials</b>                                 | shaft<br>flange<br>housing<br>cable | V2A<br>aluminum<br>zinc die-cast<br>PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                                     | 5000 m/s <sup>2</sup> , 4 ms                                  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                                     | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                         |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                   | max. 30 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short-circuit proof outputs</b>                     | yes <sup>1)</sup>                                     |
| <b>UL approval</b>                                     | File 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SSI interface                            |  |
|--|--|
| <b>Output driver</b>                     | RS485 transceiver type   |
| <b>Permissible load / channel</b>        | max. +/- 30 mA   |
| <b>Signal level</b>                      | HIGH typ 3.8 V<br>LOW with I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>             | 10 ... 14 bit  |
| <b>Absolute accuracy<sup>2)</sup></b>    | ±1°  |
| <b>Repeat accuracy</b>                   | ±0.2°  |
| <b>Number of revolutions (multiturn)</b> | max. 24 bit  |
| <b>Code</b>                              | binary or gray   |
| <b>SSI clock rate</b>                    | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>                 | 2 ms   |
| <b>Monoflop time</b>                     | ≤ 15 μs  |

**Note:** If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

| SET input                               |  |
|---|--|
| <b>Input</b>                            | active HIGH  |
| <b>Input type</b>                       | comparator   |
| <b>Signal level</b>                     | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>                    | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>        | 10 ms  |
| <b>Input delay</b>                      | 1 ms   |
| <b>New position data readable after</b> | 1 ms   |
| <b>Internal processing time</b>         | 200 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input  |      |
|--|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.                                       |      |
| <b>Response time (DIR input)</b>   | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

1) Short circuit proof to 0 V or to output when power supply correctly applied.  
2) Over the whole temperature range.

# Absolute encoders – multiturn

**Standard  
electronic multiturn, magnetic**

**Sendix M5863 (shaft)**

**SSI**

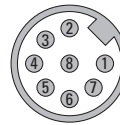
## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |        |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|--------|
| 2         | 2, B               | SET, DIR | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥      |
|           |                    |          | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | shield |

| Interface | Type of connection | Features | M12 connector, 8-pin |     |    |    |    |    |    |     |     |    |
|-----------|--------------------|----------|----------------------|-----|----|----|----|----|----|-----|-----|----|
| 2         | 4                  | SET, DIR | Signal:              | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | ⊥  |
|           |                    |          | Pin:                 | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | PH |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



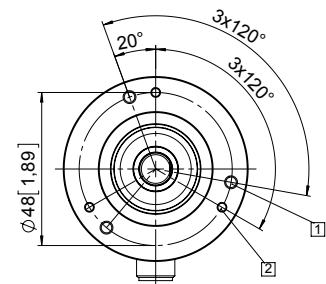
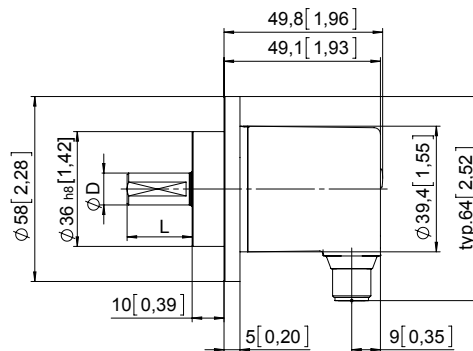
M12 connector, 8-pin

## Dimensions

Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28] Flange type 3

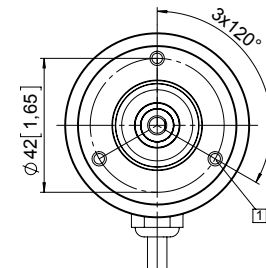
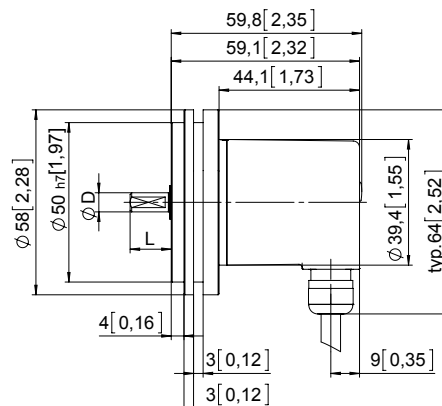
- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |

### Synchro flange, ø 58 [2.28] Flange type 4

- 1 3 x M4, 10 [0.39] deep



| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |



# Absolute encoders – multiturn

|  |                             |                |
|--|-----------------------------|----------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5868 (shaft)</b> | <b>CANopen</b> |
|--|-----------------------------|----------------|



The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



|                  |                       |                                      |                             |                          |                             |                             |                   |
|------------------|-----------------------|--------------------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|-------------------|
|                  |                       |                                      |                             |                          |                             |                             |                   |
| Safety-Lockplus™ | High rotational speed | Temperature range<br>-40°C ... +85°C | High protection level<br>IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Energy Harvesting |

### Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

### Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Absolute encoders multiturn

|                      |                |                |           |           |
|----------------------|----------------|----------------|-----------|-----------|
| <b>Order code</b>    | <b>8.M5868</b> | <b>.XXX2X.</b> | <b>21</b> | <b>22</b> |
| <b>Shaft version</b> | Type           | a b c d        | e         |           |

- |  |  |   |
|--|--|---|
| <p><b>a</b> Version</p> <p>3 = clamping flange, IP65, ø 58 mm [2.28"]</p> <p>4 = synchro flange, IP65, ø 58 mm [2.28"]</p> <p><b>b</b> Shaft (ø x L), with flat</p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"]</p> <p>5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p><b>c</b> Interface / power supply</p> <p>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</p> | <p><b>d</b> Type of connection</p> <p>2 = radial cable, 1 m [3.28'] PVC</p> <p>B = radial cable, special length PVC *)</p> <p>4 = radial M12 connector, 5-pin</p> <p>*) Available special lengths (connection types B):</p> <p>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']</p> <p>order code expansion .XXXX = length in dm</p> <p>ex.: 8.M5868.312B.2122.0030 (for cable length 3 m)</p> | <p><b>e</b> Fieldbus profile</p> <p>21 = CANopen encoder profile DS406 V4.0</p> <p><i>Optional on request</i></p> <p>- Ex 2/22 (only for connection type 4)</p> |
|--|--|---|

| Connection technology                      | Order no.   |
|--|---|
| <b>Coupling</b>                            | Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                |
| <b>Connection technology</b>               | Order no.   |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 5-pin<br>5 m [16.40'] PVC cable |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 5-pin                           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

# Absolute encoders – multiturn

|  |                             |                |
|--|-----------------------------|----------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5868 (shaft)</b> | <b>CANopen</b> |
|--|-----------------------------|----------------|

## Technical data

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 4000 min <sup>-1</sup><br>2000 min <sup>-1</sup> (continuous)      |
| <b>Starting torque at 20°C [68°F]</b>            | < 0.01 Nm  |
| <b>Shaft load capacity</b>                       | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.2 kg [7.06 oz]   |
| <b>Protection acc. to EN 60529/DIN 40050-9</b>   | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F]                                 |
| <b>Materials</b>                                 | shaft V2A<br>flange aluminum<br>housing zinc die-cast<br>cable PVC |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 5000 m/s <sup>2</sup> , 4 ms                                       |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                              |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                   | max. 30 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short-circuit proof outputs</b>                     | yes <sup>1)</sup>                                     |
| <b>UL approval</b>                                     | File 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics CANopen        |   |
|--|---|
| <b>Resolution singleturn</b>             | 1 ... 16384 (14 bit), scalable<br>default: 8192 (13 bit)  |
| <b>Absolute accuracy <sup>2)</sup></b>   | ±1°   |
| <b>Repeat accuracy</b>                   | ±0.2°   |
| <b>Number of revolutions (multiturn)</b> | max. 16.777.216 (24 bit)<br>scalable only via the total resolution  |
| <b>Total resolution</b>                  | 1 ... 274.877.906.944 (38 bit), scalable<br>default: 33.554.432 (25 bit)  |
| <b>Code</b>                              | binary  |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B  |
| <b>Protocol</b>                          | CANopen profile DS406 V4.0<br>with manufacturer-specific add-ons,<br>LSS-Service, bootloader  |
| <b>Power-ON time</b>                     | < 1200 ms   |
| <b>SDO timeout</b>                       | < 1000 ms   |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable   |
| <b>Node address</b>                      | 1 ... 127<br>software configurable  |
| <b>Termination</b>                       | software configurable   |
| <b>LSS protocol</b>                      | CIA LSS protocol DS305,<br>global command support for node<br>address and baud rate,<br>selective commands via attributes of<br>the identity object |
| <b>Bootloader</b>                        | configuration management<br>CIA DS 302-3  |

1) Short circuit proof to 0 V or to output when power supply correctly applied.

2) Over the whole temperature range.

# Absolute encoders – multiturn

|  |                             |                |
|--|-----------------------------|----------------|
| <b>Standard electronic multiturn, magnetic</b> | <b>Sendix M5868 (shaft)</b> | <b>CANopen</b> |
|--|-----------------------------|----------------|

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

## CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

## LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

## CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

- NMT Slave.
- Heartbeat Protocol.
- Identity Object.
- Error Behavior Object.
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus / programmable termination.

## CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

## Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
| 2         | 2, B               | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Cable color:  | BN | WH  | GY      | GN    | YE    |
| Interface | Type of connection | M12 connector, 5-pin  |    |     |         |       |       |
| 2         | 4                  | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
|           |                    | Pin:  | 2  | 3   | 1       | 4     | 5     |

Top view of mating side, male contact base



M12 connector, 5-pin

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
electronic multiturn, magnetic**

**Sendix M5868 (shaft)**

**CANopen**

## Dimensions

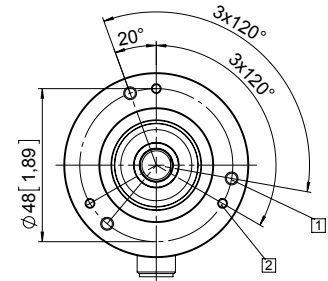
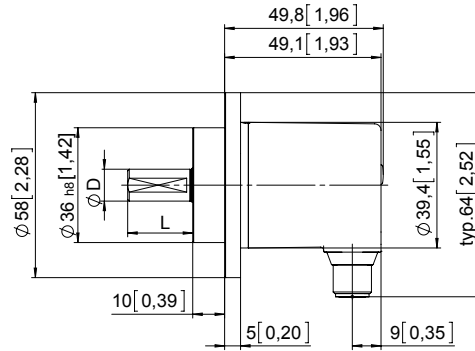
Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 3

- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |

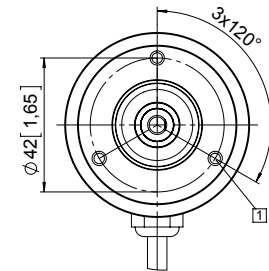
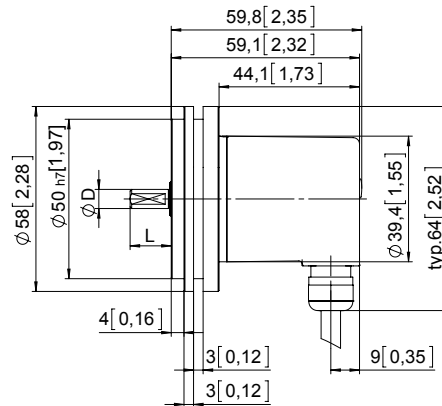


### Synchro flange, ø 58 [2.28]

#### Flange type 4

- 1 3 x M4, 10 [0.39] deep

| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 10 [0.39] | f7  | 20 [0.79]   |



# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

41 bits total resolution, through hollow shaft up to 15 mm and versions with additional SinCos or RS422 incremental track.



|  |                     |                              |  |                                    |                                 |                                    |                             |                                    |                                     |  |
|--|---------------------|------------------------------|--|------------------------------------|---------------------------------|------------------------------------|-----------------------------|------------------------------------|-------------------------------------|--|
| <b>24 bit MT</b><br>Multiturn resolution | <b>Safety-Lock™</b> | <b>High rotational speed</b> | <b>-40°...+85°C</b><br>Temperature range | <b>IP</b><br>High protection level | <b>High shaft load capacity</b> | <b>Shock / vibration resistant</b> | <b>Magnetic field proof</b> | <b>Reverse polarity protection</b> | <b>Intelligent Scan Technology™</b> | <b>Surface protection salt spray-tested optional</b> |
|--|---------------------|------------------------------|--|------------------------------------|---------------------------------|------------------------------------|-----------------------------|------------------------------------|-------------------------------------|--|

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

## Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Absolute encoders multiturn

**Order code** **8.F5863** . XXXX . XXXX  
**Shaft version** Type **a** **b** **c** **d** **e** **f** **g** **h**

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



|  |  |  |  |
|--|--|--|--|
| <p><b>a</b> Flange</p> <p><u>1</u> = clamping flange, IP65 ø 58 mm [2.28"]<br/>         3 = clamping flange, IP67 ø 58 mm [2.28"]<br/> <u>2</u> = synchro flange, IP65 ø 58 mm [2.28"]<br/>         4 = synchro flange, IP67 ø 58 mm [2.28"]</p> <p><b>b</b> Shaft (ø x L), with flat</p> <p><u>1</u> = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup><br/> <u>2</u> = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup><br/>         3 = 1/4" x 7/8"<br/>         4 = 3/8" x 7/8"</p> | <p><b>c</b> Interface / power supply</p> <p>1 = SSI, BiSS / 5 V DC<br/> <u>2</u> = <b>SSI, BiSS / 10 ... 30 V DC</b><br/>         3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/>         4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC<br/>         5 = SSI, BiSS / 5 V DC, with sensor output<br/>         6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output<br/>         7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC<br/>         8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC</p> <p><b>d</b> Type of connection</p> <p>1 = axial cable, 1 m [3.28'] PVC<br/>         A = axial cable, special length PVC *)<br/> <u>2</u> = <b>radial cable, 1 m [3.28'] PVC</b><br/>         B = radial cable, special length PVC *)<br/>         3 = axial M23 connector, 12-pin<br/> <u>4</u> = <b>radial M23 connector, 12-pin</b><br/>         5 = axial M12 connector, 8-pin<sup>3)</sup><br/>         6 = radial M12 connector, 8-pin<sup>3)</sup></p> <p>*) Available special lengths (connection types A, B):<br/>         2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>         order code expansion .XXXX = length in dm<br/>         ex.: 8.F5863.122A.G323.0030 (for cable length 3 m)</p> | <p><b>e</b> Code</p> <p>B = SSI, binary<br/>         C = BiSS, binary<br/> <u>G</u> = <b>SSI, gray</b></p> <p><b>f</b> Resolution (singleturn)<sup>4)</sup></p> <p>B = 9 bit ST<br/>         A = 10 bit ST<br/>         1 = 11 bit ST<br/>         2 = 12 bit ST<br/> <u>3</u> = <b>13 bit ST</b><br/>         4 = 14 bit ST<br/>         7 = 17 bit ST</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22<sup>5)</sup></li> <li>- surface protection salt spray tested</li> <li>- other singleturn resolutions</li> </ul> | <p><b>g</b> Resolution (multiturn)<sup>4)</sup></p> <p><u>2</u> = <b>12 bit MT</b><br/>         6 = 16 bit MT<br/>         4 = 24 bit MT</p> <p><b>h</b> Options (service)</p> <p>1 = no option<br/>         2 = status LED<br/> <u>3</u> = <b>SET button and status LED</b></p> |
|--|--|--|--|

1) Preferred type only in conjunction with flange type 2.  
 2) Preferred type only in conjunction with flange type 1.  
 3) Can be combined only with interface 1 and 2.

4) Resolution, preset value and counting direction factory-programmable.  
 5) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

|   |                |   |              |  |   |   |   |  |   |  |  |
|---|----------------|---|--------------|--|---|---|---|--|---|--|--|
| <b>Order code</b>   | <b>8.F5883</b> | <b>.XXXX</b>  | <b>.XXXX</b> | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.   |   |   |   |  |   |  |  |
| <b>Hollow shaft</b>   | Type           | a   | b            | c  | d | e   | f | g  | h |  |  |
| <b>a Flange</b>   |                | <b>b Through hollow shaft</b>   |              | <b>c Interface / power supply</b>  |   | <b>e Code</b>   |   | <b>g Resolution (multiturn)<sup>1)</sup></b>           |   |  |  |
| 1 = with spring element, long, IP65<br>2 = with spring element, long, IP67<br>3 = with stator coupling, IP65, ø 65 mm [2.56"]<br>4 = with stator coupling, IP67, ø 65 mm [2.56"]<br><u>5 = with stator coupling, IP65, ø 63 mm [2.48"]</u><br>6 = with stator coupling, IP67, ø 63 mm [2.48"] |                | 3 = ø 10 mm [0.39"]<br><u>4 = ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>6 = ø 15 mm [0.59"]<br>8 = ø 3/8"<br>9 = ø 1/2"   |              | 1 = SSI, BiSS / 5 V DC<br><u>2 = SSI, BiSS / 10 ... 30 V DC</u><br>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC<br>5 = SSI, BiSS / 5 V DC, with sensor output<br>6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output<br>7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC<br>8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC |   | B = SSI, binary<br>C = BiSS, binary<br><u>G = SSI, gray</u>             |   | <u>2 = 12 bit MT</u><br>6 = 16 bit MT<br>4 = 24 bit MT |   |  |  |
|   |                | <b>d Type of connection</b>   |              | <b>f Resolution (singleturn)<sup>1)</sup></b>  |   | <b>h Options (service)</b>  |   |  |   |  |  |
|   |                | 2 = radial cable, 1 m [3.28'] PVC<br>B = radial cable, special length PVC *)<br><u>E = tangential cable, 1 m [3.28'] PVC</u><br>F = tangential cable, special length PVC *)<br><u>4 = radial M23 connector, 12-pin</u><br>6 = radial M12 connector, 8-pin <sup>2)</sup> |              | B = 9 bit ST<br>A = 10 bit ST<br>1 = 11 bit ST<br>2 = 12 bit ST<br><u>3 = 13 bit ST</u><br>4 = 14 bit ST<br>7 = 17 bit ST  |   | 1 = no option<br>2 = status LED<br><u>3 = SET button and status LED</u> |   |  |   |  |  |
|   |                | *) Available special lengths (connection types B, F):<br>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.F5883.542B.G323.0030 (for cable length 3 m)  |              | <i>Optional on request</i><br>- Ex 2/22 (not for type of connection E, F) <sup>3)</sup><br>- surface protection salt spray tested<br>- other singleturn resolutions  |   |   |   |  |   |  |  |

| Mounting accessory for shaft encoders                                   | Order no.                    |
|---|------------------------------|
| <b>Coupling</b>   |                              |
| bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                 | <b>8.0000.1102.0606</b>      |
| bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                | <b>8.0000.1102.1010</b>      |
| Mounting accessory for hollow shaft encoders                            | Order no.                    |
| <b>Cylindrical pin, long</b>  |                              |
| for flange with spring element<br>(flange type 1 + 2)                   |                              |
| with fixing thread  | <b>8.0010.4700.0000</b>      |
|   |                              |
| Connection technology   | Order no.                    |
| <b>Cordset, pre-assembled</b>   |                              |
| M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable  | <b>05.00.6041.8211.002M</b>  |
| M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6901.0002.0031</b> |
| <b>Connector, self-assembly (straight)</b>                              |                              |
| M12 female connector with coupling nut, 8-pin                           | <b>05.CMB 8181-0</b>         |
| M23 female connector with coupling nut, 12-pin                          | <b>8.0000.5012.0000</b>      |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and counting direction factory-programmable.  
 2) Can be combined only with Interface 1 and 2.  
 3) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Technical data

| Mechanical characteristics                       |  |  |
|--|--|--|
| <b>Maximum speed shaft version</b>               |  |  |
| IP65 up to 70°C [158°F]                          | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |  |
| IP65 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C [158°F]                          | 11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)  |  |
| IP67 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| <b>Maximum speed hollow shaft version</b>        |  |  |
| IP65 up to 70°C [158°F]                          | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |  |
| IP65 up to T <sub>max</sub>                      | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C [158°F]                          | 8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to T <sub>max</sub>                      | 4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)   |  |
| <b>Starting torque at 20°C [68°F]</b>            |  |  |
| IP65   | < 0.01 Nm  |  |
| IP67   | < 0.05 Nm  |  |
| <b>Mass moment of inertia</b>                    |  |  |
| shaft version                                    | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |  |
| hollow shaft version                             | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |  |
| <b>Load capacity of shaft</b>                    |  |  |
| radial   | 80 N   |  |
| axial  | 40 N   |  |
| <b>Weight</b>                                    |  |  |
|  | approx. 0.45 kg [15.87 oz]                                     |  |
| <b>Protection acc. to EN 60529</b>               |  |  |
| housing side                                     | IP67   |  |
| shaft side                                       | IP65, opt. IP67  |  |
| <b>Working temperature range</b>                 |  |  |
|  | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup>               |  |
| <b>Material</b>                                  |  |  |
| shaft/hollow shaft                               | stainless steel  |  |
| flange   | aluminum   |  |
| housing  | zinc die-cast  |  |
| cable  | PVC (PUR for Ex 2/22)  |  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  |  |
|  | 2500 m/s <sup>2</sup> , 6 ms                                   |  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  |  |
|  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                          |  |

| Electrical characteristics                             |   |  |
|--|---|--|
| <b>Power supply</b>                                    |   |  |
|  | 5 V DC (+5%) or 10 ... 30 V DC                        |  |
| <b>Current consumption (no load)</b>                   |   |  |
| 5 V DC   | max. 60 mA  |  |
| 10 ... 30 V DC   | max. 30 mA  |  |
| <b>Reverse polarity protection of the power supply</b> |   |  |
|  | yes (at 10 ... 30 V DC)                               |  |
| <b>Short circuit proof outputs</b>                     |   |  |
|  | yes <sup>2)</sup>                                     |  |
| <b>UL approval</b>                                     |   |  |
|  | file 224618   |  |
| <b>CE compliant acc. to</b>                            |   |  |
|  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |  |

| SSI interface   |                        |  |
|---|------------------------|--|
| <b>Output driver</b>  |                        |  |
|   | RS485 transceiver type |  |
| <b>Permissible load / channel</b>   |                        |  |
|   | max. +/- 30 mA         |  |
| <b>Signal level</b>   |                        |  |
| HIGH  | typ 3.8 V              |  |
| LOW at I <sub>Load</sub> = 20 mA  | typ 1.3 V              |  |
| <b>Resolution singleturn</b>  |                        |  |
|   | 10 ... 17 bit          |  |
| <b>Number of revolutions (multiturn)</b>  |                        |  |
|   | max. 24 bit            |  |
| <b>Code</b>   |                        |  |
|   | binary or gray         |  |
| <b>SSI clock rate</b>   |                        |  |
|   | 50 kHz ... 2 MHz       |  |
| <b>Data refresh rate</b>  |                        |  |
| ST resolution ≤ 14 bit  | ≤ 1 μs                 |  |
| ST resolution ≥ 15 bit  | 4 μs                   |  |
| <b>Monoflop time</b>  |                        |  |
|   | ≤ 15 μs                |  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |                        |  |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 17 bit   |
| <b>Number of revolutions (multiturn)</b> | max. 24 bit   |
| <b>Code</b>                              | binary  |
| <b>BiSS clock rate</b>                   | 50 kHz ... 10 MHz   |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |

| Status output and LED   |   |
|---|---|
| <b>Output driver</b>  | open collector, internal pull up resistor 22 kOhm |
| <b>Permissible load</b>   | max. 20 mA  |
| <b>Signal level</b>   | HIGH: +V / LOW: < 1 V                             |
| <b>Active</b>   | LOW   |
| The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm).                                     |   |
| An active status output (LOW) displays: <ul style="list-style-type: none"> <li>– sensor error, singleturn or multiturn (soiling, glass breakage etc.)</li> <li>– LED fault (failure or ageing)</li> <li>– over- or under-temperature</li> </ul> |   |
| In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.  |   |

| Option incremental outputs (A/B), 2048 ppr |                           |                                     |
|--|---------------------------|-------------------------------------|
|  | SinCos                    | RS422 TTL-compatible                |
| <b>Max. frequency -3dB</b>                 | 400 kHz                   | 400 kHz                             |
| <b>Signal level</b>                        | 1 V <sub>pp</sub> (±20 %) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>                 | yes <sup>2)</sup>         | yes <sup>2)</sup>                   |

| SET input                               |  |
|---|--|
| <b>Input</b>                            | active HIGH  |
| <b>Input type</b>                       | comparator   |
| <b>Signal level (+V = power supply)</b> | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>                    | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>        | 10 ms  |
| <b>Input delay</b>                      | 1 ms   |
| <b>New position data readable after</b> | 1 ms   |
| <b>Internal processing time</b>         | 200 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].  
2) Short circuit to 0 V or to output; if power supply correctly applied.



# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

### Terminal assignment

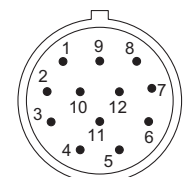
| Interface  | Type of connection | Features                            | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
|------------|--------------------|-------------------------------------|---|-----|----|----|----|----|----|-----|-----------|------|-----------|--------|-----------|--------|
| 1, 2       | 1, 2, A, B, E, F   | SET, DIR, Status                    | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | N/C    | N/C       | ⊥      |
|            |                    |                                     | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | -      | -         | shield |
| Interface  | Type of connection | Features                            | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 1, 2       | 3, 4               | SET, DIR, Status                    | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | N/C    | N/C       | ⊥      |
|            |                    |                                     | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                            | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 5          | 1, 2, A, B, E, F   | SET, DIR, Status sensor output      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | 0Vsens | +Vsens    | ⊥      |
|            |                    |                                     | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                            | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 5          | 3, 4               | SET, DIR, Status sensor output      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | 0Vsens | +Vsens    | ⊥      |
|            |                    |                                     | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                            | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 3, 4, 7, 8 | 1, 2, A, B, E, F   | SET, DIR, SinCos or incr. RS422     | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | A    | $\bar{A}$ | B      | $\bar{B}$ | ⊥      |
|            |                    |                                     | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                            | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 3, 4, 7, 8 | 3, 4               | SET, DIR, SinCos or incr. RS422     | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | A    | $\bar{A}$ | B      | $\bar{B}$ | ⊥      |
|            |                    |                                     | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                            | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 6          | 1, 2, A, B, E, F   | SinCos o. incr. RS422 sensor output | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A   | $\bar{A}$ | B    | $\bar{B}$ | 0Vsens | +Vsens    | ⊥      |
|            |                    |                                     | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                            | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 6          | 3, 4               | SinCos o. incr. RS422 sensor output | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A   | $\bar{A}$ | B    | $\bar{B}$ | 0Vsens | +Vsens    | ⊥      |
|            |                    |                                     | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                            | M12 connector, 8-pin  |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 1, 2       | 5, 6               | SET, DIR                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       |      |           |        |           | ⊥      |
|            |                    |                                     | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         |      |           |        |           | PH     |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin



# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Dimensions shaft version

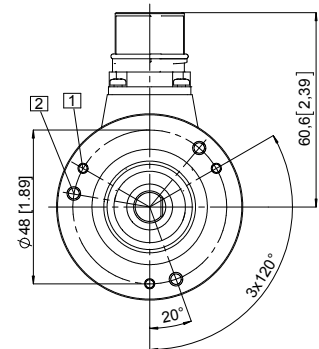
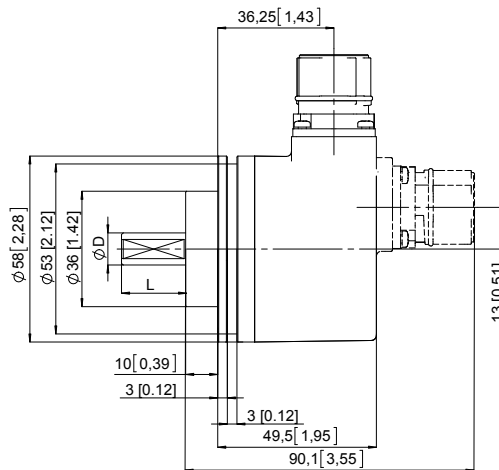
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



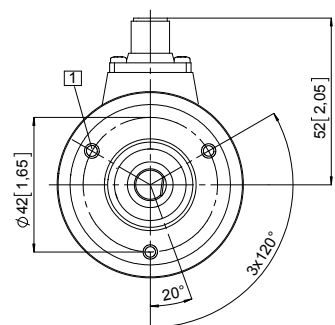
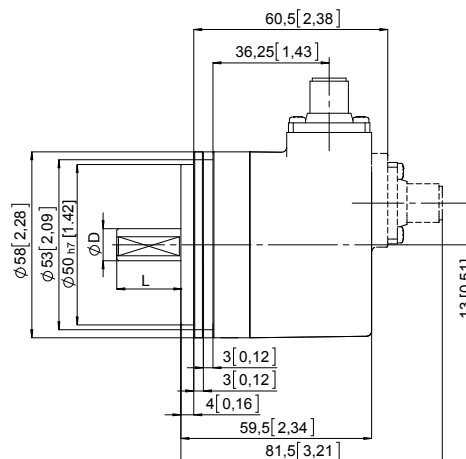
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
electronic multiturn, optical**

**Sendix F5863 / F5883 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

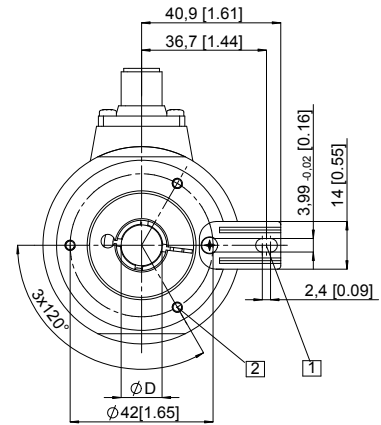
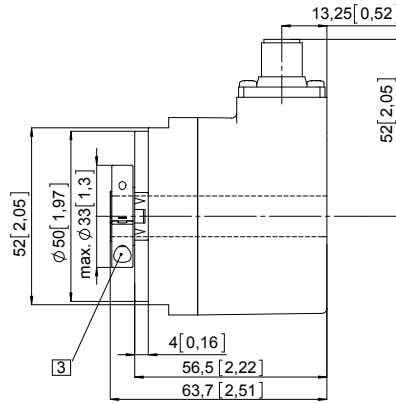
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

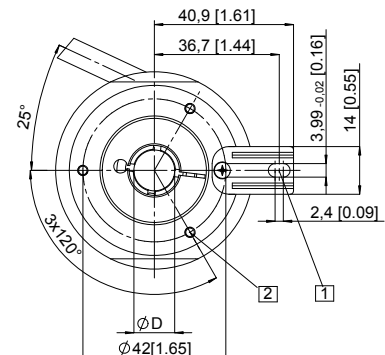
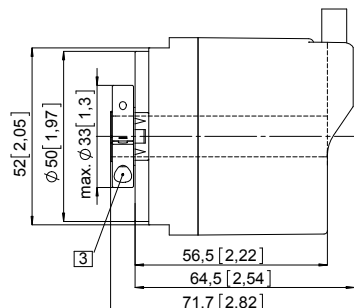
- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |

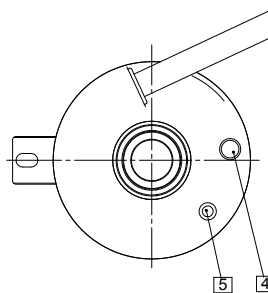
(drawing with tangential cable)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |

- 4 Status-LED
- 5 SET button



# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5863 / F5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Dimensions hollow shaft version

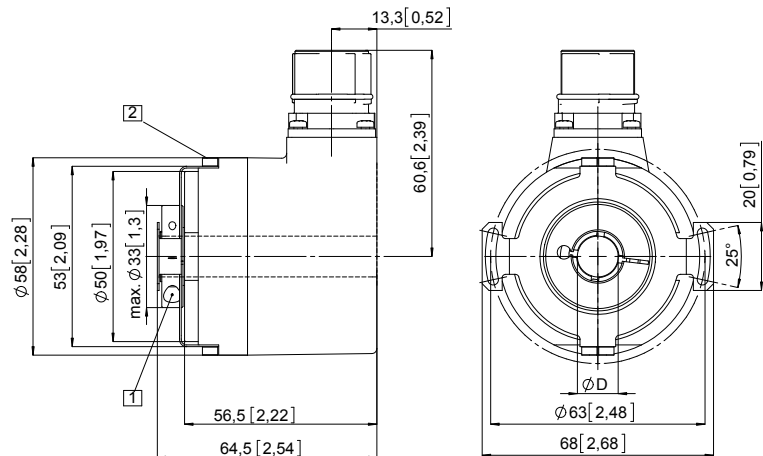
Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type 5 and 6

Pitch circle diameter for fixing screws  
63 mm [2.48]  
(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Fixing screws (4x) DIN 912 M3 x 8 (washer included in delivery)

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |

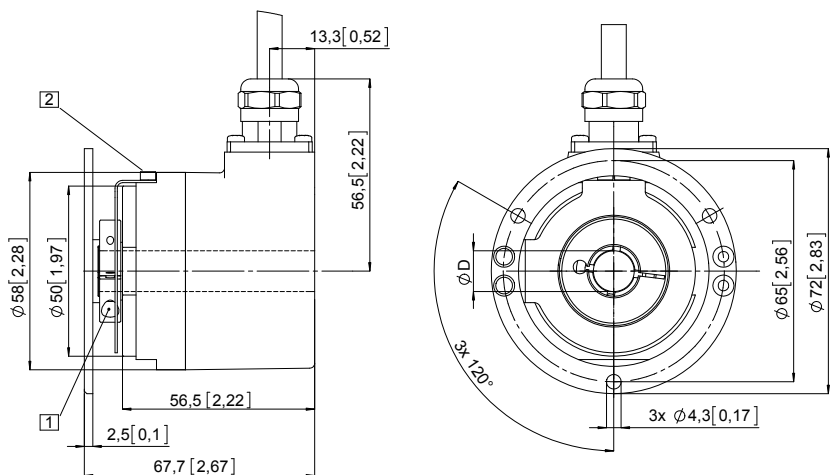


### Flange with stator coupling, $\varnothing$ 65 [2.56] Flange type 3 and 4

Pitch circle diameter for fixing screws  
65 [2.56]  
(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Fixing screws (2x) DIN 912 M3 x 8 (washer included in delivery)

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 3/8"      | H7  |
| 1/2"      | H7  |



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard**  
Motor-Line, electronic multiturn, optical

Sendix F5883M (hollow shaft)

SSI / BiSS + incremental



The optical Sendix F5883 multiturn encoder in the Motor-Line version stands out particularly because of its reduced overall depth of only 43 mm with a through hollow shaft up to 15 mm.

This opens up new possibilities when dimensioning the motors and for installation in tight mounting spaces. Its technical features make the F5883 Motor-Line the ideal device for use in geared motors.



Multiturn resolution



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Intelligent Scan Technology™



Surface protection salt spray-tested optional

## Compact and robust

- Suitable for restricted mounting spaces thanks to its small construction depth of 43 mm and its tangential cable outlet.
- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

## Versatile

- Through hollow shaft up to max. 15 mm and clamping both on the flange and on the cover side – suitable for usual drive shafts for geared motors, flexible installation.
- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

## Order code

**8.F5883M** . **XXXX** . **XXXX**  
Type                    **a b c d**                    **e f g h**

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = with spring element, long, IP65
- 5 = with stator coupling, IP65, ø 63 mm [2.48"]**
- 9 = with torque stop, flexible, IP65

### b Through hollow shaft

- Clamping on the flange side
- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]**
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 9 = ø 1/2"

### Clamping on the cover side

- A = ø 12 mm [0.39"]
- B = ø 14 mm [0.55"]
- C = ø 15 mm [0.59"]

### c Interface / power supply

- 1 = SSI, BiSS / 5 V DC
- 2 = SSI, BiSS / 10 ... 30 V DC**
- 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
- 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
- 5 = SSI, BiSS / 5 V DC, with sensor output
- 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
- 7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
- 8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
- A = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 5 V DC
- B = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

### d Type of connection

- E = tangential cable, 1 m PVC**
- F = tangential cable, special length PVC \*)

\*) Available special lengths (connection type F):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21"]  
order code expansion .XXXX = length in dm  
ex.: 8.F5883M.542F.G323.0030 (for cable length 3 m)

### e Code

- B = SSI, binary
- C = BiSS, binary
- G = SSI, gray**

### f Resolution (singleturn) <sup>1)</sup>

- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- 3 = 13 bit**
- 4 = 14 bit
- 7 = 17 bit

### Optional on request

- surface protection salt spray tested
- other singleturn resolutions

### g Resolution (multiturn) <sup>1)</sup>

- 2 = 12 bit MT**
- 6 = 16 bit MT
- 4 = 24 bit MT

### h Options (service)

- 1 = no option
- 2 = status LED
- 3 = SET button and status LED**

1) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders – multiturn

|   |                                     |                                 |
|---|-------------------------------------|---------------------------------|
| <b>Standard Motor-Line, electronic multiturn, optical</b> | <b>Sendix F5883M (hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|-------------------------------------|---------------------------------|

| Mounting accessory for hollow shaft encoders                                      | Dimensions in mm [inch] | Order no.               |
|---|-------------------------|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1) | with fixing thread<br>  | <b>8.0010.4700.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Suitable connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |   |
|--|---|
| <b>Maximum speed</b>                             | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)                          |
| <b>Starting torque at 20°C [68°F]</b>            | < 0.01 Nm   |
| <b>Mass moment of inertia</b>                    | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>   |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N   |
| <b>Weight</b>                                    | approx. 0.45 kg [15.87 oz]  |
| <b>Protection</b>                                | IP65  |
| <b>Working temperature range</b>                 | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup>                                      |
| <b>Material</b>                                  | hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz   |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (+5%) or 10 ... 30 V DC                        |
| <b>Current consumption (no load)</b>                   | 5 V DC max. 60 mA<br>10 ... 30 V DC max. 30 mA        |
| <b>Reverse polarity protection of the power supply</b> | yes (at 10 ... 30 V DC)                               |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>                                     |
| <b>UL approval</b>                                     | file 224618 (pending)                                 |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 30 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 17 bit  |
| <b>Number of revolutions (multiturn)</b>  | max. 24 bit  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |  |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 17 bit   |
| <b>Number of revolutions (multiturn)</b> | max. 24 bit   |
| <b>Code</b>                              | binary  |
| <b>BiSS clock rate</b>                   | 50 kHz ... 10 MHz   |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings<br>– CRC data verification |

| Status output and LED   |   |
|---|---|
| <b>Output driver</b>  | open collector, internal pull up resistor 22 kOhm |
| <b>Permissible load</b>   | max. 20 mA  |
| <b>Signal level</b>   | HIGH: +V / LOW: < 1 V                             |
| <b>Active</b>   | LOW   |
| The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm). |   |
| An active status output (LOW) displays:   |   |
| – sensor error, singleturn or multiturn (soiling, glass breakage etc.)<br>– LED fault (failure or ageing)<br>– over- or under-temperature   |   |
| In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.  |   |

| Option incremental outputs (A/B), 1024 / 2048 ppr |                          |                                     |
|---|--------------------------|-------------------------------------|
|   | SinCos                   | RS422 TTL-compatible                |
| <b>Max. frequency -3dB</b>                        | 400 kHz                  | 400 kHz                             |
| <b>Signal level</b>                               | 1 V <sub>pp</sub> (±20%) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>                        | yes <sup>2)</sup>        | yes <sup>2)</sup>                   |

Absolute encoders multiturn

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).  
 2) Short circuit to 0 V or to output; if power supply correctly applied.

# Absolute encoders – multiturn

|   |                                     |                                 |
|---|-------------------------------------|---------------------------------|
| <b>Standard<br/>Motor-Line, electronic multiturn, optical</b> | <b>Sendix F5883M (hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|-------------------------------------|---------------------------------|

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | active HIGH  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = power supply) | HIGH min. 60 % of +V, max: +V<br>LOW max. 30 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Input Delay</b>                         | 1 ms   |
| <b>New position data readable after</b>    | 1 ms   |
| <b>Internal processing time</b>            | 200 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.  |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

| Interface           | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
|---------------------|--------------------|--|---|-----|----|----|----|----|----|-----|-----------|------|-----------|--------|-----------|--------|
| 1, 2                | E, F               | SET, DIR, Status                       | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | N/C    | N/C       | ⊥      |
|                     |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | -      | -         | shield |
| 5                   | E, F               | SET, DIR, Status<br>sensor output      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | 0Vsens | +Vsens    | ⊥      |
|                     |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | GY-PK  | RD-BU     | shield |
| 3, 4, 7, 8,<br>A, B | E F                | SET, DIR, SinCos<br>or incr. RS422     | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | A    | $\bar{A}$ | B      | $\bar{B}$ | ⊥      |
|                     |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |
| 6                   | E, F               | SinCos or incr. RS422<br>sensor output | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A   | $\bar{A}$ | B    | $\bar{B}$ | 0Vsens | +Vsens    | ⊥      |
|                     |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

# Absolute encoders – multiturn

|   |                                     |                                 |
|---|-------------------------------------|---------------------------------|
| <b>Standard<br/>Motor-Line, electronic multiturn, optical</b> | <b>Sendix F5883M (hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|-------------------------------------|---------------------------------|

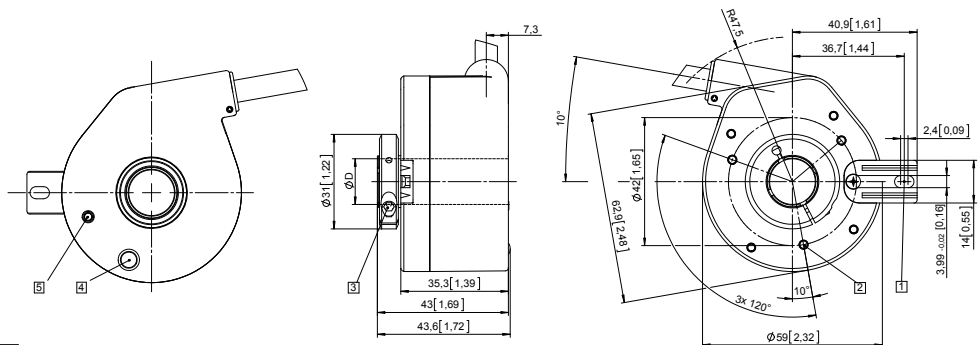
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- 4 Status-LED
- 5 SET button

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/2 "     | H7  |



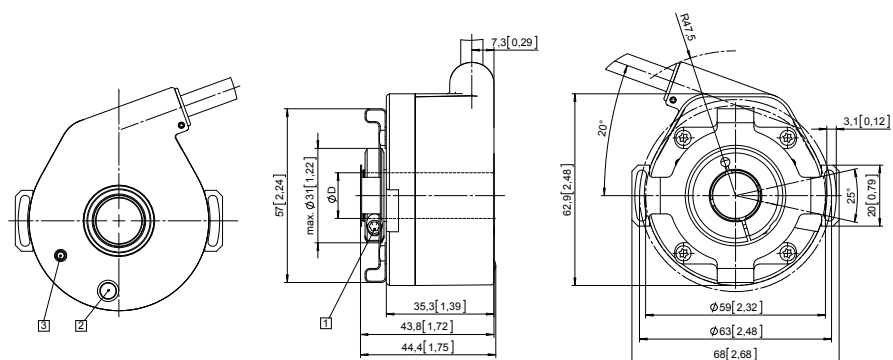
### Flange with stator coupling, $\varnothing 63$ [2.48]

#### Flange type 5

Pitch circle diameter for fixing screws 63 mm [2.48]

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/2 "     | H7  |

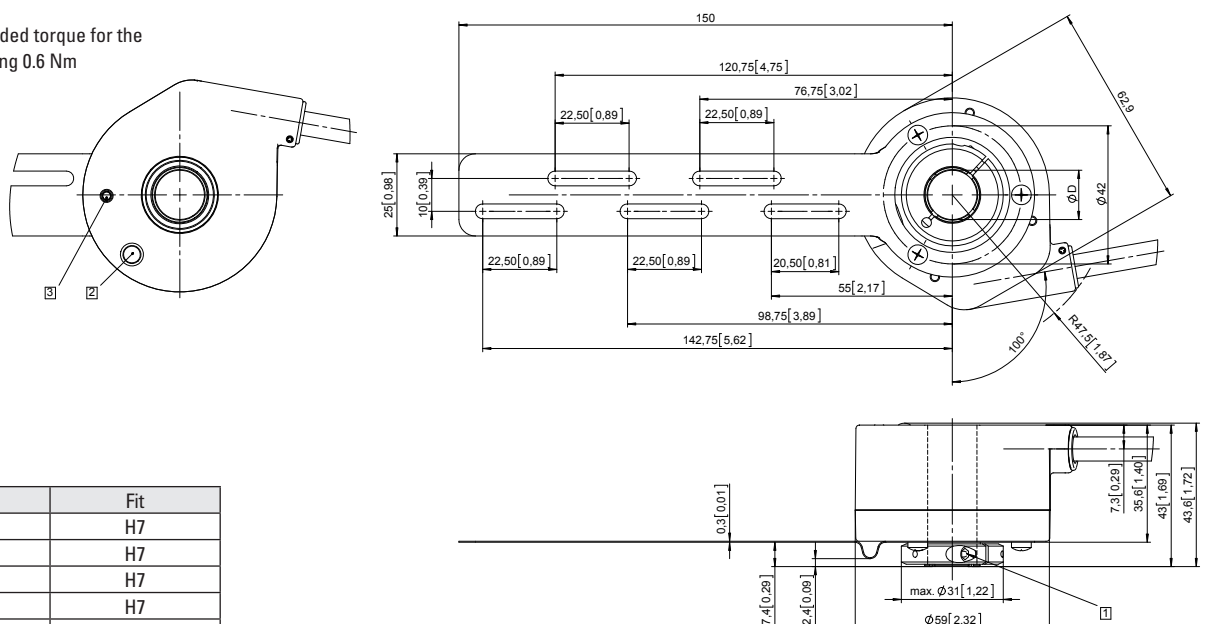


### Flange with torque stop, flexible

#### Flange type 9

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button

| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |
| 1/2 "     | H7  |





# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5863 / 5883 (shaft / hollow shaft)**

**SSI / BiSS + incremental**



The Sendix 5863 and 5883 multiturn encoders with SSI or BiSS interface and optical sensor technology can achieve a resolution of max. 29 bits.

A through hollow shaft up to 14 mm and a blind hollow shaft up to 15 mm are available, as well as versions with additional SinCos or RS422 incremental track.



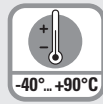
Mechanical drive



Safety-Lock™



High rotational speed



Temperature range  
-40°... +90°C



High protection level  
IP67



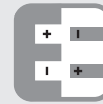
High shaft load capacity



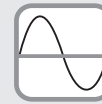
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Surface protection salt spray-tested optional

## Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Absolutely reliable operation in areas with strong magnetic fields, thanks to mechanical gear with optical sensor technology.
- Rugged die-cast housing, remains sealed even in harsh everyday use.
- -40°C ... +90°C: use in wide temperature range and protection IP67.

## Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.

## Order code Shaft version

**8.5863** . **XXXX** . **XX2X**  
Type                      a b c d                      e f g h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]**  
3 = clamping flange, IP67 ø 58 mm [2.28"]  
**2 = synchro flange, IP65 ø 58 mm [2.28"]**  
4 = synchro flange, IP67 ø 58 mm [2.28"]  
5 = square flange, IP65 □ 63.5 mm [2.5"]  
7 = square flange, IP67 □ 63.5 mm [2.5"]
- 6 = servo flange, IP65 ø 63.5 mm [2.5"]<sup>1)</sup>  
8 = servo flange, IP67 ø 63.5 mm [2.5"]<sup>1)</sup>

### b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]**<sup>2)</sup>  
**2 = 10 x 20 mm [0.39 x 0.79"]**<sup>3)</sup>  
3 = 1/4" x 7/8"  
4 = 3/8" x 7/8"

### c Interface / power supply

- 1 = SSI, BiSS / 5 V DC  
**2 = SSI, BiSS / 10 ... 30 V DC**  
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC  
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC  
5 = SSI, BiSS / 5 V DC, with sensor output  
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output  
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC  
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC  
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

### d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC  
A = axial cable, special length PVC \*)  
**2 = radial cable, 1 m [3.28'] PVC**  
B = radial cable, special length PVC \*)  
3 = axial M23 connector, 12-pin  
**4 = radial M23 connector, 12-pin**  
5 = axial M12 connector, 8-pin<sup>4)</sup>  
6 = radial M12 connector, 8-pin<sup>4)</sup>

\*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5863.112A.G323.0030 (for cable length 3 m)

### e Code

- B = SSI, binary  
C = BiSS, binary  
**G = SSI, gray**

### f Resolution<sup>5)</sup>

- A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
**3 = 13 bit ST + 12 bit MT**  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

Optional on request

- Ex 2/22<sup>6)</sup>
- surface protection salt spray tested
- other singleturn resolutions

### g Inputs / outputs<sup>5)</sup>

- 2 = SET, DIR input**  
additional  
status output

### h Options (service)

- 1 = no option  
2 = status LED  
**3 = SET button and status LED**

1) US version.  
2) Preferred type only in conjunction with flange type 1.  
3) Preferred type only in conjunction with flange type 2.

4) Only in conjunction with interface type 1 and 2.

5) Resolution, preset value and counting direction factory-programmable.  
6) For the cable connection type, cable material PUR.



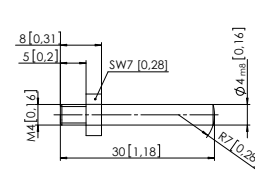
# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

|                     |               |   |  |   |   |   |   |   |   |   |                               |
|---------------------|---------------|---|--|---|---|---|---|---|---|---|-------------------------------|
| <b>Order code</b>   | <b>8.5883</b> | . <b>X</b> <b>X</b> <b>X</b> <b>X</b> . <b>X</b> <b>X</b> <b>2</b> <b>X</b>   | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |   |   |   |   |   |   |   |                               |
| <b>Hollow shaft</b> | Type          | <table border="1" style="font-size: x-small; text-align: center;"> <tr> <td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td> </tr> </table> | a  | b | c | d | e | f | g | h | <b>10</b> <b>By</b> <b>10</b> |
| a                   | b             | c   | d  | e | f | g | h |   |   |   |                               |

|   |  |   |  |
|---|--|---|--|
| <p><b>a Flange</b></p> <p>1 = with spring element, long, IP65<br/>         2 = with spring element, long, IP67<br/>         3 = with stator coupling, IP65 ø 65 mm [2.56"]<br/>         4 = with stator coupling, IP67 ø 65 mm [2.56"]<br/> <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u><br/>         6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> <p><b>b Through hollow shaft</b></p> <p>3 = ø 10 mm [0.39"]<br/> <u>4 = ø 12 mm [0.47"]</u><br/>         5 = ø 14 mm [0.55"]<br/>         8 = ø 3/8"<br/>         9 = ø 1/2"</p> <p style="padding-left: 20px;"><i>Blind hollow shaft</i><br/>(insertion depth max. 30 mm [1.18"])</p> <p>6 = ø 15 mm [0.59"]</p> | <p><b>c Interface / power supply</b></p> <p>1 = SSI, BiSS / 5 V DC<br/> <u>2 = SSI, BiSS / 10 ... 30 V DC</u><br/>         3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/>         4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC<br/>         5 = SSI, BiSS / 5 V DC, with sensor output<br/>         6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output<br/>         7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC<br/>         8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC<br/>         9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output</p> <p><b>d Type of connection</b></p> <p>2 = radial cable, 1 m [3.28"] PVC<br/>         B = radial cable, special length PVC *)<br/> <u>E = tangential cable, 1 m [3.28"] PVC</u><br/>         F = tangential cable, special length PVC *)<br/> <u>4 = radial M23 connector, 12-pin</u><br/>         6 = radial M12 connector, 8-pin<sup>2)</sup></p> <p>*) Available special lengths (connection types B, F):<br/>         2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>         order code expansion .XXXX = length in dm<br/>         ex.: 8.5883.542B.G323.0030 (for cable length 3 m)</p> | <p><b>e Code</b></p> <p>B = SSI, binary<br/>         C = BiSS, binary<br/> <u>G = SSI, gray</u></p> <p><b>f Resolution<sup>1)</sup></b></p> <p>A = 10 bit ST + 12 bit MT<br/>         1 = 11 bit ST + 12 bit MT<br/>         2 = 12 bit ST + 12 bit MT<br/> <u>3 = 13 bit ST + 12 bit MT</u><br/>         4 = 14 bit ST + 12 bit MT<br/>         7 = 17 bit ST + 12 bit MT</p> <p style="padding-left: 20px;"><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 (not for type of connection E, F)<sup>3)</sup></li> <li>- surface protection salt spray tested</li> <li>- other singleturn resolutions</li> </ul> | <p><b>g Inputs / outputs<sup>1)</sup></b></p> <p><u>2 = SET, DIR input</u><br/>additional status output</p> <p><b>h Options (service)</b></p> <p>1 = no option<br/>         2 = status LED<br/> <u>3 = SET button and status LED</u></p> |
|---|--|---|--|

Absolute encoders multiturn

| Mounting accessory for shaft encoders   | Order no.                    |
|---|------------------------------|
| <b>Coupling</b>   |                              |
| bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                             | <b>8.0000.1102.0606</b>      |
| bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                            | <b>8.0000.1102.1010</b>      |
| Mounting accessory for hollow shaft encoders  | Order no.                    |
| <b>Cylindrical pin, long</b>  |                              |
| for flange with spring element<br>(flange type 1 + 2)                               |                              |
| with fixing thread  | <b>8.0010.4700.0000</b>      |
|  |                              |
| Connection technology   | Order no.                    |
| <b>Cordset, pre-assembled</b>   |                              |
| M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable              | <b>05.00.6041.8211.002M</b>  |
| M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable             | <b>8.0000.6901.0002.0031</b> |
| <b>Connector, self-assembly (straight)</b>  |                              |
| M12 female connector with coupling nut, 8-pin                                       | <b>05.CMB 8181-0</b>         |
| M23 female connector with coupling nut, 12-pin                                      | <b>8.0000.5012.0000</b>      |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and counting direction factory-programmable.  
 2) Only in conjunction with interface type 1 and 2.  
 3) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Technical data

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed shaft version</b>               |  |
| IP65 up to 70°C [158°F]                          | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |
| IP65 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |
| IP67 up to 70°C [158°F]                          | 11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)  |
| IP67 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |
| <b>Maximum speed hollow shaft version</b>        |  |
| IP65 up to 70°C [158°F]                          | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |
| IP65 up to T <sub>max</sub>                      | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| IP67 up to 70°C [158°F]                          | 8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)   |
| IP67 up to T <sub>max</sub>                      | 4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque at 20°C [68°F]</b>            |  |
| IP65   | < 0.01 Nm  |
| IP67   | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    |  |
| shaft version                                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |
| hollow shaft version                             | 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                        |
| <b>Load capacity of shaft</b>                    |  |
| radial   | 80 N   |
| axial  | 40 N   |
| <b>Weight</b>                                    |  |
|  | approx. 0.45 kg [15.87 oz]                                     |
| <b>Protection acc. to EN 60529</b>               |  |
| housing side                                     | IP67   |
| shaft side                                       | IP65, opt. IP67  |
| <b>Working temperature range</b>                 |  |
|  | -40°C ... +90°C [-40°F ... +194°F] <sup>1)</sup>               |
| <b>Material</b>                                  |  |
| shaft/hollow shaft                               | stainless steel  |
| flange   | aluminum   |
| housing  | zinc die-cast  |
| cable  | PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  |
|  | 2500 m/s <sup>2</sup> , 6 ms                                   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  |
|  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                          |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    |   |
|  | 5 V DC (+5%) or 10 ... 30 V DC                        |
| <b>Current consumption (no load)</b>                   |   |
| 5 V DC   | max. 80 mA  |
| 10 ... 30 V DC   | max. 50 mA  |
| <b>Reverse polarity protection of the power supply</b> |   |
|  | yes (at 10 ... 30 V DC)                               |
| <b>Short circuit proof outputs</b>                     |   |
|  | yes <sup>2)</sup>                                     |
| <b>UL approval</b>                                     |   |
|  | file 224618   |
| <b>CE compliant acc. to</b>                            |   |
|  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SSI interface   |                          |
|---|--------------------------|
| <b>Output driver</b>  |                          |
|   | RS485 transceiver type   |
| <b>Permissible load / channel</b>   |                          |
|   | max. +/- 20 mA           |
| <b>Signal level</b>   |                          |
| HIGH  | typ. 3.8 V               |
| LOW at I <sub>Load</sub> = 20 mA  | typ. 1.3 V               |
| <b>Resolution singleturn</b>  |                          |
|   | 10 ... 14 bit and 17 bit |
| <b>Number of revolutions (multiturn)</b>  |                          |
|   | 4096 (12 bit)            |
| <b>Code</b>   |                          |
|   | binary or gray           |
| <b>SSI clock rate</b>   |                          |
|   | 50 kHz ... 2 MHz         |
| <b>Data refresh rate</b>  |                          |
| ST resolution ≤ 14 bit  | ≤ 1 μs                   |
| ST resolution ≥ 15 bit  | 4 μs                     |
| <b>Monoflop time</b>  |                          |
|   | ≤ 15 μs                  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |                          |

| BiSS interface                           |  |
|--|--|
| <b>Resolution singleturn</b>             |  |
|  | 10 ... 14 bit and 17 bit   |
| <b>Number of revolutions (multiturn)</b> |  |
|  | 4096 (12 bit)  |
| <b>Code</b>                              |  |
|  | binary   |
| <b>Clock rate</b>                        |  |
|  | 50 kHz ... 10 MHz  |
| <b>Max. update rate</b>                  |  |
|  | < 10 μs, depends on the clock rate and the data length   |
| <b>Data refresh rate</b>                 |  |
|  | ≤ 1 μs   |
| <b>Note:</b>                             |  |
|  | – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings |
|  | – CRC data verification  |

| Status output and LED   |  |
|---|--|
| <b>Output driver</b>  |  |
|   | open collector, internal pull up resistor 22 kOhm                      |
| <b>Permissible load</b>   |  |
|   | max. 20 mA   |
| <b>Signal level</b>   |  |
| HIGH  | +V   |
| LOW   | < 1 V  |
| <b>Active</b>   |  |
|   | LOW  |
| The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm). |  |
| An active status output (LOW) displays:   |  |
|   | – sensor error, singleturn or multiturn (soiling, glass breakage etc.) |
|   | – LED fault (failure or ageing)  |
|   | – over- or under-temperature   |
| In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.  |  |

| Option incremental outputs (A/B), 2048 ppr |                           |                                     |
|--|---------------------------|-------------------------------------|
|  | SinCos                    | RS422 TTL compatible                |
| <b>Max. frequency -3dB</b>                 | 400 kHz                   | 400 kHz                             |
| <b>Signal level</b>                        | 1 V <sub>pp</sub> (± 20%) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b>                 | yes                       | yes                                 |

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

2) Short circuit to 0V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

| SET input or SET button  |  |      |   |     |                                |
|--|--|------|---|-----|--------------------------------|
| <b>Input</b>   | active HIGH  |      |   |     |                                |
| <b>Input type</b>  | comparator   |      |   |     |                                |
| <b>Signal level</b>  | <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">HIGH</td> <td>min: 60 % of +V (power supply)<br/>max: +V</td> </tr> <tr> <td>LOW</td> <td>max: 25 % of +V (power supply)</td> </tr> </table> | HIGH | min: 60 % of +V (power supply)<br>max: +V | LOW | max: 25 % of +V (power supply) |
| HIGH   | min: 60 % of +V (power supply)<br>max: +V  |      |   |     |                                |
| LOW  | max: 25 % of +V (power supply)   |      |   |     |                                |
| <b>Input current</b>   | < 0.5 mA   |      |   |     |                                |
| <b>Min. pulse duration (SET)</b>   | 10 ms  |      |   |     |                                |
| <b>Timeout after SET signal</b>  | 14 ms  |      |   |     |                                |
| <p>The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p> |  |      |   |     |                                |

| DIR input   |      |
|---|------|
| <p>Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p> |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON  |  |
|---|--|
| <p>After Power-ON the device requires a time of approx. 150 ms before valid data can be read.</p> |  |
| <p>Hot plugging of the encoder should be avoided.</p>   |  |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Terminal assignment

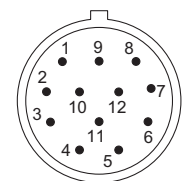
| Interface  | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
|------------|--------------------|--|---|-----|----|----|----|----|----|-----|-----------|------|-----------|--------|-----------|--------|
| 1, 2       | 1, 2, A, B, E, F   | SET, DIR, Status                       | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | N/C    | N/C       | ⊥      |
|            |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | -      | -         | shield |
| Interface  | Type of connection | Features                               | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 1, 2       | 3, 4               | SET, DIR, Status                       | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | N/C    | N/C       | ⊥      |
|            |                    |  | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 5          | 1, 2, A, B, E, F   | SET, DIR, Status<br>sensor output      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | 0Vsens | +Vsens    | ⊥      |
|            |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | -         | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                               | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 5          | 3, 4               | SET, DIR, Status<br>sensor output      | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | Stat | N/C       | 0Vsens | +Vsens    | ⊥      |
|            |                    |  | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 3, 4, 7, 8 | 1, 2, A, B, E, F   | SET, DIR, SinCos<br>or incr. RS422     | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | A    | $\bar{A}$ | B      | $\bar{B}$ | ⊥      |
|            |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                               | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 3, 4, 7, 8 | 3, 4               | SET, DIR, SinCos<br>or incr. RS422     | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | A    | $\bar{A}$ | B      | $\bar{B}$ | ⊥      |
|            |                    |  | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                               | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 6, 9       | 1, 2, A, B, E, F   | SinCos o. incr. RS422<br>sensor output | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A   | $\bar{A}$ | B    | $\bar{B}$ | 0Vsens | +Vsens    | ⊥      |
|            |                    |  | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD        | BK   | VT        | GY-PK  | RD-BU     | shield |
| Interface  | Type of connection | Features                               | M23 connector, 12-pin   |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 6, 9       | 3, 4               | SinCos o. incr. RS422<br>sensor output | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A   | $\bar{A}$ | B    | $\bar{B}$ | 0Vsens | +Vsens    | ⊥      |
|            |                    |  | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | 9    | 10        | 11     | 12        | PH     |
| Interface  | Type of connection | Features                               | M12 connector, 8-pin  |     |    |    |    |    |    |     |           |      |           |        |           |        |
| 1, 2       | 5, 6               | SET, DIR                               | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR       | ⊥    |           |        |           |        |
|            |                    |  | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8         | PH   |           |        |           |        |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: SET input
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

### Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Dimensions shaft version

Dimensions in mm [inch]

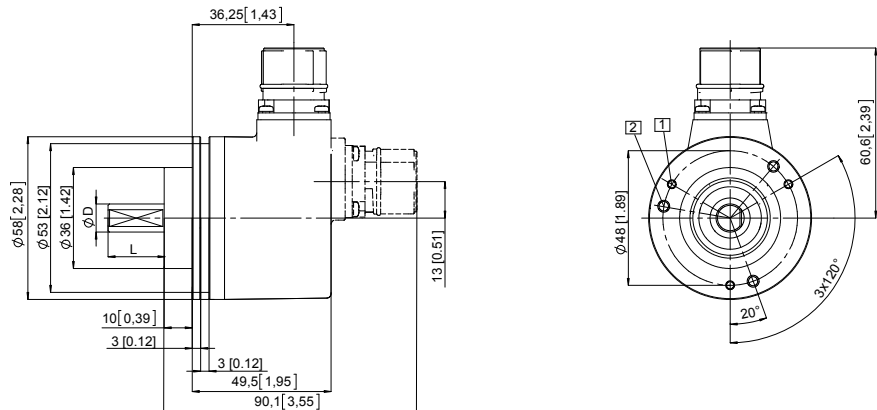
### Clamping flange, $\varnothing 58$ [2.28]

#### Flange type 1 and 3

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



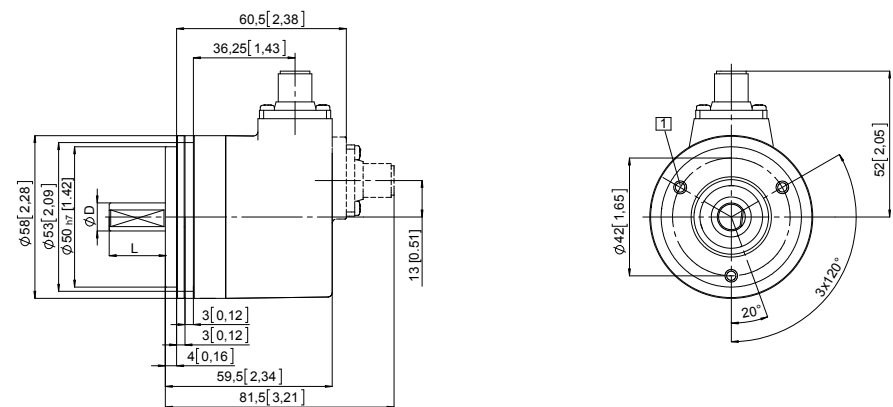
### Synchro flange, $\varnothing 58$ [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

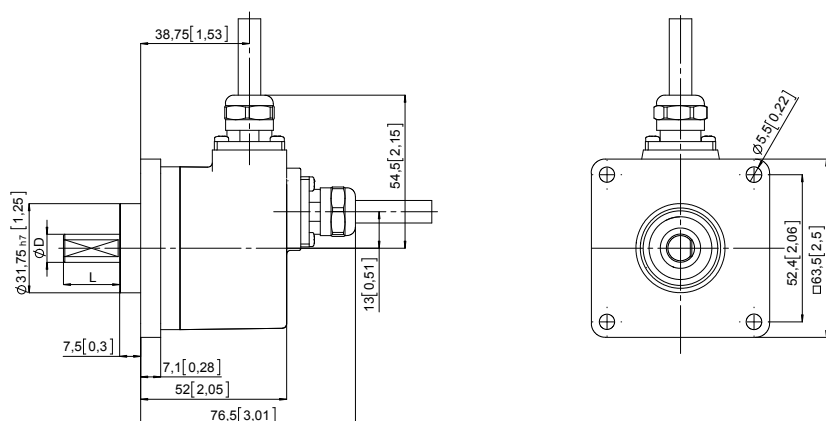


### Square flange, $\square 63.5$ [2.5]

#### Flange type 5 and 7

(drawing with cable)

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5863 / 5883 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

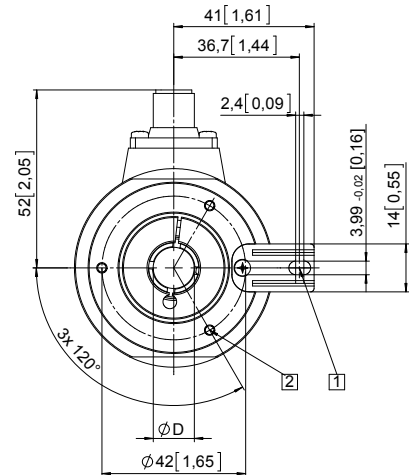
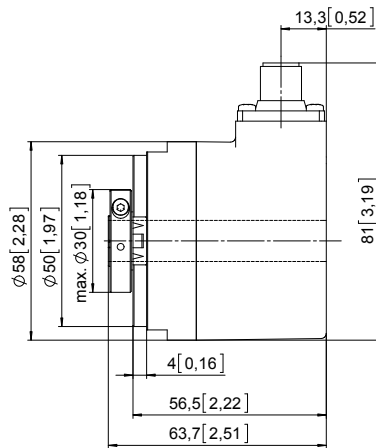
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

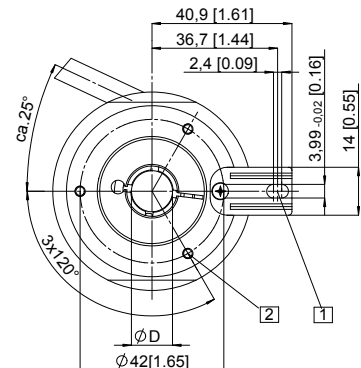
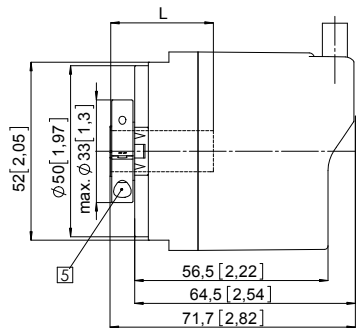


| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47]    | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59] *) | H7  |
| 3/8"         | H7  |
| 1/2"         | H7  |

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

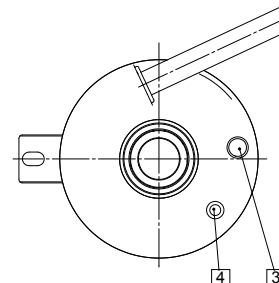
(drawing with tangential cable)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm



| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47]    | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59] *) | H7  |
| 3/8"         | H7  |
| 1/2"         | H7  |

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



# Absolute encoders – multiturn

|   |  |                                 |
|---|--|---------------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5863 / 5883 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|---|--|---------------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type 5 and 6

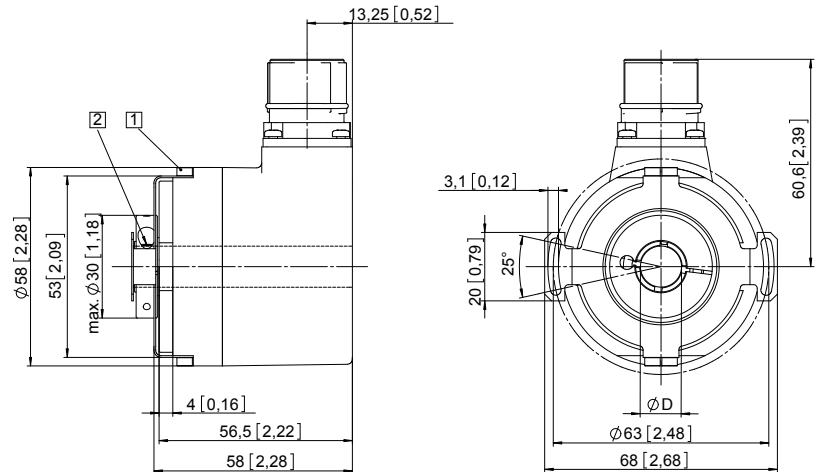
Pitch circle diameter for fixing screws  
63 [2.48]

(drawing with M23 connector)

- 1 Fixing screws DIN 912 M2,5 x 6  
(washer included in delivery)
- 2 Recommended torque for the  
clamping ring 0.6 Nm

| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47]    | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59] *) | H7  |
| 3/8"         | H7  |
| 1/2"         | H7  |

\*) Blind hollow shaft,  
insertion depth max. = 30 mm [1.18"]



### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 3 and 4

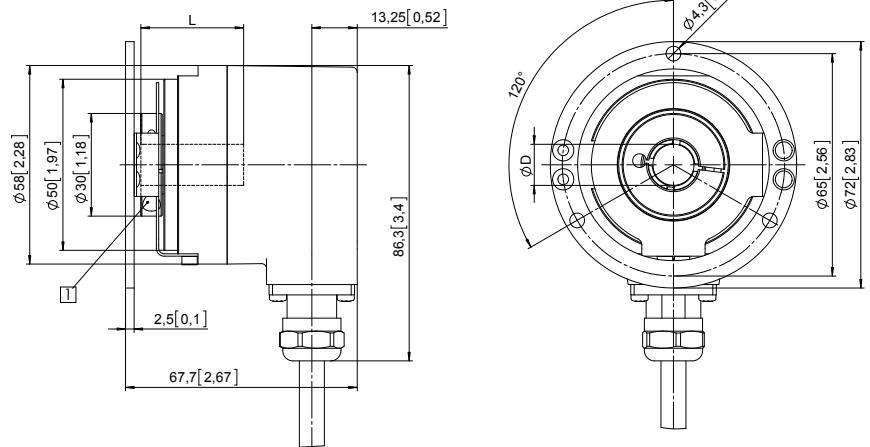
Pitch circle diameter for fixing screws  
65 [2.56]

(drawing with cable)

- 1 Recommended torque for the  
clamping ring 0.6 Nm

| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47]    | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59] *) | H7  |
| 3/8"         | H7  |
| 1/2"         | H7  |

\*) Blind hollow shaft,  
insertion depth (L) max. = 30 mm [1.18"]



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard**  
SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft) SSI/BiSS + SinCos



The absolute multiturn encoders 5863FS2 and 5883FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.



Mechanical drive



Safety-Lock™



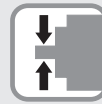
High rotational speed



Temperature range



High protection level



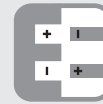
High shaft load capacity



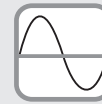
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

## Order code

**8.5863FS2**  
Type

1 X X X . X X 2 X  
a b c d e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

1 = clamping flange, IP65, ø 58 mm [2.28"]

### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

A = 10 x 20 mm [0.39 x 0.79"], with feather key

### c Interface / power supply

3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC

4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 1 m [3.28'] PVC

A = axial cable, special length PVC \*)

2 = radial cable, 1 m [3.28'] PVC

B = radial cable, special length PVC \*)

3 = axial M23 connector, 12-pin

4 = radial M23 connector, 12-pin

\*) Available special lengths (connection types A, B):

2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']

order code expansion .XXXX = length in dm

ex.: 8.5863FS2.124A.G322.0030 (for cable length 3 m)

### e Code

B = SSI, binary

C = BiSS, binary

G = SSI, gray

### f Resolution <sup>1)</sup>

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

### g Input / output <sup>1)</sup>

2 = SET, DIR input

### h Options (service)

1 = no option

2 = status LED

3 = SET button and status LED

Optional on request

- Ex 2/22 <sup>2)</sup>

- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.

2) For the cable connection type, cable material PUR.



# Absolute encoders – multiturn

|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL2/PLd, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

|  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| <b>Order code</b><br>Hollow shaft  | <b>8.5883FS2</b><br>Type   | <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">2</td> <td style="border: none;">X</td> </tr> <tr> <td style="border: none;">a</td> <td style="border: none;">b</td> <td style="border: none;">c</td> <td style="border: none;">d</td> <td style="border: none;">e</td> <td style="border: none;">f</td> <td style="border: none;">g</td> <td style="border: none;">h</td> <td style="border: none;">i</td> <td style="border: none;">j</td> </tr> </table> | . | X | X | X | X | . | X | X | 2 | X | a | b | c | d | e | f | g | h | i | j | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px 5px; width: fit-content; margin: 0 auto;">10 By 10</div> |
| .  | X  | X  | X | X | . | X | X | 2 | X |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| a  | b  | c  | d | e | f | g | h | i | j |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| <p><b>a</b> Flange<br/>9 = with torque stop, flexible, IP65<br/>A = with torque stop set, rigid, IP65<br/><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u></p> <p><b>b</b> Through hollow shaft<br/>3 = ø 10 mm [0.39"]<br/><u>4 = ø 12 mm [0.47"]</u><br/>5 = ø 14 mm [0.55"]<br/>Tapered shaft<br/>K = ø 10 mm [0.39"]</p> <p><b>c</b> Interface / power supply<br/>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u></p> | <p><b>d</b> Type of connection<br/>2 = radial cable, 1 m [3.28'] PVC<br/>B = radial cable, special length PVC *)<br/>E = tangential cable, 1 m [3.28'] PVC<br/>F = tangential cable, special length PVC *)<br/><u>4 = radial M23 connector, 12 pin</u></p> <p>*) Available special lengths (connection types B, F):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.5883FS2.B44B.G322.0030 (for cable length 3 m)</p> <p><b>e</b> Code<br/>B = SSI, binary<br/>C = BiSS, binary<br/><u>G = SSI, gray</u></p> | <p><b>i</b> Resolution <sup>1)</sup><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/><u>3 = 13 bit ST + 12 bit MT</u><br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> <p><b>j</b> Input / output <sup>1)</sup><br/><u>2 = SET, DIR input</u></p> <p><b>h</b> Options (service)<br/>1 = no option<br/><u>2 = status LED</u><br/>3 = SET button and status LED</p> <p style="text-align: right;"><i>Optional on request</i><br/>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br/>- other singleturn resolutions</p>   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |

| Accessories                                      | Order no.   |
|--|---|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting<br><b>8.0000.4G06.0000</b>  |
| <b>Screw retention</b>                           | Loctite 243, 5 ml<br><b>8.0000.4G05.0000</b>  |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |
| <b>LED SSI display 570 / 575</b>                 | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      | Order no.  |
|--|--|
| <b>Cordset, pre-assembled</b>              | M23 female connector with coupling nut, 12-pin single-ended,<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6901.0002.0031</b>                                      |
|  | M23 female connector with coupling nut, 12-pin<br>M23 male connector with external thread, 12-pin<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6905.0002.0032</b> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin<br><b>8.0000.5012.0000</b>  |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and count direction are factory-programmable.  
2) For the cable connection type, cable material PUR.  
3) Other lengths available.

# Absolute encoders – multiturn

|   |  |                          |
|---|--|--------------------------|
| <b>Standard</b><br>SIL2/PLd, mech. multiturn, optical | <b>Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|--|--------------------------|

## Technical data

**Notes regarding “Functional Safety”**

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.

| Safety characteristics                    |   |
|---|---|
| <b>Classification</b>                     | PLd / SIL2  |
| <b>System structure</b>                   | 2 channel (Cat. 3)  |
| <b>PFH<sub>d</sub> value<sup>1)</sup></b> | 2.16 x 10 <sup>-8</sup> h <sup>-1</sup>                           |
| <b>Mission time / Proof test interval</b> | 20 years  |
| <b>Relevant standards</b>                 | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   |
| <b>Current consumption</b><br>(no load)                | 5 V DC max. 80 mA<br>10 ... 30 V DC max. 50 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed shaft version</b>               | up to 70°C [158°F] 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous) |
| <b>Maximum speed hollow shaft version</b>        | up to 70°C [158°F] 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque - at 20°C [68°F]</b>          | shaft version < 0.01 Nm<br>hollow shaft version < 0.03 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Insertion depth for shaft</b>                 | hollow shaft version min. 34 mm [1.34"]  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.45 kg [15.87 oz]   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +90°C [-40°F ... +194°F] <sup>3)</sup>   |
| <b>Material</b>                                  | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B :2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit and 17 bit                                     |
| <b>Number of revolutions (multiturn)</b>  | 4096 (12 bit)  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |  |

| BiSS interface   |  |
|--|--|
| <b>Resolution singleturn</b>   | 10 ... 14 bit and 17 bit                               |
| <b>Number of revolutions (multiturn)</b>   | 4096 (12 bit)  |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |  |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

**LED**

The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.

If the LED is ON (status output LOW) this indicates:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or ageing
- Over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit. The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

# Absolute encoders – multiturn

|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL2/PLd, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

| SET input or SET button          |   |
|----------------------------------|---|
| <b>Input</b>                     | HIGH active   |
| <b>Input type</b>                | comparator  |
| <b>Signal level</b>              | HIGH min: 60 % of +V, max: +V<br>LOW max: 25 % of +V (power supply) |
| <b>Input current</b>             | < 0.5 mA  |
| <b>Min. pulse duration (SET)</b> | 10 ms   |
| <b>Timeout after SET signal</b>  | 14 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input  |      |
|--|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW. |      |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.   |      |
| <b>Reaction time (DIR input)</b>   | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

## Terminal assignment

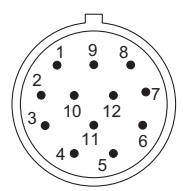
| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |    |           |       |           |         |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| 3, 4      | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | BK | VT        | GY-PK | RD-BU     | shield  |

| Interface | Type of connection | M23 connector, 12-pin |     |    |    |    |    |    |     |     |   |           |    |           |         |
|-----------|--------------------|-----------------------|-----|----|----|----|----|----|-----|-----|---|-----------|----|-----------|---------|
| 3, 4      | 3, 4               | Signal:               | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A | $\bar{A}$ | B  | $\bar{B}$ | $\perp$ |
|           |                    | Pin:                  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9 | 10        | 11 | 12        | PH      |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard**  
SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)

SSI/BiSS + SinCos

## Dimensions shaft version

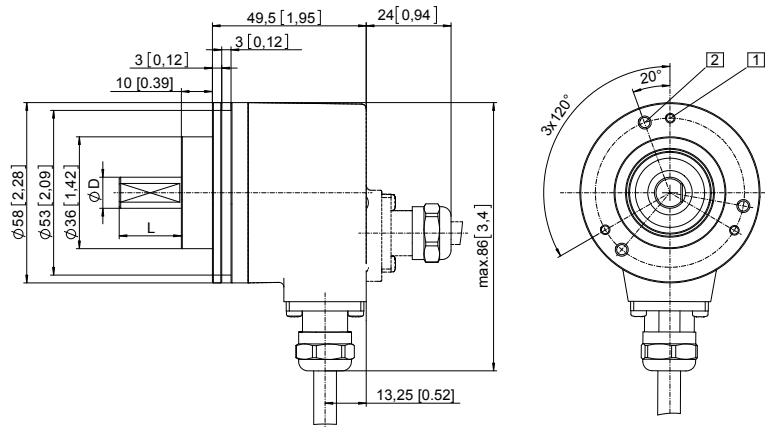
Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 1 with shaft type 2

(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



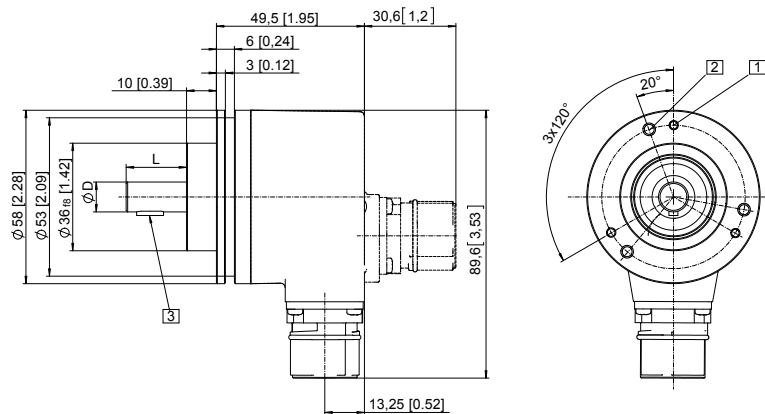
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

### Clamping flange, ø 58 [2.28]

#### Flange type 1 with shaft type A

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders – multiturn

**Standard**  
SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)

SSI/BiSS + SinCos

## Dimensions hollow shaft version

Dimensions in mm [inch]

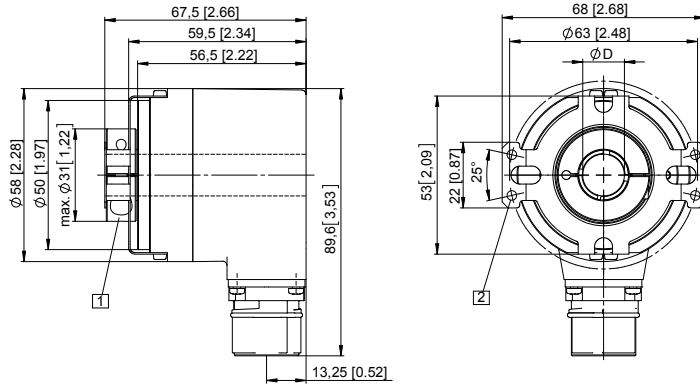
### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- 2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

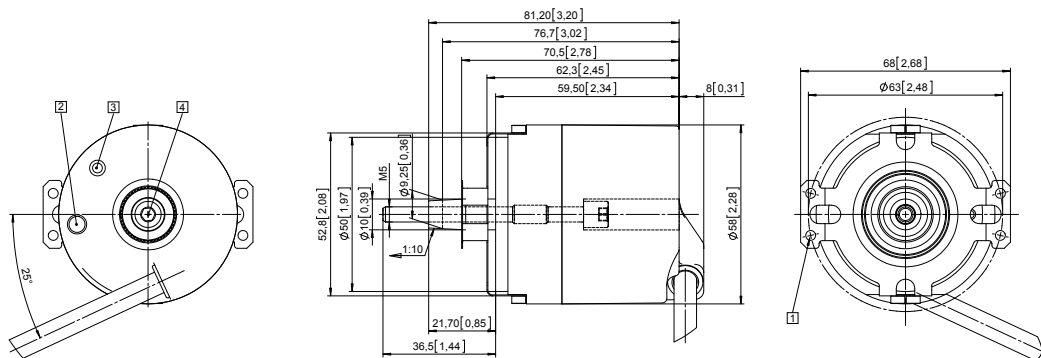
### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type B

#### Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 Status LED
- 3 SET button
- 4 SW 4



# Absolute encoders – multiturn

|   |  |                          |
|---|--|--------------------------|
| <b>Standard</b><br>SIL3/PLe, mech. multiturn, optical | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|--|--------------------------|



The absolute multiturn encoders 5863FS3 and 5883FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.



|                  |              |                       |                   |                       |                          |                             |                      |                             |        |                |
|------------------|--------------|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|--------|----------------|
|                  |              |                       |                   |                       |                          |                             |                      |                             |        |                |
| Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor |

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Absolute encoders multiturn

|                      |                  |          |          |          |          |          |          |          |
|----------------------|------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>Order code</b>    | <b>8.5863FS3</b> | <b>1</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>2</b> | <b>X</b> |
| <b>Shaft version</b> | Type             | a        | b        | c        | d        | e        | f        | g        |

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



- a** Flange  
1 = clamping flange, IP65, ø 58 mm [2.28"]
- b** Shaft (ø x L)  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
A = 10 x 20 mm [0.39 x 0.79"], with feather key
- c** Interface / power supply  
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC  
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 1 m [3.28'] PVC  
A = axial cable, special length PVC \*)  
2 = radial cable, 1 m [3.28'] PVC  
B = radial cable, special length PVC \*)  
3 = axial M23 connector, 12-pin  
4 = radial M23 connector, 12-pin
- \*) Available special lengths (connection types A, B):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5863FS3.124A.G322.0030 (for cable length 3 m)

- e** Code  
B = SSI, binary  
C = BiSS, binary  
G = SSI, gray

- f** Resolution <sup>1)</sup>  
A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
3 = 13 bit ST + 12 bit MT  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

- g** Input / output <sup>1)</sup>  
2 = SET, DIR input

- h** Options (service)  
1 = no option  
2 = status LED  
3 = SET button and status LED

*Optional on request*  
- Ex 2/22 <sup>2)</sup>  
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.  
2) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

|  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |  |  |  |
|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|--|--|--|
| <b>Order code</b><br>Hollow shaft  | <b>8.5883FS3</b><br><small>Type</small>  | <table border="1" style="font-size: 8px; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">.</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> <td style="width: 15px; height: 15px; border: 1px solid black;">2</td> <td style="width: 15px; height: 15px; border: 1px solid black;">X</td> </tr> <tr> <td style="font-size: 6px;">a</td> <td style="font-size: 6px;">b</td> <td style="font-size: 6px;">c</td> <td style="font-size: 6px;">d</td> <td></td> <td style="font-size: 6px;">e</td> <td style="font-size: 6px;">f</td> <td style="font-size: 6px;">g</td> <td style="font-size: 6px;">h</td> </tr> </table> | X | X | X | X | . | X | X | 2 | X | a | b | c | d |  | e | f | g | h | <p style="font-size: 8px;">If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="float: right; border: 1px solid black; border-radius: 50%; padding: 2px 5px; font-weight: bold; font-size: 10px;">10 by 10</div> <table style="width: 100%; font-size: 8px;"> <tr> <td style="width: 33%; vertical-align: top;"> <p><b>a Flange</b><br/>9 = with torque stop, flexible, IP65<br/>A = with torque stop set, rigid, IP65<br/><b><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u></b></p> <p><b>b Through hollow shaft</b><br/>3 = ø 10 mm [0.39"]<br/><b><u>4 = ø 12 mm [0.47"]</u></b><br/>5 = ø 14 mm [0.55"]<br/><i>Tapered shaft</i><br/>K = ø 10 mm [0.39"]</p> <p><b>c Interface / power supply</b><br/>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/><b><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u></b></p> </td> <td style="width: 33%; vertical-align: top;"> <p><b>d Type of connection</b><br/>2 = radial cable, 1 m [3.28'] PVC<br/>B = radial cable, special length PVC *)<br/>E = tangential cable, 1 m [3.28'] PVC<br/>F = tangential cable, special length PVC *)<br/><b><u>4 = radial M23 connector, 12 pin</u></b></p> <p>*) Available special lengths (connection types B, F):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.5883FS3.B44B.G322.0030 (for cable length 3 m)</p> <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/><b><u>G = SSI, gray</u></b></p> </td> <td style="width: 33%; vertical-align: top;"> <p><b>f Resolution <sup>1)</sup></b><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/><b><u>3 = 13 bit ST + 12 bit MT</u></b><br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> <p><b>g Input / output <sup>1)</sup></b><br/><b><u>2 = SET, DIR input</u></b></p> <p><b>h Options (service)</b><br/>1 = no option<br/><b><u>2 = status LED</u></b><br/>3 = SET button and status LED</p> <p style="font-size: 8px; margin-top: 10px;"><i>Optional on request</i><br/>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br/>- other singleturn resolutions</p> </td> </tr> </table> | <p><b>a Flange</b><br/>9 = with torque stop, flexible, IP65<br/>A = with torque stop set, rigid, IP65<br/><b><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u></b></p> <p><b>b Through hollow shaft</b><br/>3 = ø 10 mm [0.39"]<br/><b><u>4 = ø 12 mm [0.47"]</u></b><br/>5 = ø 14 mm [0.55"]<br/><i>Tapered shaft</i><br/>K = ø 10 mm [0.39"]</p> <p><b>c Interface / power supply</b><br/>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/><b><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u></b></p> | <p><b>d Type of connection</b><br/>2 = radial cable, 1 m [3.28'] PVC<br/>B = radial cable, special length PVC *)<br/>E = tangential cable, 1 m [3.28'] PVC<br/>F = tangential cable, special length PVC *)<br/><b><u>4 = radial M23 connector, 12 pin</u></b></p> <p>*) Available special lengths (connection types B, F):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.5883FS3.B44B.G322.0030 (for cable length 3 m)</p> <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/><b><u>G = SSI, gray</u></b></p> | <p><b>f Resolution <sup>1)</sup></b><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/><b><u>3 = 13 bit ST + 12 bit MT</u></b><br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> <p><b>g Input / output <sup>1)</sup></b><br/><b><u>2 = SET, DIR input</u></b></p> <p><b>h Options (service)</b><br/>1 = no option<br/><b><u>2 = status LED</u></b><br/>3 = SET button and status LED</p> <p style="font-size: 8px; margin-top: 10px;"><i>Optional on request</i><br/>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br/>- other singleturn resolutions</p> |
| X  | X  | X   | X | . | X | X | 2 | X |   |   |   |   |   |   |   |  |   |   |   |   |   |  |  |  |
| a  | b  | c   | d |   | e | f | g | h |   |   |   |   |   |   |   |  |   |   |   |   |   |  |  |  |
| <p><b>a Flange</b><br/>9 = with torque stop, flexible, IP65<br/>A = with torque stop set, rigid, IP65<br/><b><u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u></b></p> <p><b>b Through hollow shaft</b><br/>3 = ø 10 mm [0.39"]<br/><b><u>4 = ø 12 mm [0.47"]</u></b><br/>5 = ø 14 mm [0.55"]<br/><i>Tapered shaft</i><br/>K = ø 10 mm [0.39"]</p> <p><b>c Interface / power supply</b><br/>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/><b><u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u></b></p> | <p><b>d Type of connection</b><br/>2 = radial cable, 1 m [3.28'] PVC<br/>B = radial cable, special length PVC *)<br/>E = tangential cable, 1 m [3.28'] PVC<br/>F = tangential cable, special length PVC *)<br/><b><u>4 = radial M23 connector, 12 pin</u></b></p> <p>*) Available special lengths (connection types B, F):<br/>2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.5883FS3.B44B.G322.0030 (for cable length 3 m)</p> <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/><b><u>G = SSI, gray</u></b></p> | <p><b>f Resolution <sup>1)</sup></b><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/><b><u>3 = 13 bit ST + 12 bit MT</u></b><br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> <p><b>g Input / output <sup>1)</sup></b><br/><b><u>2 = SET, DIR input</u></b></p> <p><b>h Options (service)</b><br/>1 = no option<br/><b><u>2 = status LED</u></b><br/>3 = SET button and status LED</p> <p style="font-size: 8px; margin-top: 10px;"><i>Optional on request</i><br/>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br/>- other singleturn resolutions</p>  |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |  |  |  |

| Accessories                                      | Order no.   |
|--|---|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting<br><b>8.0000.4G06.0000</b>  |
| <b>Screw retention</b>                           | Loctite 243, 5 ml<br><b>8.0000.4G05.0000</b>  |
| <b>Bellows coupling, safety-oriented</b>         | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |
| <b>Safety modules Safety-M compact / modular</b> | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |
| <b>LED SSI display 570 / 575</b>                 | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

| Connection technology                      | Order no.   |
|--|---|
| <b>Cordset, pre-assembled</b>              | M23 female connector with coupling nut, 12-pin single-ended,<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6901.0002.0031</b><br>M23 female connector with coupling nut, 12-pin<br>M23 male connector with external thread, 12-pin<br>2 m [6.56'] PVC cable <sup>3)</sup><br><b>8.0000.6905.0002.0032</b> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin<br><b>8.0000.5012.0000</b>   |

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Resolution, preset value and count direction are factory-programmable.  
 2) For the cable connection type, cable material PUR.  
 3) Other lengths available.



# Absolute encoders – multiturn

|   |  |                          |
|---|--|--------------------------|
| <b>Standard</b><br>SIL3/PLe, mech. multiturn, optical | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|--|--------------------------|

## Technical data

**Notes regarding "Functional Safety"**

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

| Safety characteristics                    |   |
|---|---|
| <b>Classification</b>                     | PLe / SIL3  |
| <b>System structure</b>                   | 2 channel (Cat. 4)  |
| <b>PFH<sub>d</sub> value<sup>1)</sup></b> | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>                           |
| <b>Mission time / Proof test interval</b> | 20 years  |
| <b>Relevant standards</b>                 | EN ISO 13849-1:2008;<br>EN ISO 13849-2:2013;<br>EN 61800-5-2:2007 |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5 V DC (±5 %) or 10 ... 30 V DC   |
| <b>Current consumption</b><br>(no load)                | 5 V DC max. 80 mA<br>10 ... 30 V DC max. 50 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Short circuit proof outputs</b>                     | yes <sup>2)</sup>   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed shaft version</b>               | up to 70°C [158°F] 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous) |
| <b>Maximum speed hollow shaft version</b>        | up to 70°C [158°F] 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)<br>up to T <sub>max</sub> 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |
| <b>Starting torque - at 20°C [68°F]</b>          | shaft version < 0.01 Nm<br>hollow shaft version < 0.03 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version 7.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Insertion depth for shaft</b>                 | hollow shaft version min. 34 mm [1.34"]  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 0.45 kg [15.87 oz]   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -40°C ... +90°C [-40°F ... +194°F] <sup>3)</sup>   |
| <b>Material</b>                                  | shaft / hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast<br>cable PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B :2009 / A1:2010<br>EN 61000-6-3:2007 / A1:2011<br>EN 61000-6-2:2005 |

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit and 17 bit                                     |
| <b>Number of revolutions (multiturn)</b>  | 4096 (12 bit)  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. |  |

| BiSS interface   |  |
|--|--|
| <b>Resolution singleturn</b>   | 10 ... 14 bit and 17 bit                               |
| <b>Number of revolutions (multiturn)</b>   | 4096 (12 bit)  |
| <b>Code</b>  | binary   |
| <b>Clock rate</b>  | up to 10 MHz   |
| <b>Max. update rate</b>  | < 10 μs, depends on the clock rate and the data length |
| <b>Data refresh rate</b>   | ≤ 1 μs   |
| <b>Note:</b> <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |  |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>2)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

**LED**

The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.

If the LED is ON (status output LOW) this indicates:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or ageing
- Over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.  
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

# Absolute encoders – multiturn

|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

**SET input or SET button**

|                                  |   |
|----------------------------------|---|
| <b>Input</b>                     | HIGH active   |
| <b>Input type</b>                | comparator  |
| <b>Signal level</b>              | HIGH min: 60 % of +V, max: +V<br>LOW max: 25 % of +V (power supply) |
| <b>Input current</b>             | < 0.5 mA  |
| <b>Min. pulse duration (SET)</b> | 10 ms   |
| <b>Timeout after SET signal</b>  | 14 ms   |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

**DIR input**

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

|                                  |      |
|----------------------------------|------|
| <b>Reaction time (DIR input)</b> | 1 ms |
|----------------------------------|------|

**Power-ON**

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

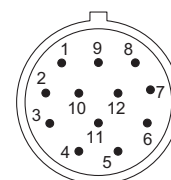
Hot plugging of the encoder should be avoided.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |    |           |       |           |         |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| 3, 4      | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU  | RD  | BK | VT        | GY-PK | RD-BU     | shield  |
| Interface | Type of connection | M23 connector, 12-pin   |     |    |    |    |    |    |     |     |    |           |       |           |         |
| 3, 4      | 3, 4               | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Pin:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9  | 10        | 11    | 12        | PH      |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- PH  $\perp$ : Plug connector housing (shield)

**Top view of mating side, male contact base**



M23 connector, 12-pin

# Absolute encoders – multiturn

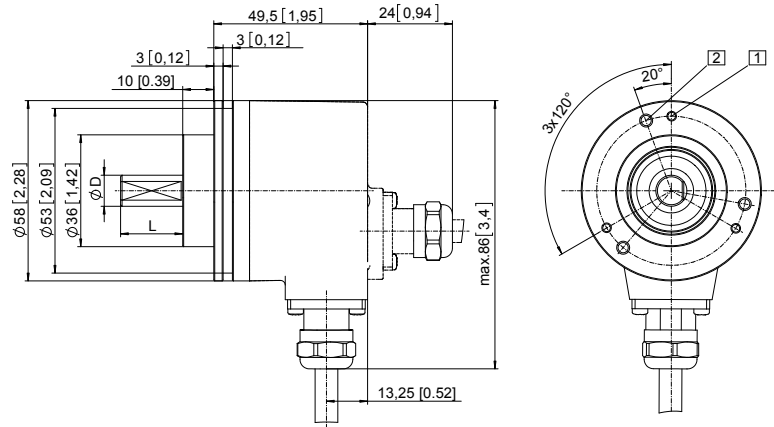
|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange,  $\varnothing$  58 [2.28]**  
**Flange type 1 with shaft type 2**  
 (drawing with cable)

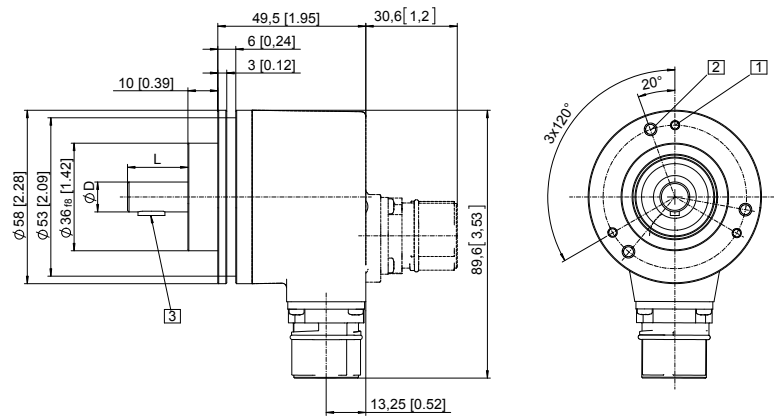
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

**Clamping flange,  $\varnothing$  58 [2.28]**  
**Flange type 1 with shaft type A**  
 (drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard**  
**SIL3/PLe, mech. multiturn, optical**

**Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)**

**SSI/BiSS + SinCos**

## Dimensions hollow shaft version

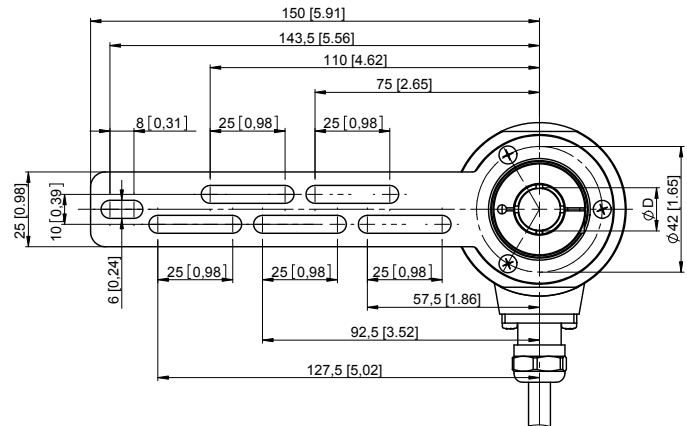
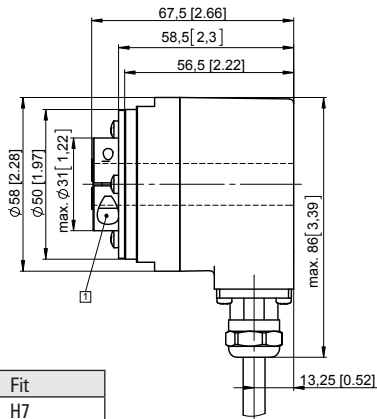
Dimensions in mm [inch]

### Flange with torque stop set, rigid

#### Flange type A

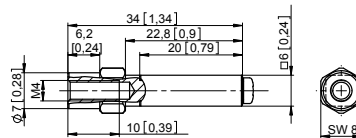
Through hollow shaft  
(drawing with cable)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

Torque pin with rectangular sleeve with M4 thread

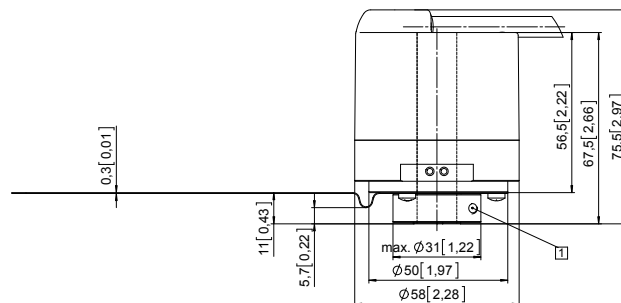
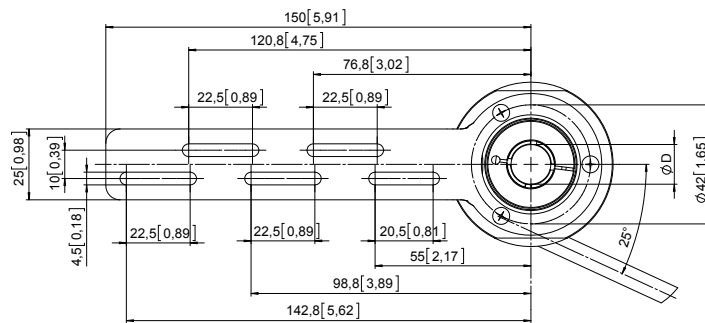


### Flange with torque stop, flexible

#### Flange type 9

Through hollow shaft  
(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

# Absolute encoders – multiturn

|  |  |                          |
|--|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, mech. multiturn, optical</b> | <b>Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|--|--------------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 63 [2.48]

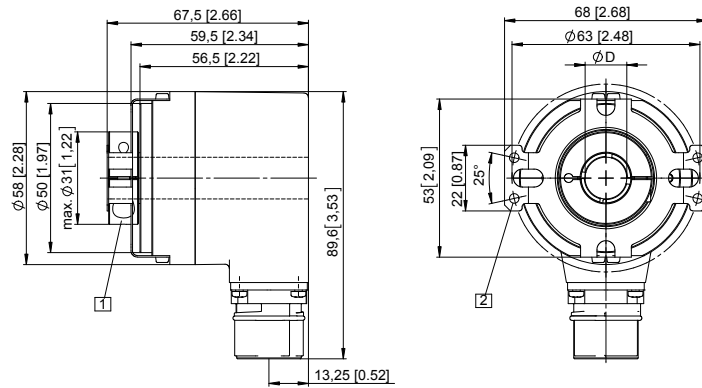
#### Flange type B

#### Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |

Absolute encoders  
multiturn

### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type B

#### Tapered shaft

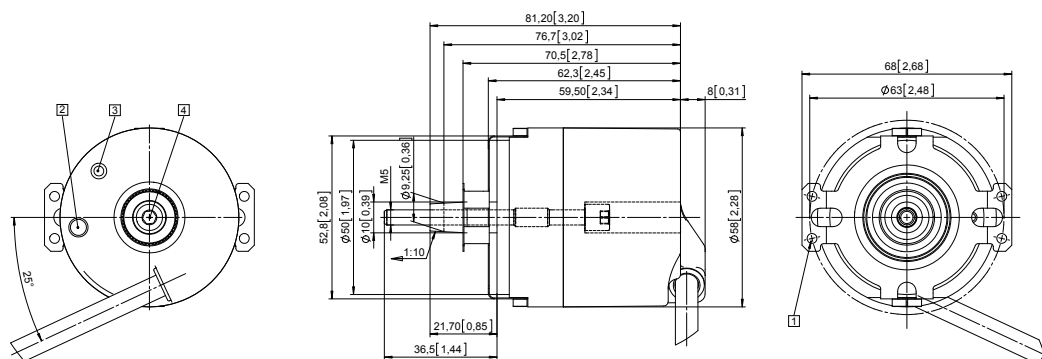
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4

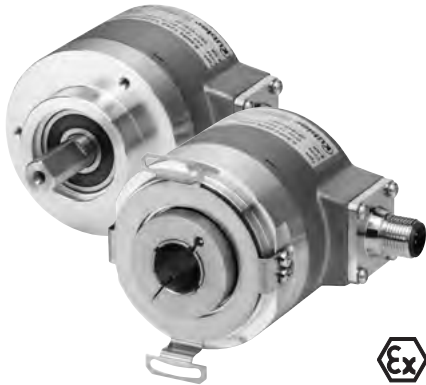


# Absolute encoders – multiturn

**Standard electronic multiturn, optical**

**Sendix F5868 / F5888 (shaft / hollow shaft)**

**CANopen**



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and CANopen functionalities according to up-to-date encoder profile.



**16 bit MT**  
Multiturn resolution



Safety-Lock™



High rotational speed



Temperature range  
-40...+80°C



High protection level  
IP67



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Intelligent Scan Technology™



Surface protection salt spray-tested optional

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.

## Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

## Order code Shaft version

**8.F5868** . **XX2X** . **212X**

Type      a   b   c   d      e      f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



### a Flange

- 1** = clamping flange, IP65 ø 58 mm [2.28"]  
3 = clamping flange, IP67 ø 58 mm [2.28"]  
**2** = synchro flange, IP65 ø 58 mm [2.28"]  
4 = synchro flange, IP67 ø 58 mm [2.28"]

### b Shaft (ø x L), with flat

- 1** = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>  
**2** = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>  
3 = 1/4" x 7/8"  
4 = 3/8" x 7/8"

### c Interface / power supply

- 2** = CANopen DS301 V4.02 / 10 ... 30 V DC

### d Type of connection

- A = radial cable, 2 m [6.56'] PVC  
B = radial cable, special length PVC \*)  
**E** = 1 x radial M12 connector, 5-pin  
F = 2 x radial M12 connector, 5-pin

\*) Available special lengths (connection type B):  
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.F5868.122B.2123.0030 (for cable length 3 m)

### e Fieldbus profile

- 21** = CANopen encoder profile DS406 V3.2

### f Options (service)

- 2 = no option  
**3** = SET button

### Optional on request

- Ex 2/22<sup>3)</sup>  
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.  
2) Preferred type only in conjunction with flange type 1.

3) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

|   |  |   |                     |  |
|---|--|---|---------------------|--|
| <b>Order code</b><br><b>Hollow shaft</b>  | <b>8.F5888</b><br>Type   | <b>.XX2X</b><br>a b c d   | <b>.212X</b><br>e f | <p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br/>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> |
| <p><b>a Flange</b></p> <p>1 = with spring element, long, IP65<br/>2 = with spring element, long, IP67<br/>3 = with stator coupling, IP65 ø 65 mm [2.56"]<br/>4 = with stator coupling, IP67 ø 65 mm [2.56"]<br/><u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u><br/>6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> <p><b>b Through hollow shaft</b></p> <p>3 = ø 10 mm [0.39"]<br/><u>4 = ø 12 mm [0.47"]</u><br/>5 = ø 14 mm [0.55"]<br/>6 = ø 15 mm [0.59"]</p> <p><i>Blind hollow shaft</i><br/>(insertion depth max. 30 mm [1.18"])<br/>B = ø 12 mm <sup>1)</sup></p> | <p><b>c Interface / power supply</b></p> <p><u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u></p> <p><b>d Type of connection</b></p> <p>L = tangential cable, 2 m [6.56'] PVC<br/>M = tangential cable, special length PVC *)<br/><u>E = 1 x radial M12 connector, 5-pin</u><br/>F = 2 x radial M12 connector, 5-pin <sup>2)</sup></p> <p>*) Available special lengths (connection type M):<br/>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br/>order code expansion .XXXX = length in dm<br/>ex.: 8.F5888.542M.2123.0030 (for cable length 3 m)</p> | <p><b>e Fieldbus profile</b></p> <p><u>21 = CANopen encoder profile DS406 V3.2</u></p> <p><b>f Options (service)</b></p> <p>2 = no option<br/><u>3 = SET button</u></p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Ex 2/22 <sup>3)</sup> (not for type of connection L, M)</li> <li>- surface protection salt spray tested</li> </ul> |                     |  |

| Mounting accessory for shaft encoders   |   | Order no.                   |
|---|---|-----------------------------|
| <b>Coupling</b>   | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                             | <b>8.0000.1102.0606</b>     |
|   | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                            | <b>8.0000.1102.1010</b>     |
| Mounting accessory for hollow shaft encoders  |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread  | <b>8.0010.4700.0000</b>     |
|   |   |                             |
| Connection technology   |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut for bus in, 5-pin<br>2 m [6.56'] PVC cable   | <b>05.00.6091.A211.002M</b> |
|   | M12 male connector with external thread for bus out, 5-pin<br>2 m [6.56'] PVC cable | <b>05.00.6091.A411.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut for bus in, 5-pin                            | <b>8.0000.5116.0000</b>     |
|   | M12 male connector with external thread for bus out, 5-pin                          | <b>8.0000.5111.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Can be combined only with type of connection F.  
2) Can be combined only with blind hollow shaft ø12 mm [0.47"].

3) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

## Technical data

| Mechanical characteristics                       |  |  |
|--|--|--|
| <b>Maximum speed shaft version</b>               |  |  |
| IP65 up to 70°C                                  | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous) |  |
| IP65 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C                                  | 11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)  |  |
| IP67 up to T <sub>max</sub>                      | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)   |  |
| <b>Maximum speed hollow shaft version</b>        |  |  |
| IP65 up to 70°C                                  | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)   |  |
| IP65 up to T <sub>max</sub>                      | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to 70°C                                  | 8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)   |  |
| IP67 up to T <sub>max</sub>                      | 4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)   |  |
| <b>Starting torque at 20°C [68°F]</b>            | IP65   | < 0.01 Nm  |
|  | IP67   | < 0.05 Nm  |
| <b>Load capacity of shaft</b>                    | radial   | 80 N   |
|  | axial  | 40 N   |
| <b>Mass moment of inertia</b>                    | shaft version  | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>          |
|  | hollow shaft version   | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>          |
| <b>Weight</b>                                    |  | approx. 0.45 kg [15.87 oz]                       |
| <b>Protection acc. to EN 60529</b>               | housing side   | IP67   |
|  | shaft side   | IP65, opt. IP67                                  |
| <b>Working temperature range</b>                 |  | -40°C ... +80°C [-40°F ... +176°F] <sup>1)</sup> |
| <b>Material</b>                                  | shaft/hollow shaft   | stainless steel                                  |
|  | flange   | aluminum   |
|  | housing  | zinc die-cast                                    |
|  | cable  | PVC (PUR for Ex 2/22)                            |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  | 2500 m/s <sup>2</sup> , 6 ms                     |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz            |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 80 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Diagnostic LED (two-color, red/green) |                         |                |
|---------------------------------------|-------------------------|----------------|
| <b>LED ON or blinking</b>             | red                     | error display  |
|                                       | green                   | status display |
|                                       | combination red / green | error code     |

| Interface characteristics CANopen        |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)   |
| <b>Number of revolutions (multiturn)</b> | max. 65536 (16 bit)<br>scalable only via the total resolution  |
| <b>Total resolution</b>                  | 1 ... 4.294.967.296 (32 bit)<br>default: 25 bit  |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B   |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2 with<br>manufacturer-specific add-ons,<br>LSS-service DS305 V2.0  |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>                      | 1 ... 127<br>software configurable   |
| <b>Termination switchable</b>            | software configurable  |
| <b>LSS protocol</b>                      | CIA LSS protocol DS305, global<br>command support for node address<br>and baud rate, selective commands<br>via attributes of the identity object |

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].



# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, temperature** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

## Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

## CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

## LSS layer setting services DS305 V2.0

- Global support of node-ID and baud rate
- Selective protocol via identity object (1018h)

Absolute encoders  
multiturn

## Terminal assignment

| Interface | Type of connection | Function | Cable (Bus terminal cover with terminal box) |                     |                    |       |       |         |  |
|-----------|--------------------|----------|--|---------------------|--------------------|-------|-------|---------|--|
| 2         | A, B, L, M         | Bus IN   | Signal:                                      | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |  |
|           |                    |          | Abbreviation:                                | 0 V                 | +V                 | CL    | CH    | CG      |  |
|           |                    |          | Cable color:                                 | WH                  | BN                 | YE    | GN    | GY      |  |
| Interface | Type of connection | Function | 2 x M12 connector, 5-pin                     |                     |                    |       |       |         |  |
| 2         | F                  | Bus IN   | Signal:                                      | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |  |
|           |                    |          | Abbreviation:                                | 0 V                 | +V                 | CL    | CH    | CG      |  |
|           |                    |          | Pin:   | 3                   | 2                  | 5     | 4     | 1       |  |
|           |                    | Bus OUT  | Signal:                                      | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |  |
|           |                    |          | Abbreviation:                                | CG                  | CL                 | CH    | 0 V   | +V      |  |
|           |                    |          | Pin:   | 3                   | 2                  | 5     | 4     | 1       |  |
| Interface | Type of connection | Function | 1 x M12 connector, 5-pin                     |                     |                    |       |       |         |  |
| 2         | E                  | Bus IN   | Signal:                                      | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |  |
|           |                    |          | Abbreviation:                                | 0 V                 | +V                 | CL    | CH    | CG      |  |
|           |                    |          | Pin:   | 3                   | 2                  | 5     | 4     | 1       |  |

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard<br/>electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

## Dimensions shaft version

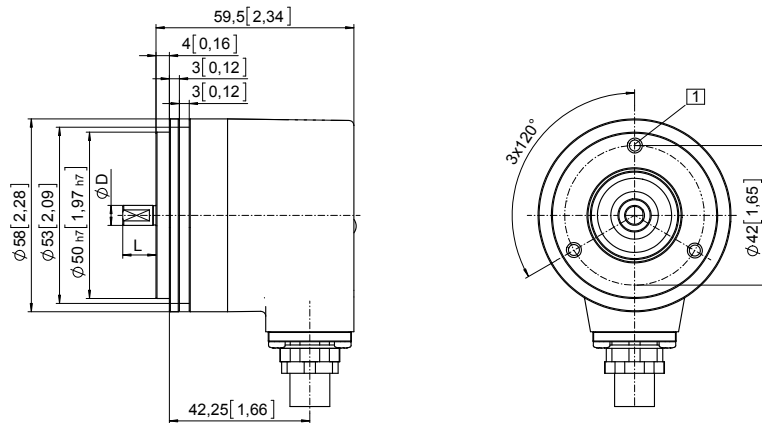
Dimensions in mm [inch]

### Synchro flange, ø 58 [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

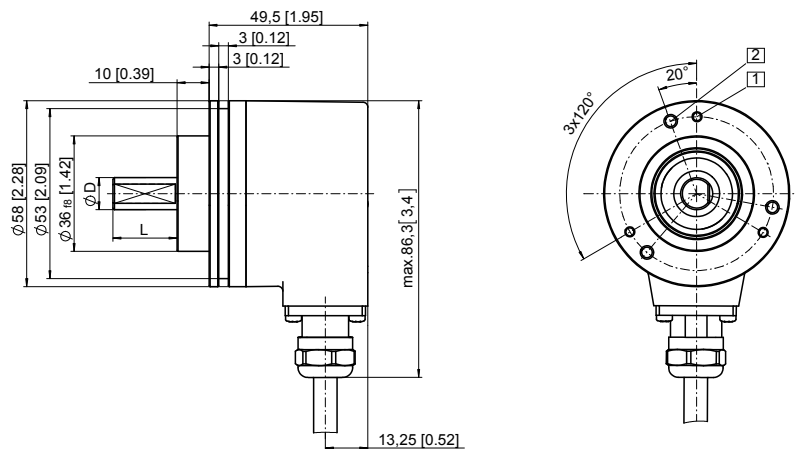
### Clamping flange, ø 58 [2.28]

#### Flange type 1 and 3

(drawing with cable)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

## Dimensions hollow shaft version

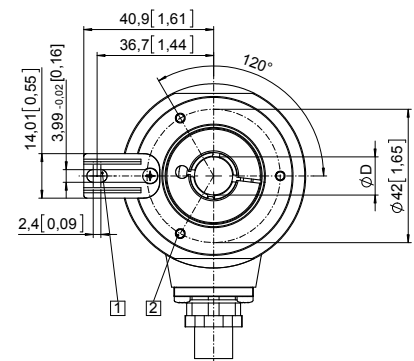
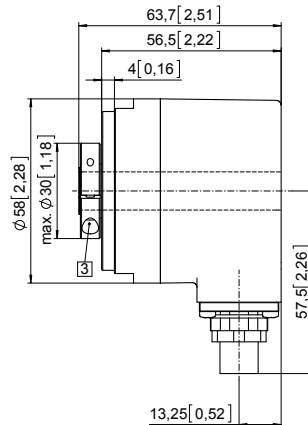
Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2 (drawing with cable)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47] *) | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59]    | H7  |

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



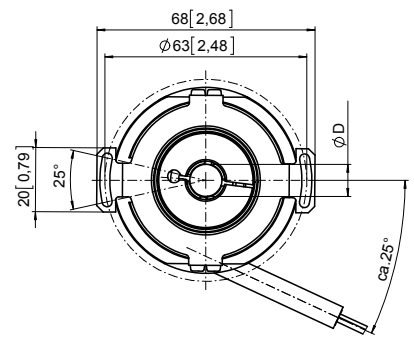
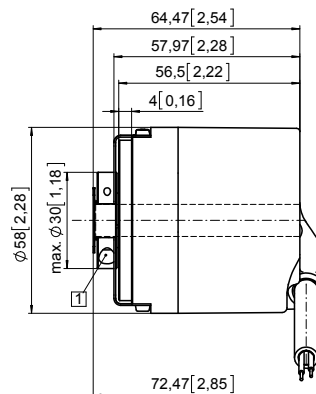
### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]  
(drawing with tangential cable)

- 1 Recommended torque for the clamping ring 0.6 Nm

| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47] *) | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59]    | H7  |

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



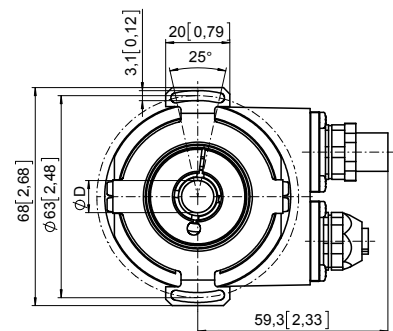
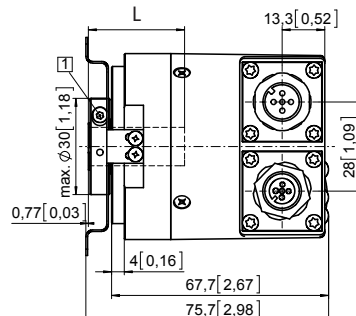
### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]  
(drawing with 2 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

| D            | Fit |
|--------------|-----|
| 10 [0.39]    | H7  |
| 12 [0.47] *) | H7  |
| 14 [0.55]    | H7  |
| 15 [0.59]    | H7  |

\*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
electronic multiturn, optical**

**Sendix F5868 / F5888 (shaft / hollow shaft)**

**EtherNet/IP**

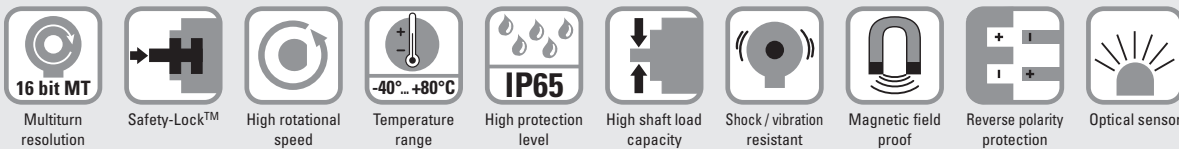


The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.



**EtherNet/IP™**



## Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.

**Order code** 8.F5868 . XXAN . A2 2 2  
**Shaft version** Type a b c d e

**a Flange**

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]

**b Shaft (ø x L), with flat**

- 1 = 6 x 10 mm [0.24 x 0.39"]
- 2 = 10 x 20 mm [0.39 x 0.79"]
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

**c Interface / Power supply**

A = EtherNet IP / 10 ... 30 V DC

**e Fieldbus profile**

A2= EtherNet/IP

**d Type of connection**

N = 3 x axial M12 connector, 4-pin

Optional on request

- Ex 2/22

**Order code** 8.F5888 . XXAN . A2 2 2  
**Hollow shaft** Type a b c d e

**a Flange**

- 1 = with spring element long, IP65
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]

**b Blind hollow shaft**

(insertion depth max. 30 mm [1.18"])

- A = ø 10 mm [0.39"]
- B = ø 12 mm [0.47"]
- C = ø 14 mm [0.55"]
- D = ø 15 mm [0.59"]
- E = ø 3/8"
- F = ø 1/2"

**c Interface / Power supply**

A = EtherNet IP / 10 ... 30 V DC

**e Fieldbus profile**

A2= EtherNet/IP

**d Type of connection**

N = 3 x axial M12 connector, 4-pin

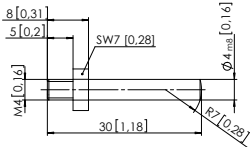
Optional on request

- Ex 2/22

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|---|--|--------------------|

| Mounting accessory for shaft encoders |  | Order no.               |
|---------------------------------------|--|-------------------------|
| <b>Coupling</b>                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders                                      |                    | Dimensions in mm [inch]   | Order no.               |
|---|--------------------|---|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1) | with fixing thread |  | <b>8.0010.4700.0000</b> |

| Connection technology                      |   | Order no.                   |
|--|---|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 male connector with external thread for port 1 and port 2, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6031.4411.002M</b> |
|  | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable       | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 male connector with external thread for port 1 and port 2, 4-pin                          | <b>05.WASCSY4S</b>          |
|  | M12 female connector with coupling nut for power supply, 4-pin                                | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                    |                             |  |
|---|-----------------------------|--|
| <b>Max. speed shaft version</b>               | IP65 up to 70°C             | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|   | IP65 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
| <b>Max. speed hollow shaft version</b>        | IP65 up to 70°C             | 6000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|   | IP65 up to T <sub>max</sub> | 4000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque</b> at 20°C [68°F]         |                             | < 0.01 Nm  |
| <b>Moment of inertia</b>                      | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|   | hollow shaft version        | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                 | radial                      | 80 N   |
|   | axial                       | 40 N   |
| <b>Weight</b>                                 |                             | approx. 0.45 kg  |
| <b>Protection</b> acc. to EN 60529            |                             | IP65   |
| <b>Working temperature range</b>              |                             | -40°C ... +80°C [-40°F ... +176°F]                           |
| <b>Material</b>                               | shaft/hollow shaft          | stainless steel  |
|   | flange                      | aluminum   |
|   | housing                     | aluminum   |
| <b>Shock resistance</b> acc. EN 60068-2-27    |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance</b> acc. EN 60068-2-6 |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |

| Electrical characteristics                                  |   |
|---|---|
| <b>Power supply</b>   | 10 ... 30 V DC  |
| <b>Power consumption</b> (no load)                          | max. 250 mA   |
| <b>Reverse polarity protection of the power supply (+V)</b> | yes   |
| <b>UL approval</b>  | File 224618   |
| <b>CE compliant</b> acc. to                                 | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics EtherNet/IP |  |
|---------------------------------------|--|
| <b>Singleturn resolution</b>          | 1 ... 65.536 (16 bit), scalable<br>default: 65.536 (16 bit)    |
| <b>Multiturn resolution</b>           | max. 65.536 (16 bit)<br>scalable only via the total resolution |
| <b>Total resolution</b>               | 1 ... 4.294.967.296 (32 bit), scalable                         |
| <b>Code</b>                           | binary   |
| <b>Protocol</b>                       | EtherNet/IP  |

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|---|--|--------------------|

## General information about EtherNet/IP

EtherNet/IP conformance tested acc. to version CT-12 of 11. Dez. 2014  
 EtherNet/IP specification Vol 2, Ed 1.17  
 CIP specification Vol 1, Ed 3.16

## The following functionalities are integrated

### Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Number of revolutions
- Position
- Diagnosis
- Position limit
- Warning messages

### Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Parameter Object
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

### EtherNet/IP features

- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

## Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

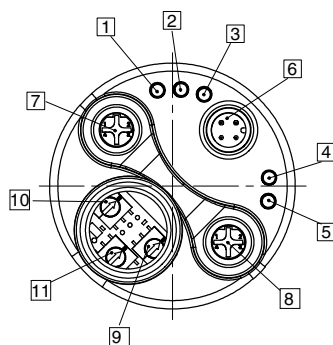
The universal scaling function remedies this problem.

## Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                | Diagram |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|---------|
|           |                          |              | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
| A         | N<br>(3 x M12 connector) | Bus Port 1   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Power supply | Signal:              | Voltage +      | –             | Voltage –       | –              |         |
|           |                          |              | Abbreviation:        | + V            | –             | 0 V             | –              |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Bus Port 2   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |

## Rear side connections and display elements

- 1 LED: Link 1
- 2 LED: Mod.
- 3 LED: Net.
- 4 LED: Encoder
- 5 LED: Link 2
- 6 Power
- 7 Port 1
- 8 Port 2
- 9 Switch: x1
- 10 Switch: x100
- 11 Switch: x10



# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>EtherNet/IP</b> |
|---|--|--------------------|

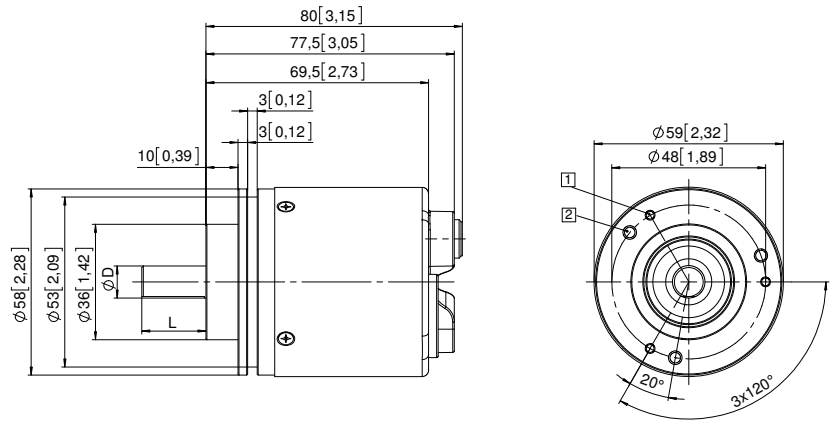
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28] Flange type 1

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

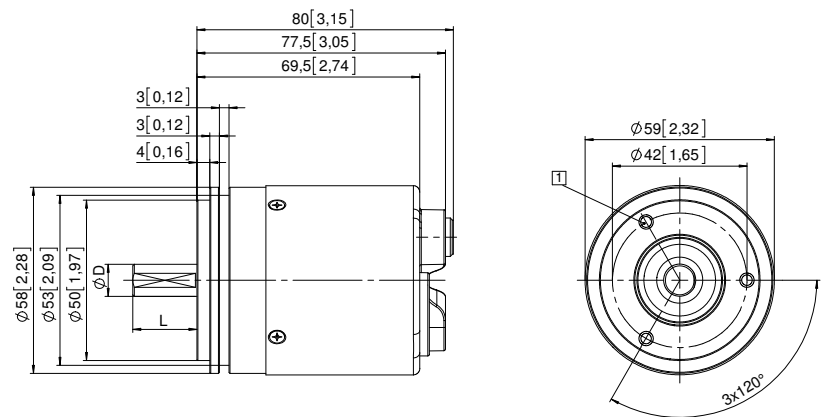
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



### Synchro flange, $\varnothing$ 58 [2.28] Flange type 2

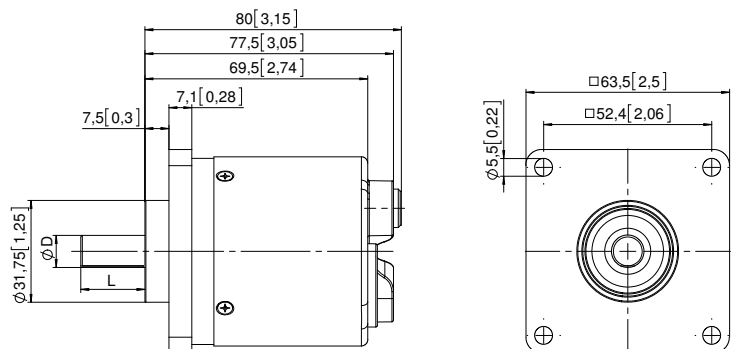
- 1 3 x M3, 6 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



### Square flange, $\square$ 63.5 [2.5] Flange type 5

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
electronic multiturn, optical**

**Sendix F5868 / F5888 (shaft / hollow shaft)**

**EtherNet/IP**

## Dimensions hollow shaft version

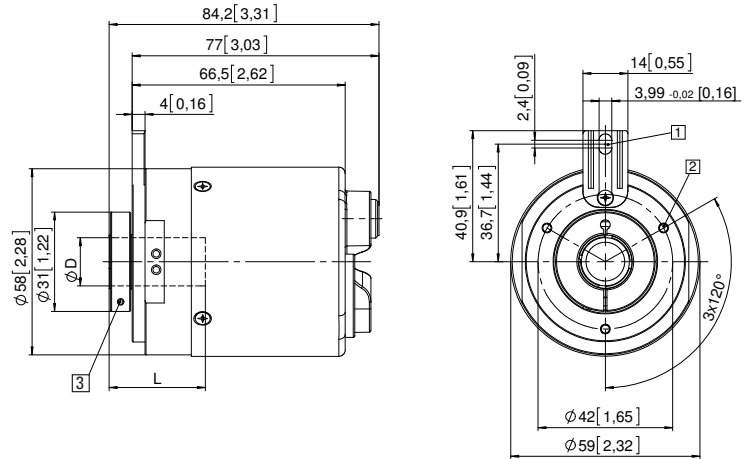
Dimensions in mm [inch]

### Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

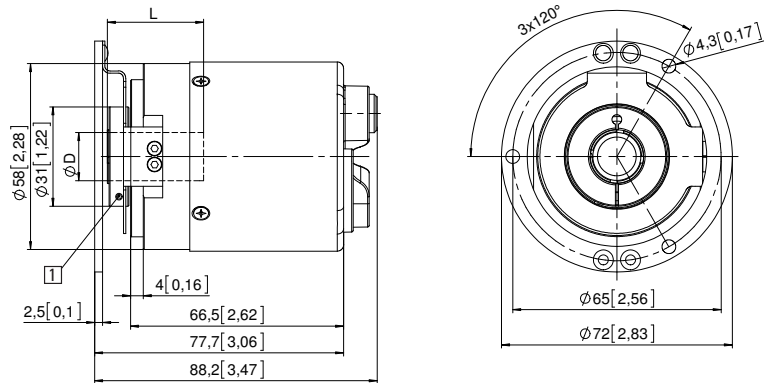


### Flange with stator coupling, $\varnothing$ 65 [2.56] Flange type 3

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

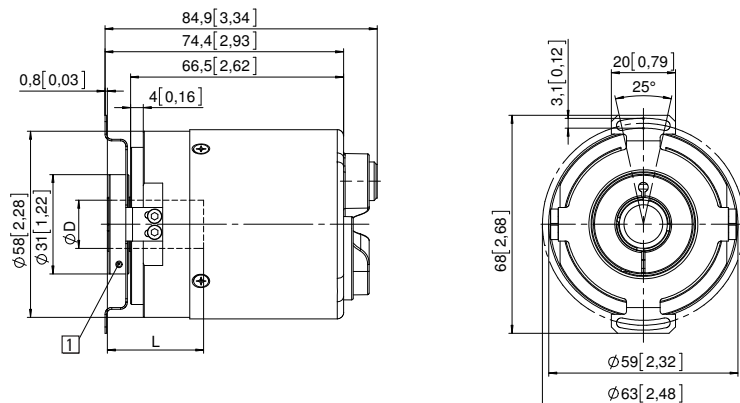


### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type 5

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

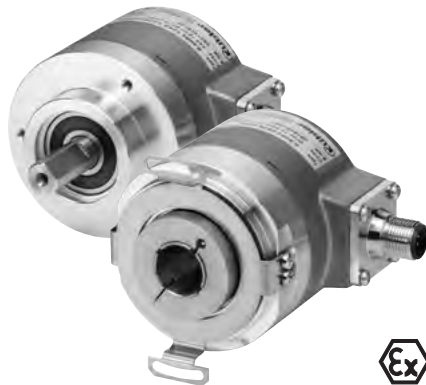
L = insertion depth max. blind hollow shaft





# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>Modbus</b> |
|---|--|---------------|



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and Modbus RTU interface.



|                                   |              |                       |                                   |                       |                          |                             |                      |                             |                              |   |
|-----------------------------------|--------------|-----------------------|-----------------------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|------------------------------|---|
| 16 bit MT<br>Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range<br>-40°...+80°C | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray tested optional |
|-----------------------------------|--------------|-----------------------|-----------------------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|------------------------------|---|

### Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100 % magnetic field insensitivity.

### Current Modbus performance

- Modbus register for configuration of the node address and baud rate.
- Scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).
- Preset function.
- Diagnostic functions.
- Limit switch function.

Absolute encoders multiturn

|  |   |   |   |   |   |   |   |
|--|---|---|---|---|---|---|---|
| <b>Order code</b>  | <b>8.F5868</b>  | <b>.XX6E.6112</b>   |   |   |   |   |   |
| <b>Shaft version</b>   | Type  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; font-size: 8px;">a</td> <td style="text-align: center; font-size: 8px;">b</td> <td style="text-align: center; font-size: 8px;">c</td> <td style="text-align: center; font-size: 8px;">d</td> <td style="text-align: center; font-size: 8px;">e</td> </tr> </table> | a | b | c | d | e |
| a  | b   | c   | d | e |   |   |   |
| <p><b>a Flange</b></p> <p>1 = clamping flange, IP65 ø 58 mm [2.28"]</p> <p>3 = clamping flange, IP67 ø 58 mm [2.28"]</p> <p>2 = synchro flange, IP65 ø 58 mm [2.28"]</p> <p>4 = synchro flange, IP67 ø 58 mm [2.28"]</p> | <p><b>b Shaft (ø x L), with flat</b></p> <p>1 = 6 x 10 mm [0.24 x 0.39"]</p> <p>2 = 10 x 20 mm [0.39 x 0.79"]</p> <p>3 = 1/4" x 7/8"</p> <p>4 = 3/8" x 7/8"</p> | <p><b>d Type of connection</b></p> <p>E = 1 x radial M12 connector, 5-pin</p> <p><b>e Fieldbus profile</b></p> <p>61 = Modbus RTU Application Protocol V1.1b3</p> <p style="margin-top: 10px;"><i>Optional on request</i></p> <p>- Ex 2/22</p> <p>- surface protection salt spray tested</p>  |   |   |   |   |   |
| <p><b>c Interface / power supply</b></p> <p>6 = Modbus RTU, 10 ... 30 V DC</p>   |   |   |   |   |   |   |   |

|  |  |   |   |   |   |   |   |
|--|--|---|---|---|---|---|---|
| <b>Order code</b>  | <b>8.F5888</b>   | <b>.XX6E.6112</b>   |   |   |   |   |   |
| <b>Hollow shaft</b>  | Type   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; font-size: 8px;">a</td> <td style="text-align: center; font-size: 8px;">b</td> <td style="text-align: center; font-size: 8px;">c</td> <td style="text-align: center; font-size: 8px;">d</td> <td style="text-align: center; font-size: 8px;">e</td> </tr> </table> | a | b | c | d | e |
| a  | b  | c   | d | e |   |   |   |
| <p><b>a Flange</b></p> <p>1 = with spring element, long, IP65</p> <p>2 = with spring element, long, IP67</p> <p>3 = with stator coupling, IP65 ø 65 mm [2.56"]</p> <p>4 = with stator coupling, IP67 ø 65 mm [2.56"]</p> <p>5 = with stator coupling, IP65 ø 63 mm [2.48"]</p> <p>6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> | <p><b>b Through hollow shaft</b></p> <p>3 = ø 10 mm [0.39"]</p> <p>4 = ø 12 mm [0.47"]</p> <p>5 = ø 14 mm [0.55"]</p> <p>6 = ø 15 mm [0.59"]</p> | <p><b>d Type of connection</b></p> <p>E = 1 x radial M12 connector, 5-pin</p> <p><b>e Fieldbus profile</b></p> <p>61 = Modbus RTU Application Protocol V1.1b3</p> <p style="margin-top: 10px;"><i>Optional on request</i></p> <p>- Ex 2/22</p> <p>- surface protection salt spray tested</p>  |   |   |   |   |   |
| <p><b>c Interface / power supply</b></p> <p>6 = Modbus RTU, 10 ... 30 V DC</p>   |  |   |   |   |   |   |   |

# Absolute encoders – multiturn

|   |   |                             |
|---|---|-----------------------------|
| <b>Standard electronic multiturn, optical</b>   | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b>                            | <b>Modbus</b>               |
| <b>Mounting accessory for shaft encoders</b>  |   | Order no.                   |
| <b>Coupling</b>   | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                       | <b>8.0000.1102.0606</b>     |
|   | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                      | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>                                   |   | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]   |                             |
|   | with fixing thread<br>  | <b>8.0010.4700.0000</b>     |
| <b>Connection technology</b>  |   | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling for bus in, 5-pin<br>2 m [6.56'] PVC cable | <b>05.00.6091.A211.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling for bus in, 5-pin                          | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |   |
|--|---|
| <b>Mechanical characteristics</b>                      |   |
| <b>Maximum speed shaft version</b>                     |   |
| IP65 up to 70°C  | 12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)  |
| IP65 up to T <sub>max</sub>                            | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)  |
| IP67 up to 70°C  | 11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)   |
| IP67 up to T <sub>max</sub>                            | 8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)  |
| <b>Maximum speed hollow shaft version</b>              |   |
| IP65 up to 70°C  | 9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)  |
| IP65 up to T <sub>max</sub>                            | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)  |
| IP67 up to 70°C  | 8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)  |
| IP67 up to T <sub>max</sub>                            | 4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque</b><br>at 20°C [68°F]               | IP65 < 0.01 Nm<br>IP67 < 0.05 Nm  |
| <b>Mass moment of inertia</b>                          | shaft version 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup><br>hollow shaft version 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup> |
| <b>Load capacity of shaft</b>                          | radial 80 N<br>axial 40 N   |
| <b>Weight</b>  | approx. 0.45 kg [15.87 oz]  |
| <b>Protection acc. to EN 60529</b>                     |   |
| housing side   | IP67  |
| shaft side   | IP65, opt. IP67   |
| <b>Working temperature range</b>                       |   |
|  | -40°C ... +80°C [-40°F ... +176°F]  |
| <b>Material</b>  | shaft/hollow shaft stainless steel<br>flange aluminum<br>housing zinc die-cast  |
| <b>Shock resistance acc. to EN 60068-2-27</b>          |   |
|  | 2500 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b>       |   |
|  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz   |
| <b>Electrical characteristics</b>                      |   |
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 80 mA  |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |
| <b>Diagnostic LED (two-color, red/green)</b>           |   |
| <b>LED ON or blinking</b>                              | red error display<br>green status display<br>combination red / green error code                                       |
| <b>Interface characteristics Modbus</b>                |   |
| <b>Resolution singleturn</b>                           | 1 ... 65536 (16 bit), scalable<br>default: 65536 (16 bit)   |
| <b>Number of revolutions (multiturn)</b>               | max. 65536 (16 bit)<br>scalable only via the total resolution   |
| <b>Total resolution</b>                                | 1 ... 4.294.967.296 (32 bit), scalable  |
| <b>Code</b>  | binary  |
| <b>Interface</b>                                       | Modbus V1.02  |
| <b>Protocol</b>  | Modbus RTU V1.1b3   |
| <b>Baud rate</b>                                       | 9600 ... 115200 kbit/s<br>software configurable   |
| <b>Node address</b>                                    | 1 ... 63<br>software configurable   |
| <b>Termination</b>                                     | software configurable   |

# Absolute encoders – multiturn

|   |  |               |
|---|--|---------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>Modbus</b> |
|---|--|---------------|

### Read holding register

| Register | Data name                                      |
|----------|--|
| 40257    | Baud rate<br>Number Data<br>Parity<br>Stopbits |
| 40261    | Comm Update                                    |
| 40262    | Node Address                                   |
| 40263    | Node Update                                    |
| 40264    | Presetvalue                                    |
| 40266    | Preset Update                                  |
| 40267    | Count Direct                                   |
| 40268    | Count Update                                   |
| 40269    | Termination                                    |
| 40270    | Term Update                                    |

### Write holding register

| Register | Data name        |
|----------|------------------|
| 40275    | Lower Limit      |
| 40276    | Upper Limit      |
| 40277    | Compare Activ    |
| 40278    | MUR (MSB)        |
| 40279    | MUR (LSB)        |
| 40280    | TMR (MSB)        |
| 40281    | TMR (LSB)        |
| 40282    | Scaling Function |
| 40283    | Delay Prescaler  |

### Modbus Communication Profile V 1.02

- Node address, baud rate and bus termination programmable.

### Modbus Application Protocol V1.1b3

The following parameters can be programmed:

- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- "Watchdog controlled" device.
- Extended diagnostic modes.

### Terminal assignment

| Interface | Type of connection | 1 x M12 connector, 5-pin |                     |                    |    |    |  |    |
|-----------|--------------------|--------------------------|---------------------|--------------------|----|----|--|----|
| 6         | E<br>Bus in        | Signal:                  | 0 V<br>power supply | +V<br>power supply | D0 | D1 |  | TG |
|           |                    | Pin:                     | 3                   | 2                  | 5  | 4  |  | 1  |

 Absolute encoders  
multiturn

# Absolute encoders – multiturn

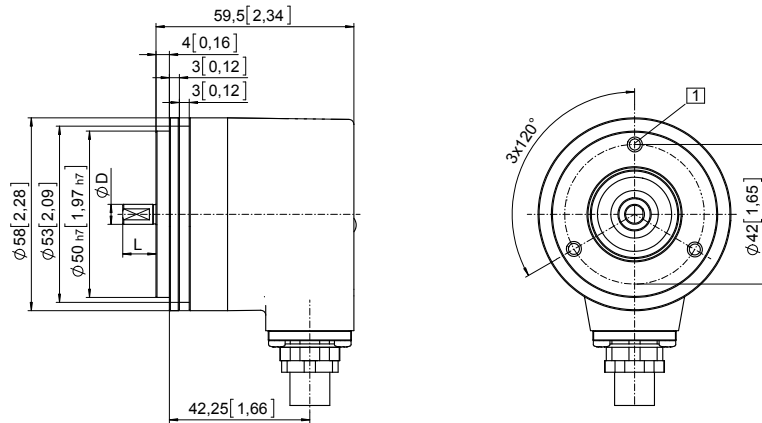
|   |  |               |
|---|--|---------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>Modbus</b> |
|---|--|---------------|

## Dimensions shaft version

Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 58 [2.28] Flange type 2 and 4

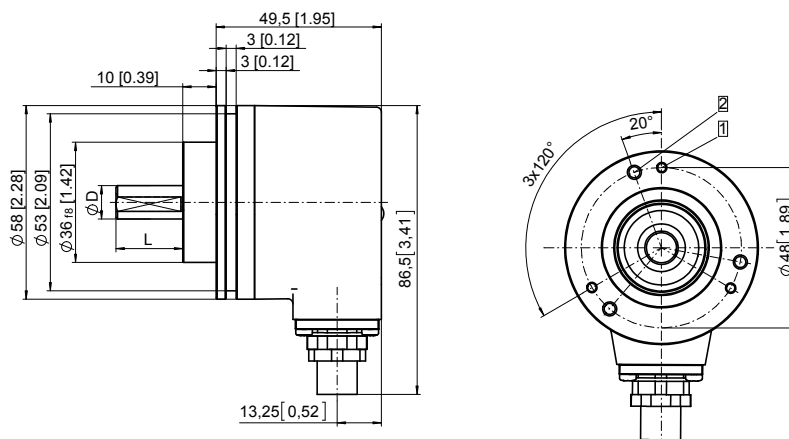
- 1 3 x M4, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Clamping flange, $\varnothing$ 58 [2.28] Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

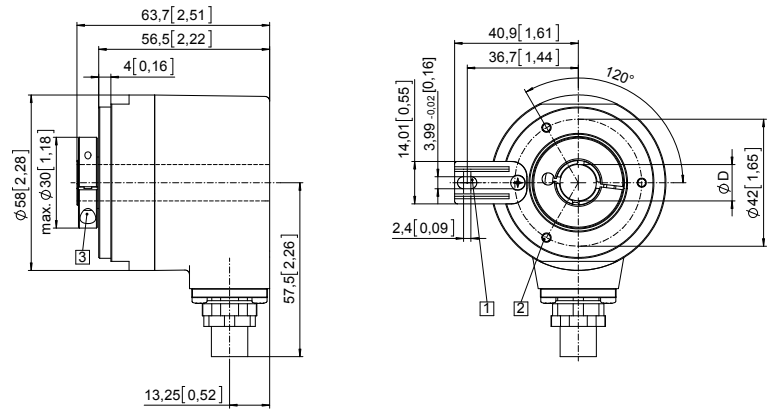
|   |  |               |
|---|--|---------------|
| <b>Standard electronic multiturn, optical</b> | <b>Sendix F5868 / F5888 (shaft / hollow shaft)</b> | <b>Modbus</b> |
|---|--|---------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

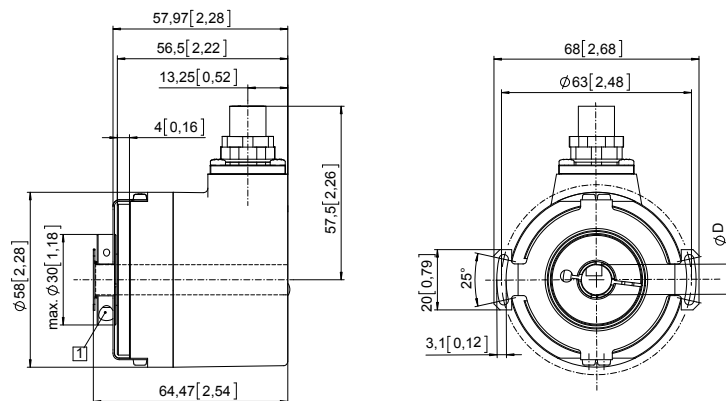
- 1 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |

### Flange with stator coupling, $\varnothing$ 63 [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit |
|-----------|-----|
| 10 [0.39] | H7  |
| 12 [0.47] | H7  |
| 14 [0.55] | H7  |
| 15 [0.59] | H7  |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**PROFIBUS DP**



The multiturn encoders Sendix 5868 and 5888 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

With a maximum resolution of 28 bits these encoders are available with blind hollow shaft up to 15 mm.



Mechanical drive



Safety-Lock™



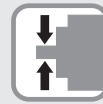
High rotational speed



Temperature range  
-40...+80°C



High protection level  
IP



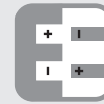
High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Surface protection salt spray-tested optional

## Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Absolutely reliable operation in areas with strong magnetic fields, thanks to mechanical gear with optical sensor technology.

## Flexible

- Fast, simple, error-free connection using versions with M12 connector.
- Wide-ranging programming options thanks to latest encoder profile.

### Order code Shaft version

**8.5868**  
Type

. X X 3 X . 31 1 X  
a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

#### b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>
- 2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

#### c Interface / power supply

- 3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC

#### d Type of connection, removable bus terminal cover

- 1 = with radial cable gland fitting
- 2 = with 3 x radial M12 connectors

#### e Fieldbus profile

- 31 = PROFIBUS DP V0 encoder profile class 2

#### f Options (service)

- 2 = no option
  - 3 = SET button
- Optional on request
- Ex 2/22
  - surface protection salt spray tested

### Order code Hollow shaft

**8.5888**  
Type

. X X 3 X . 31 1 X  
a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.  
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

#### b Blind hollow shaft (insertion depth max. 30 mm [1.18"])

- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

#### c Interface / power supply

- 3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC

#### d Type of connection, removable bus terminal cover

- 1 = with radial cable gland fitting
- 2 = with 3 x radial M12 connectors

#### e Fieldbus profile

- 31 = PROFIBUS DP V0 encoder profile class 2

#### f Options (service)

- 2 = no option
  - 3 = SET button
- Optional on request
- Ex 2/22
  - surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.

2) Preferred type only in conjunction with flange type 1.

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

| Mounting accessory for shaft encoders |  | Order no.               |
|---------------------------------------|--|-------------------------|
| <b>Coupling</b>                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]  | <b>8.0000.1102.0606</b> |
|                                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

| Mounting accessory for hollow shaft encoders  |   | Order no.               |
|---|---|-------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]<br>with fixing thread<br> | <b>8.0010.4700.0000</b> |

| Connection technology                      |   | Order no.                   |
|--|---|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut for bus in , 5-pin<br>5 m [16.40'] PUR cable     | <b>05.00.6011.3211.005M</b> |
|  | M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PUR cable    | <b>05.00.6011.3411.005M</b> |
|  | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut for bus in , 5-pin                               | <b>05.BMWS 8151-8.5</b>     |
|  | M12 male connector with external thread for bus out, 5-pin                              | <b>05.BMSWS 8151-8.5</b>    |
|  | M12 female connector with coupling nut for power supply, 4-pin                          | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |                             |  |
|--|-----------------------------|--|
| <b>Maximum speed</b>                             | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |
|  | IP65 up to T <sub>max</sub> | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
|  | IP67 up to 70°C [158°F]     | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
|  | IP67 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>          | IP65                        | < 0.01 Nm  |
|  | IP67                        | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
|  | hollow shaft version        | 7.5 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                    | radial                      | 80 N   |
|  | axial                       | 40 N   |
| <b>Weight</b>                                    | with bus terminal cover     | approx. 0.57 kg [10.11 oz]                                   |
|  | with fixed connection       | approx. 0.52 kg [18.34 oz]                                   |
| <b>Protection acc. to EN 60529</b>               | housing side                | IP67   |
|  | shaft side                  | IP65, opt. IP67  |
| <b>Working temperature range</b>                 |                             | -40°C ... +80°C [-40°F ... +176°F]                           |
| <b>Materials</b>                                 | shaft / hollow shaft        | stainless steel  |
|  | flange                      | aluminum   |
|  | housing                     | zinc die-cast  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                             | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 120 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| SET button (zero or defined value, option)  |  |
|---|--|
| Protection against accidental activation.<br>Button can only be operated with a ball-pen or pencil. |  |

| Diagnostic LED (yellow)                |                               |
|--|-------------------------------|
| <b>LED is ON with following errors</b> | Sensor error (Profibus error) |

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

| Interface characteristics PROFIBUS DP    |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable default: 8192 (13 bit)  |
| <b>Number of revolutions (multiturn)</b> | 1 ... 4096 (12 bit), scalable  |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)  |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | Interface specification acc. to PROFIBUS-DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated |
| <b>Protocol</b>                          | Profibus encoder profile V1.1 class1 and class 2 with manufacturer-specific add-ons                                |
| <b>Baud rate</b>                         | max. 12 Mbit/s   |
| <b>Device address</b>                    | 1 ... 127 set by rotary switches   |
| <b>Termination switchable</b>            | set by DIP switches  |

### Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the user-specific component within the Profibus field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that Profibus-compliant device systems can be used now with the guarantee that they are ready for the future too.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling (number of steps per revolution).
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full class 1 and class 2 functionality.

### Terminal assignment terminal box

| Interface | Type of connection    |              | BUS IN  |                       |      |                       | BUS OUT |        |    |   | The shield of the connection cable must be connected over a large area via the cable gland. |
|-----------|-----------------------|--------------|---------|-----------------------|------|-----------------------|---------|--------|----|---|---|
|           |                       |              | Signal: | B                     | A    | 0 V                   | +V      | 0 V    | +V | B |   |
| 3         | 1 (terminal box)      | Terminal:    | 1       | 2                     | 3    | 4                     | 5       | 6      | 7  | 8 |   |
| 3         | 2 (3 x M12 connector) | Bus in       | Signal: | –                     | PB_A | –                     | PB_B    | Shield |    |   |   |
|           |                       |              | Pin:    | 1                     | 2    | 3                     | 4       | 5      |    |   |   |
|           |                       | Power supply | Signal: | +V                    | –    | 0 V                   | –       |        |    |   |   |
|           |                       |              | Pin:    | 1                     | 2    | 3                     | 4       |        |    |   |   |
|           |                       | Bus out      | Signal: | BUS_VDC <sup>1)</sup> | PB_A | BUS_GND <sup>1)</sup> | PB_B    | Shield |    |   |   |
|           |                       |              | Pin:    | 1                     | 2    | 3                     | 4       | 5      |    |   |   |

1) For supplying an external Profibus DP termination resistor.



# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

## Dimensions shaft version, with removable bus terminal cover

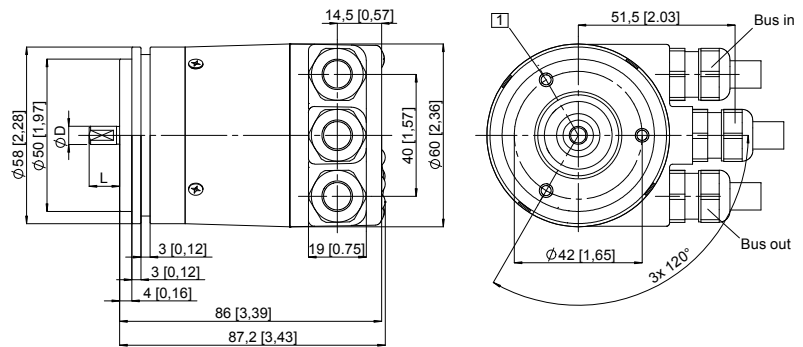
Dimensions in mm [inch]

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep



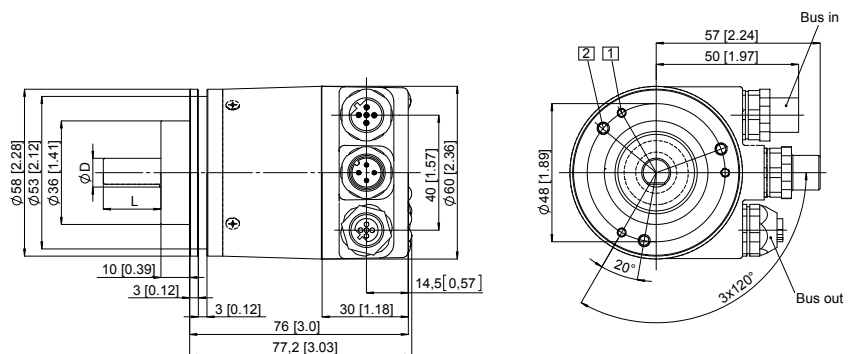
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with 3 x M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep

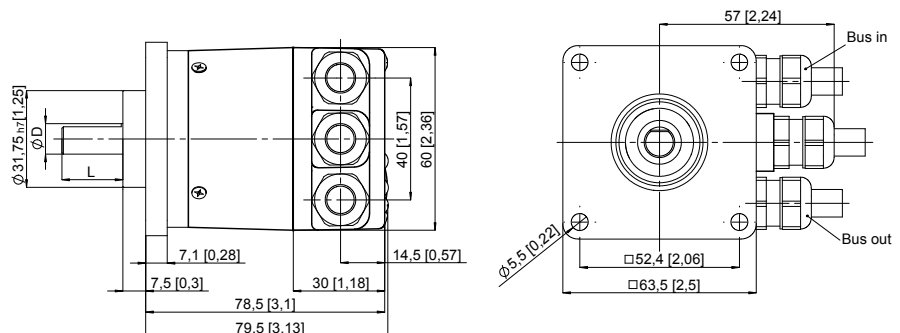


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

#### Flange type 5 and 7

(drawing with cable)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**PROFIBUS DP**

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

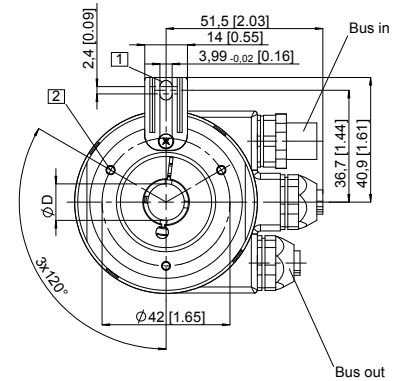
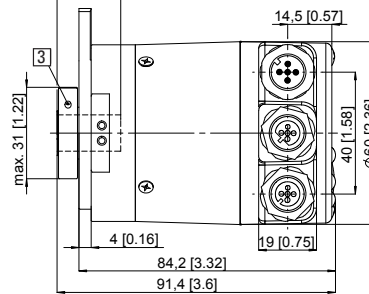
Dimensions in mm [inch]

### Flange with spring element, long

#### Flange type 1 and 2

(drawing with 3 x M12 connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 63$ [2.48]

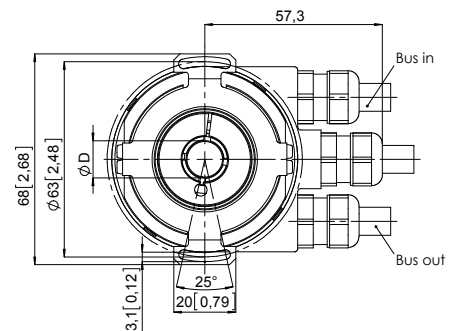
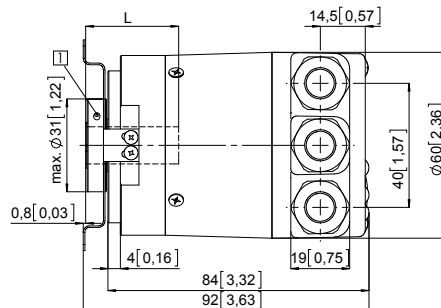
#### Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

63 [2.48]

(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56]

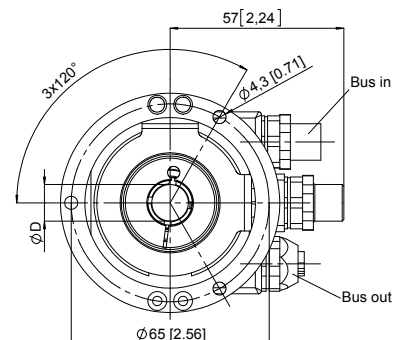
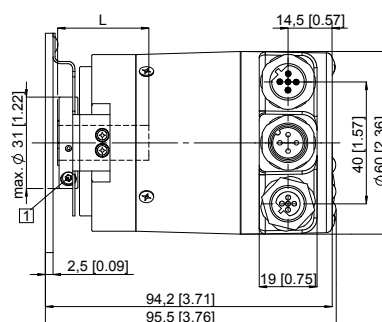
#### Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

65 [2.56]

(drawing with 3 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

|   |  |                            |
|---|--|----------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|



The Sendix multiturn encoders 5868 and 5888 with CANopen or CANopenLift interface and optical sensor technology are the right encoders for all CANopen or CANopenLift applications.

With a maximum resolution of 28 bits these encoders offer an optional additional RS422 incremental track with 2048 pulses.



|                  |              |                       |                   |                       |                          |                             |                      |                             |                |   |
|------------------|--------------|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|----------------|---|
|                  |              |                       |                   |                       |                          |                             |                      |                             |                |   |
| Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional |

|   |  |
|---|--|
| <h3>Reliable</h3> <ul style="list-style-type: none"> <li>Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.</li> <li>Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.</li> </ul> | <h3>Flexible</h3> <ul style="list-style-type: none"> <li>Node address can be set via rotary switches or software.</li> <li>Baud rate and termination can be set via DIP switches or software.</li> <li>With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.</li> <li>Universal scaling function.</li> </ul> |
|---|--|

|   |  |  |   |   |  |
|---|--|--|---|---|--|
| <b>Order code</b><br><b>Shaft version</b>   | <b>8.5868</b><br>Type  | <b>.XXXXX</b><br>a b c d   | <b>.XXX X</b><br>e f  | For each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>a Flange</b><br><u>1 = clamping flange, IP65 ø 58 mm [2.28"]</u><br>3 = clamping flange, IP67 ø 58 mm [2.28"]<br><u>2 = synchro flange, IP65 ø 58 mm [2.28"]</u><br>4 = synchro flange, IP67 ø 58 mm [2.28"]<br>5 = square flange, IP65 □ 63.5 mm [2.5"]<br>7 = square flange, IP67 □ 63.5 mm [2.5"] | <b>b Shaft (ø x L), with flat</b><br><u>1 = 6 x 10 mm [0.24 x 0.39"]</u> <sup>1)</sup><br><u>2 = 10 x 20 mm [0.39 x 0.79"]</u> <sup>2)</sup><br>3 = 1/4" x 7/8"<br>4 = 3/8" x 7/8" | <b>c Interface / power supply</b><br><u>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u><br><u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u><br><u>with 2048 ppr incremental track (TTL-compatible)</u> <sup>3)</sup> | <b>d Type of connection</b><br><i>removable bus terminal cover</i><br>1 = radial cable gland<br><u>2 = M12 connector, 5-pin</u><br><i>Fixed connection without bus terminal cover</i><br>A = radial cable, 2 m [6.56'] PVC<br>B = radial cable, special length PVC *)<br>E = 1 x radial M12 connector, 5-pin<br>F = 2 x radial M12 connector, 5-pin<br>I = 1 x radial M23 connector, 12-pin<br>J = 2 x radial M23 connector, 12-pin<br>K = 1 x Sub-D connector, 9-pin<br>*) Available special lengths (connection type B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.5868.112B.2123.0030 (for cable length 3 m) | <b>e Fieldbus profile</b><br><u>212 = CANopen encoder profile DS406 V3.2</u><br>221 = CANlift DS417 V1.01   | <b>f Options (service)</b><br>2 = no options<br><u>3 = SET button</u><br><br><i>Optional on request</i><br>- Ex 2/22 <sup>4)</sup><br>- surface protection salt spray tested |

1) Preferred type only in conjunction with flange type 2.  
 2) Preferred type only in conjunction with flange type 1.

3) Only in conjunction with connection type 2.  
 4) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                            |
|---|--|----------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|

**Order code** **8.5888** . **XXXX** . **XXX** **X**

**Hollow shaft** Type **a** **b** **c** **d** **e** **f**

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. **10 by 10**

**a Flange**  
 1 = with spring element, long, IP65  
 2 = with spring element, long, IP67  
 3 = with stator coupling, IP65 ø 65 mm [2.56"]  
 4 = with stator coupling, IP67 ø 65 mm [2.56"]  
5 = with stator coupling, IP65 ø 63 mm [2.48"]  
 6 = with stator coupling, IP67 ø 63 mm [2.48"]

**b Blind hollow shaft**  
 (insertion depth max. 30 mm [1.18"])  
 3 = ø 10 mm [0.39"]  
4 = ø 12 mm [0.47"]  
 5 = ø 14 mm [0.55"]  
 6 = ø 15 mm [0.59"]  
 8 = ø 3/8"  
 9 = ø 1/2"

**c Interface / power supply**  
2 = CANopen DS301 V4.02, 10 ... 30 V DC  
5 = CANopen DS301 V4.02, 10 ... 30 V DC  
 with 2048 ppr incremental track (TTL-compatible) <sup>1)</sup>

**d Type of connection**  
 removable bus terminal cover  
 1 = radial cable gland  
2 = M12 connector, 5-pin  
 Fixed connection without bus terminal cover  
 A = radial cable, 2 m [6.56'] PVC  
 B = radial cable, special length PVC \*)  
 E = 1 x radial M12 connector, 5-pin  
 F = 2 x radial M12 connector, 5-pin  
 I = 1 x radial M23 connector, 12-pin  
 J = 2 x radial M23 connector, 12-pin  
 K = 1 x Sub-D connector, 9-pin

**e Fieldbus profile**  
212 = CANopen encoder profile DS406 V3.2  
 221 = CANlift DS417 V1.01

**f Options (service)**  
 2 = no options  
3 = SET button

*Optional on request*  
 - Ex 2/22 <sup>2)</sup>  
 - surface protection  
 salt spray tested

\*) Available special lengths (connection type B):  
 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.5888.542B.2123.0030 (for cable length 3 m)

| Mounting accessory for shaft encoders   |  | Order no.                   |
|---|--|-----------------------------|
| <b>Coupling</b>   | bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]                              | <b>8.0000.1102.0606</b>     |
|   | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]                             | <b>8.0000.1102.1010</b>     |
| Mounting accessory for hollow shaft encoders  |  | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | with fixing thread   | <b>8.0010.4700.0000</b>     |
|   |  |                             |
| Connection technology   |  | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 female connector with coupling nut for bus in, 5-pin<br>5 m [16.40'] PVC cable   | <b>05.00.6091.A211.005M</b> |
|   | M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PVC cable | <b>05.00.6091.A411.005M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut for bus in, 5-pin                             | <b>8.0000.5116.0000</b>     |
|   | M12 male connector with external thread for bus out, 5-pin                           | <b>8.0000.5111.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

1) Only in conjunction with connection type 2.  
 2) For the cable connection type, cable material PUR.

# Absolute encoders – multiturn

|   |  |                            |
|---|--|----------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|

## Technical data

### Mechanical characteristics

|  |                 |  |
|--|-----------------|--|
| <b>Maximum speed</b>                             |                 |  |
| IP65 up to 70°C [158°F]                          |                 | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous) |
| IP65 up to T <sub>max</sub>                      |                 | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous) |
| IP67 up to 70°C [158°F]                          |                 | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous) |
| IP67 up to T <sub>max</sub>                      |                 | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>          |                 |  |
| IP65   |                 | < 0.01 Nm  |
| IP67   |                 | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    |                 |  |
| shaft version                                    |                 | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| hollow shaft version                             |                 | 7.5 x 10 <sup>-6</sup> kgm <sup>2</sup>                      |
| <b>Load capacity of shaft</b>                    |                 |  |
| radial   |                 | 80 N   |
| axial  |                 | 40 N   |
| <b>Weight</b>                                    |                 |  |
| with bus terminal cover                          |                 | approx. 0.57 kg [20.11 oz]                                   |
| with fixed connection                            |                 | approx. 0.52 kg [18.34 oz]                                   |
| <b>Protection acc. to EN 60529</b>               |                 |  |
| housing side                                     | IP67            |  |
| shaft side                                       | IP65, opt. IP67 |  |
| <b>Working temperature range</b>                 |                 |  |
|  |                 | -40°C ... +80°C [-40°F ... +176°F] <sup>1)</sup>             |
| <b>Material</b>                                  |                 |  |
| shaft/hollow shaft                               |                 | stainless steel  |
| flange   |                 | aluminum   |
| housing  |                 | zinc die-cast  |
| cable  |                 | PVC (PUR for Ex 2/22)  |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |                 |  |
|  |                 | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |                 |  |
|  |                 | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                        |

### Electrical characteristics

|  |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 100 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

### Interface characteristics CANopen/CANopenLift

|  |   |
|--|---|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)  |
| <b>Number of revolutions (multiturn)</b> | max. 4096 (12 bit)<br>scalable only via the total resolution                                      |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)                              |
| <b>Code</b>                              | binary  |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN<br>CAN specification 2.0 B               |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons<br>or CANlift profile DS417 V1.1 |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>can be set via DIP switches,<br>software configurable                       |
| <b>Node address</b>                      | 1 ... 127<br>can be set via rotary switches,<br>software configurable                             |
| <b>Termination switchable</b>            | can be set via DIP switches,<br>software configurable   |

### Incremental track characteristics

|                                    |                                   |
|------------------------------------|-----------------------------------|
| <b>Output driver</b>               | RS422 (TTL-compatible)            |
| <b>Permissible load / channel</b>  | max. +/- 20 mA                    |
| <b>Signal level</b>                | HIGH typ. 3.8 V<br>LOW typ. 1.3 V |
| <b>Short circuit proof outputs</b> | yes <sup>2)</sup>                 |
| <b>Resolution</b>                  | 2048 ppr                          |

### SET button (zero or defined value, option)

Protection against accidental activation.  
Button can only be operated with a ball-pen or pencil.

### Diagnostic LED (yellow)

#### LED is ON with the following fault conditions

Sensor error (internal code or LED error) too low voltage, over-temperature

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied.

## Standard mechanical multiturn, optical

## Sendix 5868 / 5888 (shaft / hollow shaft)

## CANopen/CANopenLift

### General information about CANopen / CANopenLift

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS417 V1.1 (for lift applications) are available

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): position, speed, acceleration as well as the status of the working area.

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

### Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

### CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

- Class C2 functionality.
- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping.
- Self-start programmable (power on to operational).
- 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

### CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

### CANopen Lift Profile DS417 V1.1

Among others, the following functionality is integrated:

- Car position unit.
- 2 virtual devices.
- 1 virtual device delivers the position in absolute measuring steps (steps).
- 1 virtual device delivers the position as an absolute travel information in mm.
- Lift number programmable.
- Independent setting of the node address in relation with the CAN identifier.
- Factor for speed calculation (e.g. measuring wheel periphery).
- Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, acceleration, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- "Watchdog controlled" device.

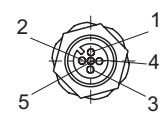
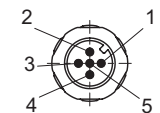
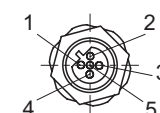
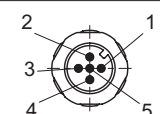
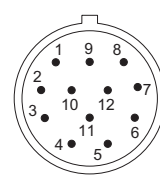
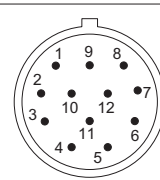
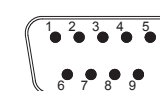
All profiles stated here: Key-features

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

# Absolute encoders – multiturn

|   |  |                            |
|---|--|----------------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|

## Terminal assignment

| Interface           | Type of connection | Cable gland (bus terminal cover with terminal box)                |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|---------------------|--------------------|---|--------------------|---------|---------------------|--------------------|---------------------|--------------------|-------|-------|---------|---|--|--|
| 2, 5                | 1                  | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | Bus OUT   |                    |         |                     |                    | Bus IN              |                    |       |       |         |   |  |  |
|                     |                    | CAN_GND   | CAN_L              | CAN_H   | 0 V<br>power supply | +V<br>power supply | 0 V<br>power supply | +V<br>power supply | CAN_L | CAN_H | CAN_GND |   |  |  |
| Abbreviation:       |                    | CG  | CL                 | CH      | 0 V                 | +V                 | 0 V                 | +V                 | CL    | CH    | CG      |   |  |  |
| Interface           | Type of connection | Cable (isolate unused wires individually before initial start-up) |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | A, B               | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
| Cable color:        |                    | WH  | BN                 | YE      | GN                  | GY                 |                     |                    |       |       |         |   |  |  |
| Interface           | Type of connection | 2 x M12 connector, 5-pin (3 x M12 connector with interface 5)     |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | 2, F               | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |        |  |  |
|                     |                    | Bus OUT   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
|                     |                    | Pin:  |                    | 3       | 2                   | 5                  | 4                   | 1                  |       |       |         |   |  |  |
|                     |                    | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |       |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 0 V<br>power supply | +V<br>power supply | CAN_L   | CAN_H              | CAN_GND |                     |                    |                     |                    |       |       |         |   |  |  |
| Pin:                |                    | 3   | 2                  | 5       | 4                   | 1                  |                     |                    |       |       |         |   |  |  |
| 5                   | 2                  | Incremental track   |                    |         |                     |                    |                     |                    |       |       |         |      |  |  |
|                     |                    | A   | $\bar{A}$          | B       | $\bar{B}$           | 0 V                |                     |                    |       |       |         |   |  |  |
|                     |                    | Pin:  |                    | 1       | 2                   | 3                  | 4                   | 5                  |       |       |         |   |  |  |
| Interface           | Type of connection | 1 x M12 connector, 5-pin  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | E                  | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |      |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
| Pin:                |                    | 3   | 2                  | 5       | 4                   | 1                  |                     |                    |       |       |         |   |  |  |
| Interface           | Type of connection | 2 x M23 connector, 12-pin   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | J                  | Signal:   |                    |         |                     |                    |                     |                    |       |       |         | 2 x  |  |  |
|                     |                    | Bus OUT   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
|                     |                    | Pin:  |                    | 10      | 12                  | 2                  | 7                   | 3                  |       |       |         |   |  |  |
|                     |                    | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 0 V<br>power supply | +V<br>power supply | CAN_L   | CAN_H              | CAN_GND |                     |                    |                     |                    |       |       |         |   |  |  |
| Pin:                |                    | 10  | 12                 | 2       | 7                   | 3                  |                     |                    |       |       |         |   |  |  |
| Interface           | Type of connection | 1 x M23 connector, 12-pin   |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | I                  | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |      |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
| Pin:                |                    | 10  | 12                 | 2       | 7                   | 3                  |                     |                    |       |       |         |   |  |  |
| Interface           | Type of connection | Sub-D connector, 9-pin  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
| 2, 5                | K                  | Signal:   |                    |         |                     |                    |                     |                    |       |       |         |      |  |  |
|                     |                    | Bus IN  |                    |         |                     |                    |                     |                    |       |       |         |   |  |  |
|                     |                    | 0 V<br>power supply   | +V<br>power supply | CAN_L   | CAN_H               | CAN_GND            |                     |                    |       |       |         |   |  |  |
| Pin:                |                    | 6   | 9                  | 2       | 7                   | 3                  |                     |                    |       |       |         |   |  |  |

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**CANopen/CANopenLift**

## Dimensions shaft version, with removable bus terminal cover

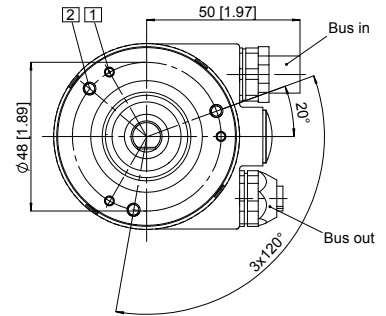
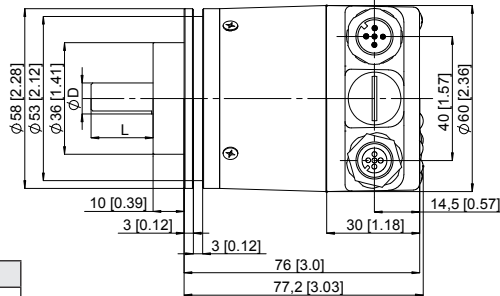
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with 2 x M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



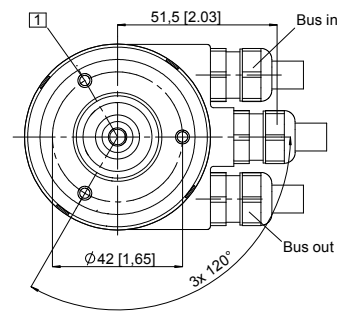
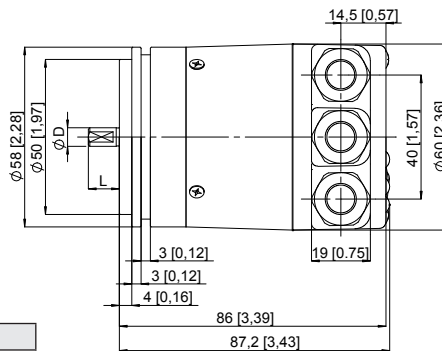
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep

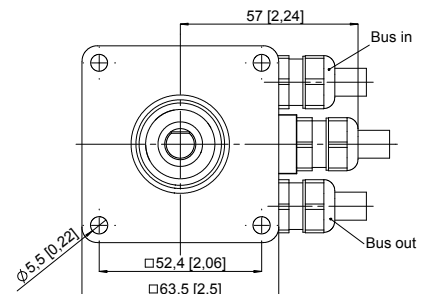
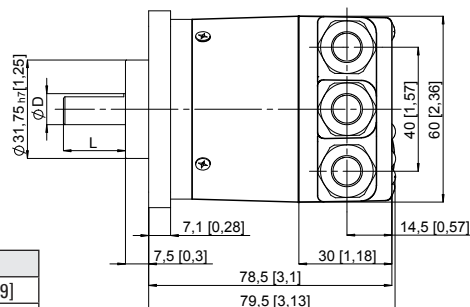


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

#### Flange type 5 and 7

(drawing with cable)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



# Absolute encoders – multiturn

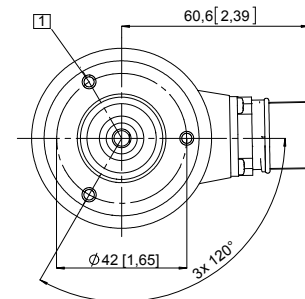
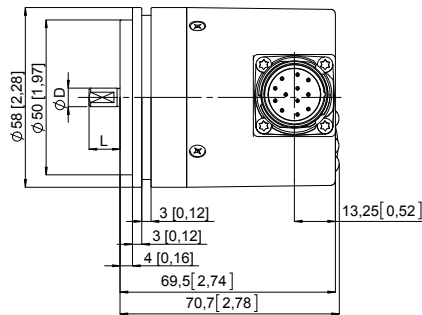
|   |  |                            |
|---|--|----------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|

## Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

**Synchro flange,  $\varnothing$  58 [2.28]**  
**Flange type 2 and 4**  
 (drawing with M23 connector)

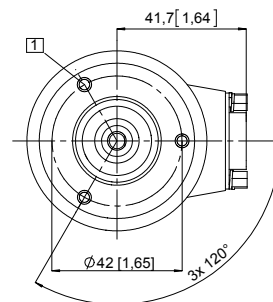
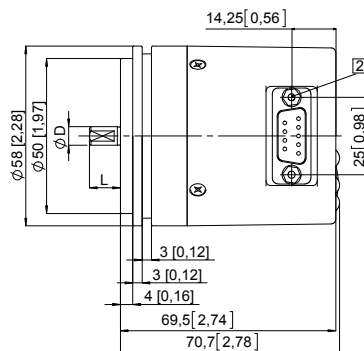
① 3 x M4, 6 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

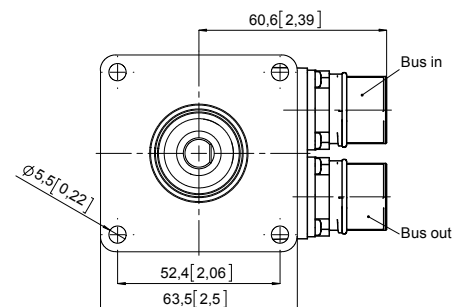
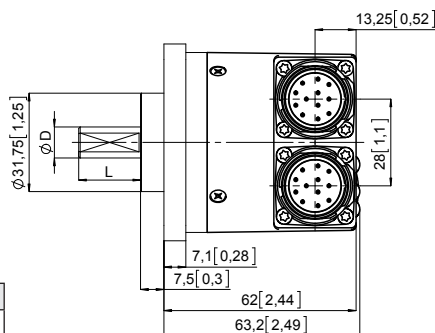
**Synchro flange,  $\varnothing$  58 [2.28]**  
**Flange type 2 and 4**  
 (drawing with Sub-D connector)

① 3 x M4, 6 [0.24] deep  
 ② 2 x 4/40 UNC; 3.0 [0.12] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

**Square flange,  $\square$  63.5 [2.5]**  
**Flange type 5 and 7**  
 (drawing with 2 x M23 connector)



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**CANopen/CANopenLift**

## Dimensions shaft version, with fixed connection

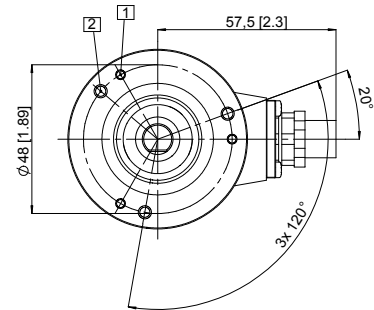
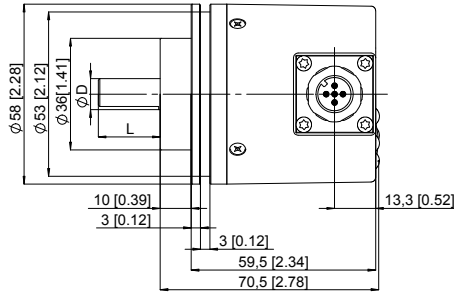
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with 1 x M12 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



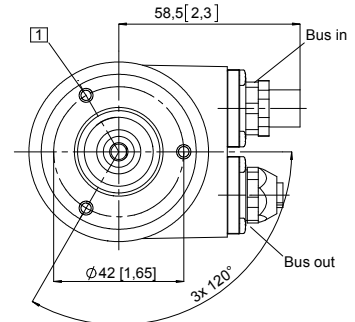
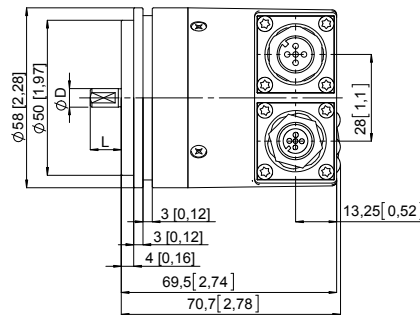
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 8 [0.32] deep



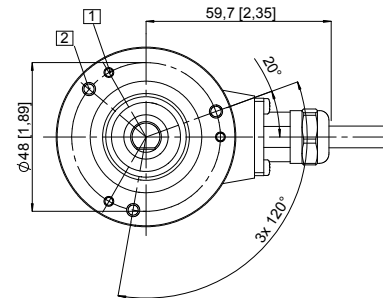
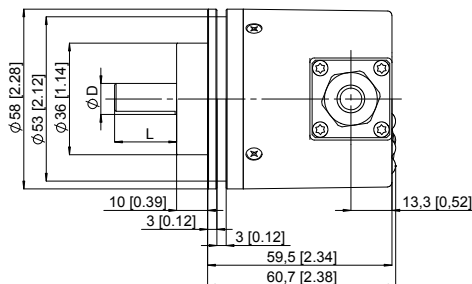
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Clamping flange, $\varnothing$ 58 [2.28]

#### Flange type 1 and 3

(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

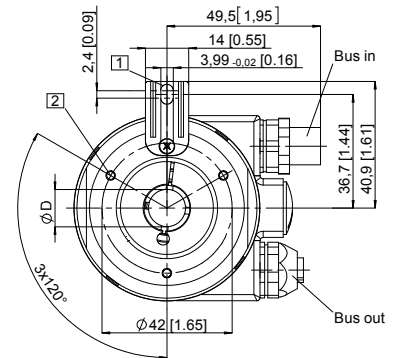
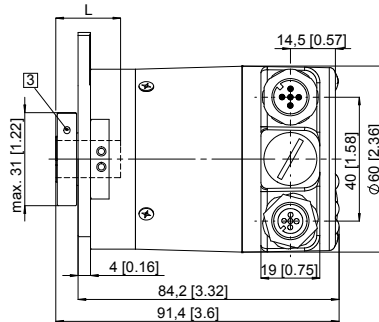
|   |  |                            |
|---|--|----------------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|---|--|----------------------------|

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2 (drawing with 2 x M12 connector)

- 1 Slot spring element  
recommendation:  
cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the  
clamping ring 0.6 Nm



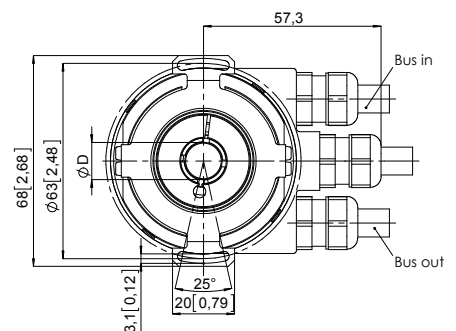
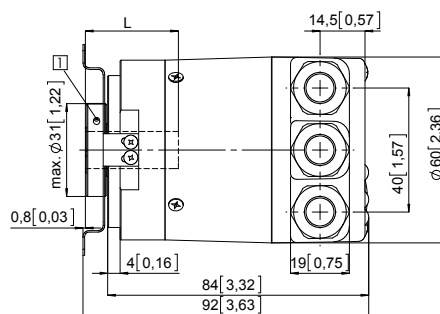
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

Pitch circle diameter for fixing screws  
63 [2.48]  
(drawing with cable)

- 1 Recommended torque for the  
clamping ring 0.6 Nm



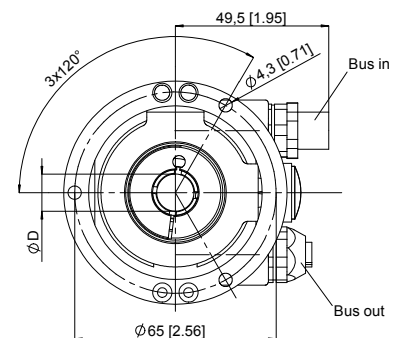
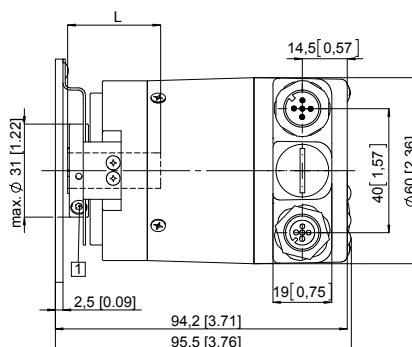
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

Pitch circle diameter for fixing screws  
65 [2.56]  
(drawing with 2x M12 connector)

- 1 Recommended torque for the  
clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

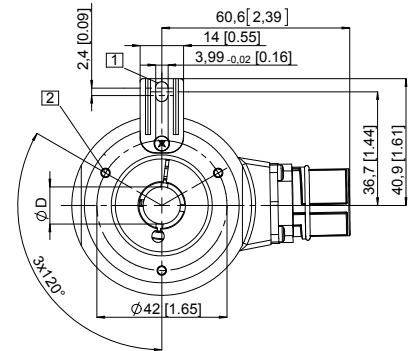
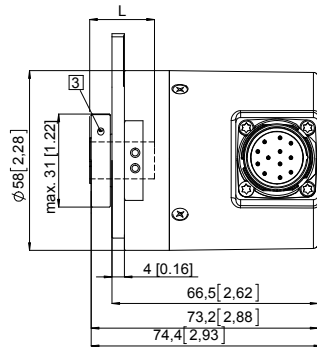
**CANopen/CANopenLift**

## Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2 (drawing with M23 connector)

- 1 Slot spring element  
recommendation:  
cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the  
clamping ring 0.6 Nm

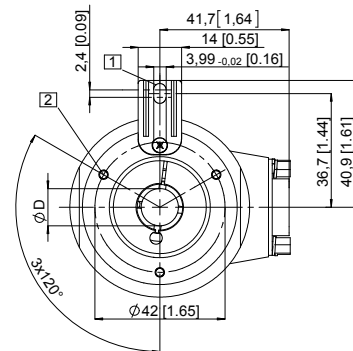
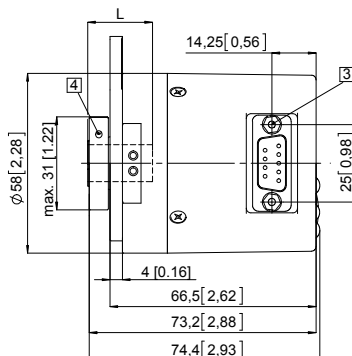


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with spring element, long Flange type 1 and 2 (drawing with Sub-D connector)

- 1 Slot spring element  
recommendation:  
cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 2 x 4/40 UNC; 3.0 [0.12] deep
- 4 Recommended torque for the  
clamping ring 0.6 Nm



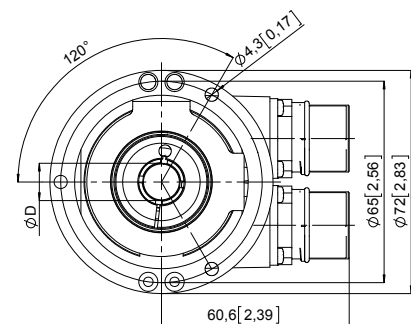
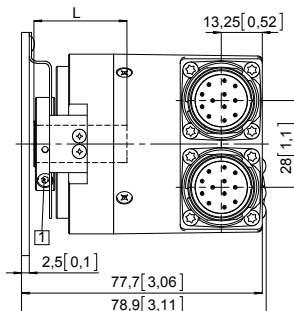
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

Pitch circle diameter for fixing screws  
65 [2.56]  
(drawing with 2 x M23 connector)

- 1 Recommended torque for the  
clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multitrurn

|  |  |                            |
|--|--|----------------------------|
| <b>Standard<br/>mechanical multitrurn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>CANopen/CANopenLift</b> |
|--|--|----------------------------|

## Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

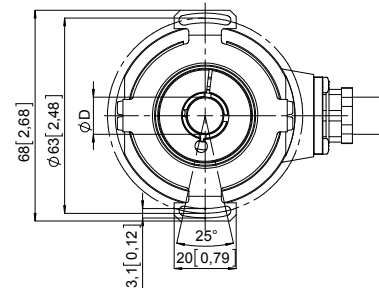
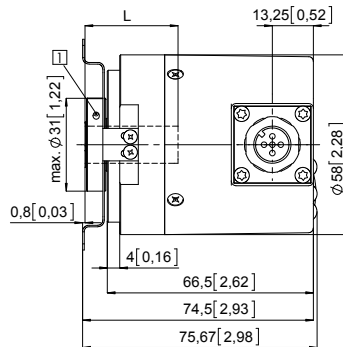
### Flange with stator coupling, $\varnothing$ 63 [2.48]

#### Flange type 5 and 6

Pitch circle diameter for fixing screws  
63 [2.48]

(drawing with M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

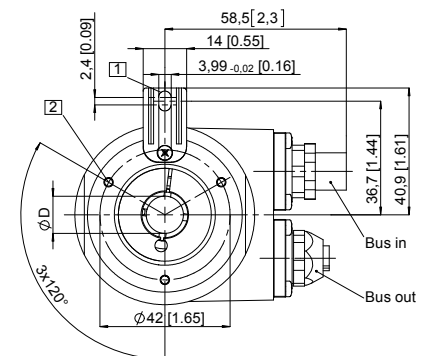
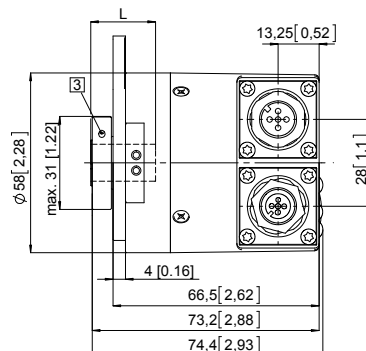
L = insertion depth max. blind hollow shaft

### Flange with spring element, long

#### Flange type 1 and 2

(drawing with 2 x M12 connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]  
 2 3 x M3, 5.5 [0.22] deep  
 3 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

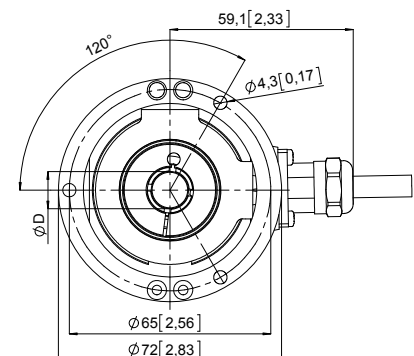
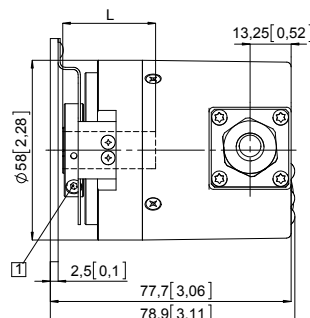
### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 3 and 4

Pitch circle diameter for fixing screws  
65 [2.56]

(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

**Standard mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**EtherCAT**



The multiturn encoders Sendix 5868 and 5888 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.



**EtherCAT**  
Conformance tested



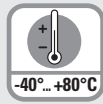
Mechanical drive



Safety-Lock™



High rotational speed



Temperature range  
-40... +80°C



High protection level  
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Surface protection salt spray-tested optional

## Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, Version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

## Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.

### Order code Shaft version

**8.5868** . **X** **X** **B** **2** . **B2** **12**  
Type                      a    b    c    d                      e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

#### b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup>
- 2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup>
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

#### c Interface / power supply

B = EtherCAT / 10 ... 30 V DC

#### Optional on request

- Ex 2/22
- surface protection salt spray tested

#### d Type of connection

2 = 3 x M12 connector, 4-pin  
removable bus terminal cover

#### e Fieldbus profile

B2 = EtherCAT with CoE (CAN over EtherNet)

### Order code Hollow shaft

**8.5888** . **X** **X** **B** **2** . **B2** **12**  
Type                      a    b    c    d                      e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

#### b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

#### c Interface / power supply

B = EtherCAT / 10 ... 30 V DC

#### Optional on request

- Ex 2/22
- surface protection salt spray tested

#### d Type of connection

2 = 3 x M12 connector, 4-pin  
removable bus terminal cover

#### e Fieldbus profile

B2 = EtherCAT with CoE (CAN over EtherNet)

1) Preferred type only in conjunction with flange type 2.  
2) Preferred type only in conjunction with flange type 1.

# Absolute encoders – multiturn

| Standard<br>mechanical multiturn, optical   | Sendix 5868 / 5888 (shaft / hollow shaft)  | EtherCAT                    |
|---|--|-----------------------------|
| <b>Mounting accessory for shaft encoders</b>  |  | Order no.                   |
| <b>Coupling</b>   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]                              | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]                             | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>                                   |  | Order no.                   |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 1 + 2) | Dimensions in mm [inch]  | <b>8.0010.4700.0000</b>     |
|   | with fixing thread<br>   |                             |
| <b>Connection technology</b>  |  | Order no.                   |
| <b>Cordset, pre-assembled</b>   | M12 male connector with external thread for port IN and port OUT, 4-pin<br>2 m [6.56'] PUR cable | <b>05.00.6031.4411.002M</b> |
|   | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable          | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b>  | M12 male connector with external thread for port IN and port OUT, 4-pin                          | <b>05.WASCSY4S</b>          |
|   | M12 female connector with coupling nut for power supply, 4-pin                                   | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data   |                             |  |
|--|-----------------------------|--|
| <b>Mechanical characteristics</b>  |                             |  |
| <b>Maximum speed</b>   | IP65 up to 70°C [158°F]     | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous)         |
|  | IP65 up to T <sub>max</sub> | 7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)         |
|  | IP67 up to 70°C [158°F]     | 8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)         |
|  | IP67 up to T <sub>max</sub> | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)         |
| <b>Starting torque</b> - at 20°C [68°F]  | IP65                        | < 0.01 Nm  |
|  | IP67                        | < 0.05 Nm  |
| <b>Mass moment of inertia</b>  | shaft version               | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                              |
|  | hollow shaft version        | 7.5 x 10 <sup>-6</sup> kgm <sup>2</sup>                              |
| <b>Load capacity of shaft</b>  | radial                      | 80 N   |
|  | axial                       | 40 N   |
| <b>Weight</b>  |                             | approx. 0.54 kg [19.05 oz]   |
| <b>Protection</b> acc. to EN 60529   | housing side                | IP67   |
|  | shaft side                  | IP65, opt. IP67  |
| <b>Working temperature range</b>   |                             | -40°C ... +80°C [-40°F ... +176°F]                                   |
| <b>Material</b>  | shaft/hollow shaft          | stainless steel  |
|  | flange                      | aluminum   |
|  | housing                     | zinc die-cast  |
| <b>Shock resistance</b> acc. to EN 60068-2-27  |                             | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance</b> acc. to EN 60068-2-6   |                             | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                                |
| <b>Electrical characteristics</b>  |                             |  |
| <b>Power supply</b>  |                             | 10 ... 30 V DC   |
| <b>Power consumption</b> (no load)   |                             | max. 120 mA  |
| <b>Reverse polarity protection of the power supply</b>   |                             | yes  |
| <b>UL approval</b>   |                             | file 224618  |
| <b>CE compliant</b> acc. to  |                             | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU                |
| <b>Interface characteristics EtherCAT</b>  |                             |  |
| <b>Resolution singleturn</b>   |                             | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)             |
| <b>Number of revolutions</b> (multiturn)   |                             | max. 4096 (12 bit)<br>scalable only via the total resolution         |
| <b>Total resolution</b>  |                             | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit) |
| <b>Code</b>  |                             | binary   |
| <b>Protocol</b>  |                             | EtherNet / EtherCAT  |
| <b>Diagnostic LED (red)</b>  |                             |  |
| LED is ON with the following fault conditions:<br>Sensor error (internal code or LED error), low voltage, over-temperature |                             |  |
| <b>Run LED (green)</b>   |                             |  |
| LED is ON with the following conditions:<br>Preop-, Safeop and Op-State (EtherCAT status machine)                          |                             |  |
| <b>2 x Link LEDs (yellow)</b>  |                             |  |
| LED is ON with the following conditions (port IN and port OUT):<br>Link detected   |                             |  |
| <b>Modes</b>   |                             |  |
| Freerun, distributed clock   |                             |  |



# Absolute encoders – multiturn

**Standard mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**EtherCAT**

### General information about CoE (CAN over EtherNet)

The EtherCAT encoders support the CANopen communication profile according to DS301. In addition device-specific profiles like the encoder profile DS406 are available.

Scaling, preset values, limit switch values and many other parameters can be programmed via the EtherCAT bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined as PDO (PDO mapping): **position**, **speed**, **temperature values** and **working area state** as well as other process values.

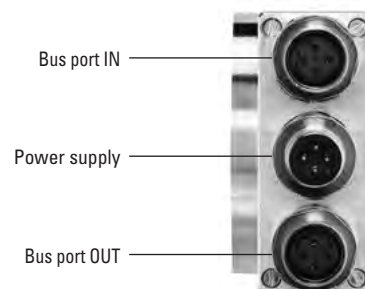
### CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 µs.
- EtherCAT certificate of conformity.
- Speed with sign.
- Four units for speed calculation: steps/sec, steps/100 ms, steps/10 ms, min<sup>-1</sup>.
- Time stamp as system time at the point in time when the position is read out.
- Two working area state registers.
- Along with the scaled position, the raw data – position as process value – is also mappable.
- Dynamic mapping.
- Gating time: setting of the time interval, via which the speed value can be interpolated.
- Sensor temperature in degrees Celsius.
- Comprehensive plausibility test when downloading parameters to the encoder.
- Alarm and warning messages.
- User interface with visual display of bus and fault status – 4 LEDs.
- Extended error management for position sensing with integrated temperature control.
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011.

### Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                | Diagram |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|---------|
|           |                          |              | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
| B         | 2<br>(3 x M12 connector) | Bus Port IN  | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Power supply | Signal:              | Voltage +      | –             | Voltage –       | –              |         |
|           |                          |              | Abbreviation:        | + V            | –             | 0 V             | –              |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |
|           |                          | Bus Port OUT | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |         |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |         |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |         |





# Absolute encoders – multiturn

|   |  |                 |
|---|--|-----------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>EtherCAT</b> |
|---|--|-----------------|

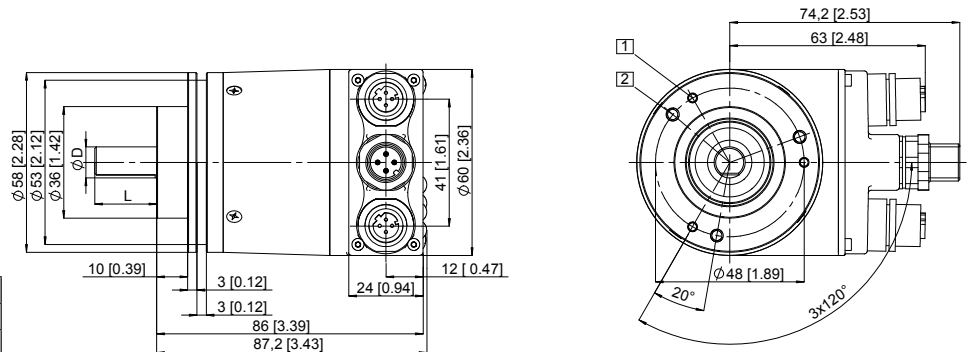
## Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28] Flange type 1 and 3

- 1 3 x M3, 6.0 [0.24] deep
- 2 3 x M4, 8.0 [0.31] deep

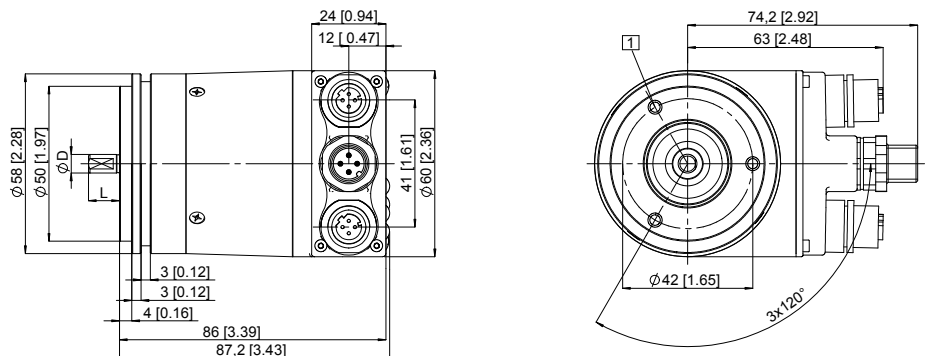
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



### Synchro flange, $\varnothing$ 58 [2.28] Flange type 2 and 4

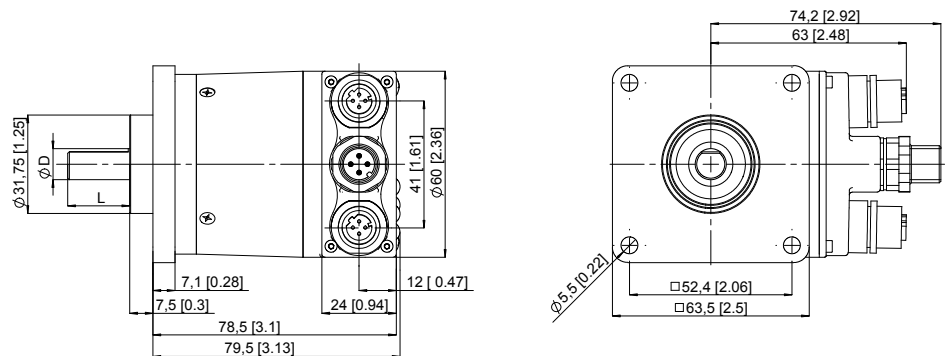
- 1 3 x M4, 6.0 [0.24] deep

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



### Square flange, $\square$ 63.5 [2.5] Flange type 5 and 7

| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |



Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**EtherCAT**

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

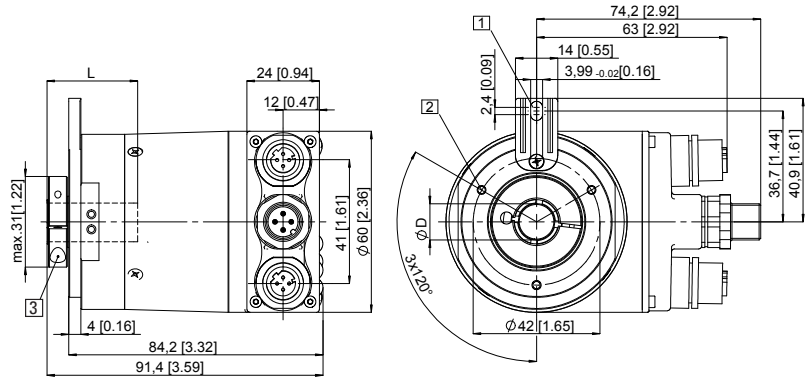
Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

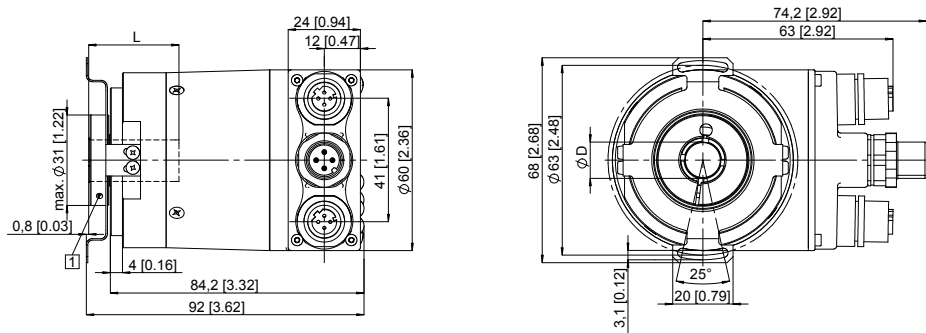


### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

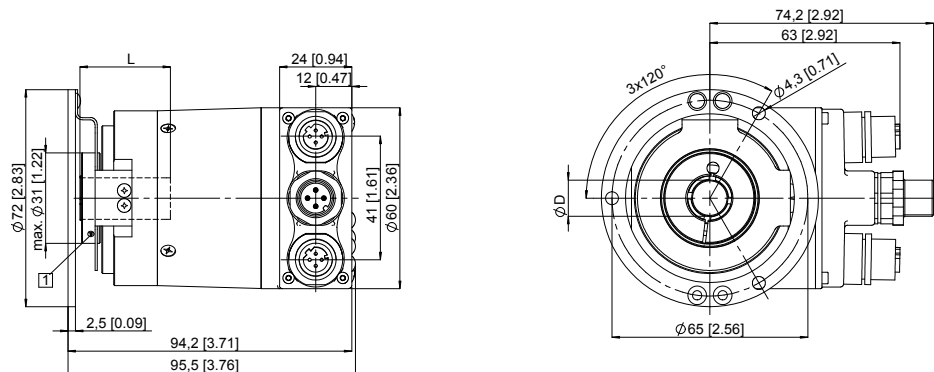


### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|---|--|--------------------|



The multiturn encoders Sendix 5868 and 5888 with PROFINET interface and optical sensor technology are ideal for use in all applications with PROFINET technology.

The encoder supports the isochronous (IRT) mode and is therefore ideal for real-time applications.

|                  |              |                       |                   |                       |                          |                             |                      |                             |                |   |
|------------------|--------------|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|----------------|---|
|                  |              |                       |                   |                       |                          |                             |                      |                             |                |   |
| Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional |

## Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

## Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time ≤ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

Absolute encoders multiturn

|  |   |                           |  |  |   |
|--|---|---------------------------|--|--|---|
| <b>Order code</b>  | <b>8.5868</b>   | <b>. X X C 2 . C 2 12</b> | Type<br>a b c d e  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |   |
| <b>Shaft version</b>   |   |                           |  |  |   |
| <b>a Flange</b>  | <b>b Shaft (ø x L), with flat</b>   |                           | <b>c Interface / power supply</b>  |  | <b>e Fieldbus profile</b>   |
| 1 = <u>clamping flange, IP65 ø 58 mm [2.28"]</u><br>3 = clamping flange, IP67 ø 58 mm [2.28"]<br>2 = <u>synchro flange, IP65 ø 58 mm [2.28"]</u><br>4 = synchro flange, IP67 ø 58 mm [2.28"]<br>5 = square flange, IP65 □ 63.5 mm [2.5"]<br>7 = square flange, IP67 □ 63.5 mm [2.5"] | 1 = <u>6 x 10 mm [0.24 x 0.39"]</u> <sup>1)</sup><br>2 = <u>10 x 20 mm [0.39 x 0.79"]</u> <sup>2)</sup><br>3 = 1/4" x 7/8"<br>4 = 3/8" x 7/8" |                           | C = <u>PROFINET IO / 10 ... 30 V DC</u><br><br>d Type of connection<br>removable bus terminal cover<br>2 = <u>3 x M12 connector, 4-pin</u> |  | C2 = <u>PROFINET IO</u><br><br>Optional on request<br>- Ex 2/22<br>- surface protection salt spray tested |

|   |   |                           |  |  |   |
|---|---|---------------------------|--|--|---|
| <b>Order code</b>   | <b>8.5888</b>   | <b>. X X C 2 . C 2 12</b> | Type<br>a b c d e  | If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |   |
| <b>Hollow shaft</b>   |   |                           |  |  |   |
| <b>a Flange</b>   | <b>b Blind hollow shaft (insertion depth max. 30 mm [1.18"])</b>  |                           | <b>c Interface / power supply</b>  |  | <b>e Fieldbus profile</b>   |
| 1 = with spring element, long, IP65<br>2 = with spring element, long, IP67<br>3 = with stator coupling, IP65 ø 65 mm [2.56"]<br>4 = with stator coupling, IP67 ø 65 mm [2.56"]<br>5 = <u>with stator coupling, IP65 ø 63 mm [2.48"]</u><br>6 = with stator coupling, IP67 ø 63 mm [2.48"] | 3 = ø 10 mm [0.39"]<br>4 = <u>ø 12 mm [0.47"]</u><br>5 = ø 14 mm [0.55"]<br>6 = ø 15 mm [0.59"]<br>8 = ø 3/8"<br>9 = ø 1/2" |                           | C = <u>PROFINET IO / 10 ... 30 V DC</u><br><br>d Type of connection<br>removable bus terminal cover<br>2 = <u>3 x M12 connector, 4-pin</u> |  | C2 = <u>PROFINET IO</u><br><br>Optional on request<br>- Ex 2/22<br>- surface protection salt spray tested |

1) Preferred type only in conjunction with flange type 2.  
 2) Preferred type only in conjunction with flange type 1.

# Absolute encoders – multiturn

| Standard mechanical multiturn, optical                |   | Sendix 5868 / 5888 (shaft / hollow shaft) | PROFINET IO                 |
|---|---|---|-----------------------------|
| <b>Mounting accessory for shaft encoders</b>          |   |   | Order no.                   |
| <b>Coupling</b>                                       | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 6 mm [0.24"]                           |   | <b>8.0000.1102.0606</b>     |
|   | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 10 mm [0.39"]                          |   | <b>8.0000.1102.1010</b>     |
| <b>Mounting accessory for hollow shaft encoders</b>   |   |   | Order no.                   |
| <b>Cylindrical pin, long</b>                          | Dimensions in mm [inch]   | with fixing thread                        | <b>8.0010.4700.0000</b>     |
| for flange with spring element<br>(flange type 1 + 2) |   |   |                             |
| <b>Connection technology</b>                          |   |   | Order no.                   |
| <b>Cordset, pre-assembled</b>                         | M12 male connector with external thread for port 1 and port 2, 4-pin<br>2 m [6.56'] PUR cable |   | <b>05.00.6031.4411.002M</b> |
|   | M12 female connector with coupling nut for power supply, 4-pin<br>2 m [6.56'] PUR cable       |   | <b>05.00.6061.6211.002M</b> |
| <b>Connector, self-assembly (straight)</b>            | M12 male connector with external thread for port 1 and port 2, 4-pin                          |   | <b>05.WACSY4S</b>           |
|   | M12 female connector with coupling nut for power supply, 4-pin                                |   | <b>05.B8141-0</b>           |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                                   |  |  |
|--|--|--|
| <b>Mechanical characteristics</b>                |  |  |
| <b>Maximum speed</b>                             | IP65 up to 70°C [158°F]<br>IP65 up to T <sub>max</sub><br>IP67 up to 70°C [158°F]<br>IP67 up to T <sub>max</sub> | 9000 min <sup>-1</sup> , 7000 min <sup>-1</sup> (continuous)<br>7000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)<br>8000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)<br>6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Starting torque - at 20°C [68°F]</b>          | IP65<br>IP67   | < 0.01 Nm<br>< 0.05 Nm   |
| <b>Mass moment of inertia</b>                    | shaft version<br>hollow shaft version  | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup><br>7.5 x 10 <sup>-6</sup> kgm <sup>2</sup>   |
| <b>Load capacity of shaft</b>                    | radial<br>axial  | 80 N<br>40 N   |
| <b>Weight</b>                                    |  | approx. 0.54 kg [19.05 oz]   |
| <b>Protection acc. to EN 60529</b>               | housing side<br>shaft side   | IP67<br>IP65, opt. IP67  |
| <b>Working temperature range</b>                 |  | -40°C ... +85°C [-40°F ... +185°F]   |
| <b>Material</b>                                  | shaft/hollow shaft<br>flange<br>housing  | stainless steel<br>aluminum<br>zinc die-cast   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    |  | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> |  | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |
| <b>Interface characteristics PRROFINET IO</b>    |  |  |
| <b>Resolution singleturn</b>                     |  | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)   |
| <b>Number of revolutions (multiturn)</b>         |  | max. 4096 (12 bit)<br>scalable only via the total resolution   |
| <b>Total resolution</b>                          |  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)   |
| <b>Code</b>                                      |  | binary   |
| <b>Protocol</b>                                  |  | PROFINET IO  |
| <b>Link 1 and 2, LED (green / yellow)</b>        |  |  |
| two colored                                      | green<br>yellow  | active link<br>data transfer   |
| <b>Error LED (red) / PWR LED (green)</b>         |  |  |
| Functionality see manual                         |  |  |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>                     | max. 200 mA   |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|---|--|--------------------|

### General information about PROFINET IO

The PROFINET encoder implements the Encoder Profile 4.1. (according to the specification Encoder Version 4.1 Dec 2008")

It permits scaling and preset values, as well as many other additional parameters to be programmed via the PROFINET-Bus.

When switching on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure, or taken over by the controller in the start-up phase.

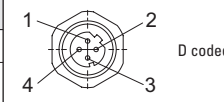
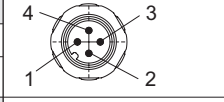
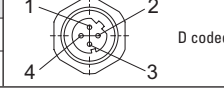
Position, speed and many other states of the encoder can be transmitted.

### PROFINET IO

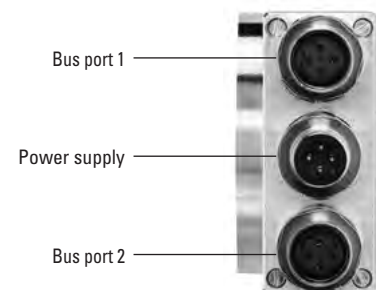
The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**rotocol is implemented here. Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

### Terminal assignment

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                |   |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|---|
| C         | 2<br>(3 x M12 connector) | Bus port 1   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |    |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |   |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |   |
|           |                          | Power supply | Signal:              | Voltage +      | -             | Voltage -       | -              |   |
|           |                          |              | Abbreviation:        | + V            | -             | 0 V             | -              |   |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |   |
|           |                          | Bus port 2   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |  |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |   |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |   |

Absolute encoders multiturn



# Absolute encoders – multiturn

**Standard  
mechanical multiturn, optical**

**Sendix 5868 / 5888 (shaft / hollow shaft)**

**PROFINET IO**

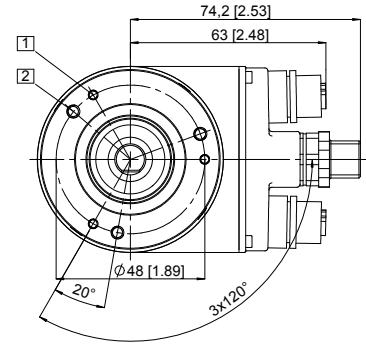
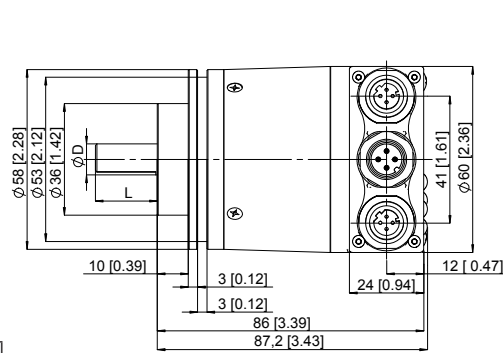
## Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 58 [2.28]

Flange type 1 and 3

- 1 3 x M3, 6.0 [0.24] deep
- 2 3 x M4, 8.0 [0.31] deep

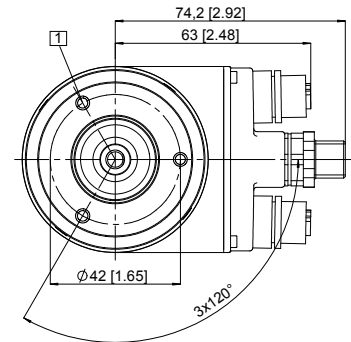
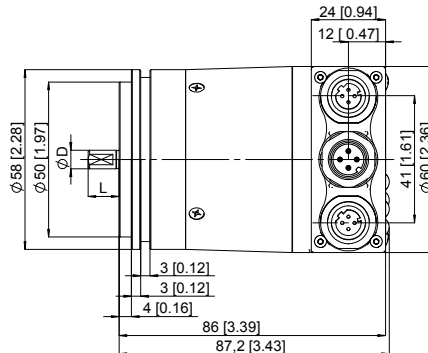


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Synchro flange, $\varnothing$ 58 [2.28]

Flange type 2 and 4

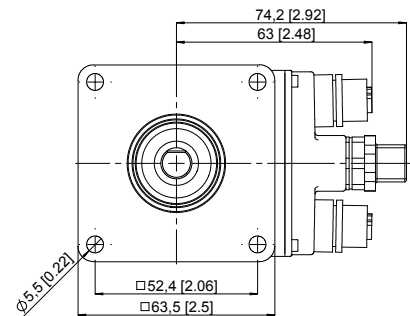
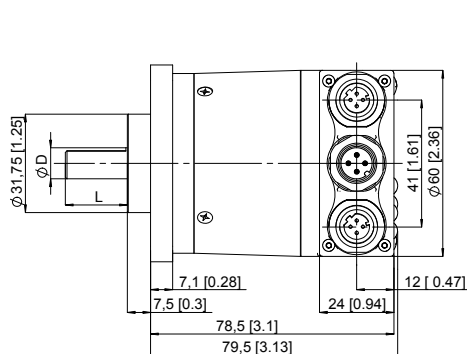
- 1 3 x M4, 6.0 [0.24] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

### Square flange, $\square$ 63.5 [2.5]

Flange type 5 and 7



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h7  | 7/8"      |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard<br/>mechanical multiturn, optical</b> | <b>Sendix 5868 / 5888 (shaft / hollow shaft)</b> | <b>PROFINET IO</b> |
|---|--|--------------------|

## Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

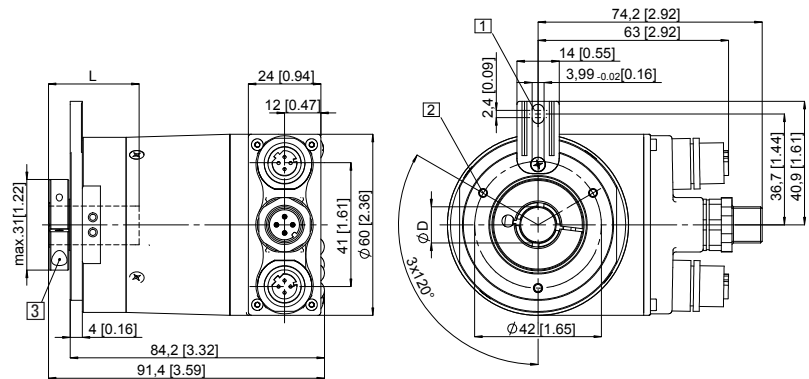
Dimensions in mm [inch]

### Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

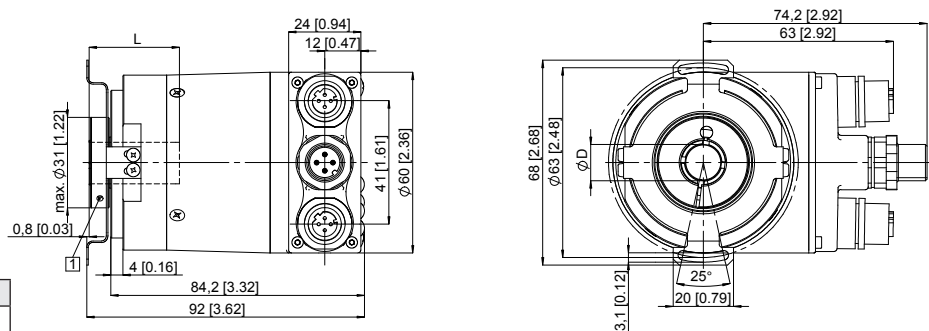


### Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

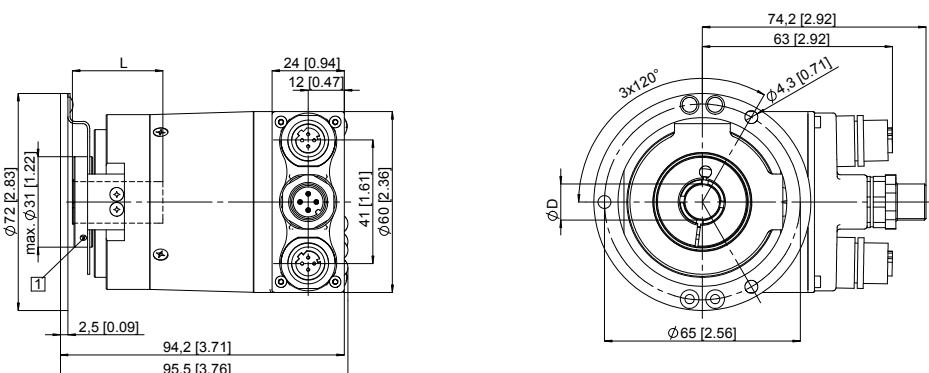


### Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm

| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft



# Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21  
mechanical multiturn, optical

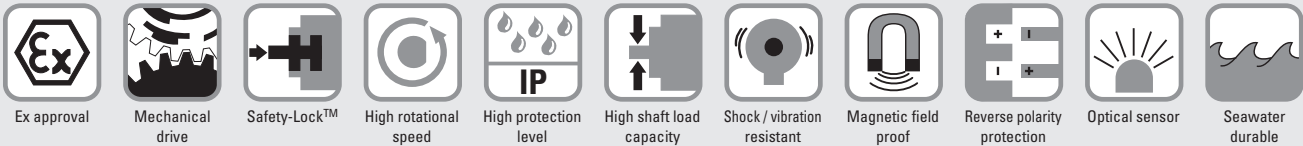
Sendix 7063 / 7083 (shaft / hollow shaft)

SSI / BiSS



The Sendix 7063 / 7083 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code Shaft version

8.7063 . 1 X 2 X . X X 2 1 . XXXX  
Type      a b c d e f g h i <sup>1)</sup>

### a Flange

1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

### b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

### c Interface / power supply

2 = SSI, BiSS / 10 ... 30 V DC

### d Type of connection

1 = axial cable, 2 m [6.56'] PUR

2 = radial cable, 2 m [6.56'] PUR

A = axial cable, length > 2 m [6.56']

B = radial cable, length > 2 m [6.56']

### e Code

B = SSI, binary

C = BiSS, binary

G = SSI, gray

### f Resolution <sup>2)</sup>

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

### g Inputs / outputs <sup>2)</sup>

2 = SET, DIR input

additional status output

### h Options

1 = no option

### i Cable length in dm <sup>1)</sup>

0050 = 5 m [16.40']

0100 = 10 m [32.81']

0150 = 15 m [49.21']

### Optional on request

- special cable length
- stainless steel version
- other singleturn resolutions
- IP65 version for T6

1) Not applicable with connection types 1 and 2.

2) Resolution, preset value and counting direction factory-programmable.



# Absolute encoders – multiturn

|   |  |                 |
|---|--|-----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7063 / 7083 (shaft / hollow shaft)</b> | <b>SSI/BiSS</b> |
|---|--|-----------------|

|   |   |  |
|---|---|--|
| <b>Order code</b><br><b>Hollow shaft</b>  | <b>8.7083</b><br>Type   | <b>.XX2X.XX21.XXXX</b><br>a b c d e f g h i <sup>1)</sup>  |
| <b>a Flange</b><br>1 = with spring element, short<br>5 = with stator coupling, IP67, ø 65 mm [2.56"]  | <b>e Code</b><br>B = SSI, binary<br>C = BiSS, binary<br>G = SSI, gray   | <b>g Inputs / outputs <sup>2)</sup></b><br>2 = SET, DIR input<br>additional status output  |
| <b>b Blind hollow shaft</b><br>(insertion depth max. 41.5 mm [1.63"])<br>1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]   | <b>f Resolution <sup>2)</sup></b><br>A = 10 bit ST + 12 bit MT<br>1 = 11 bit ST + 12 bit MT<br>2 = 12 bit ST + 12 bit MT<br>3 = 13 bit ST + 12 bit MT<br>4 = 14 bit ST + 12 bit MT<br>7 = 17 bit ST + 12 bit MT | <b>h Options</b><br>1 = no option  |
| <b>c Interface / power supply</b><br>2 = SSI, BiSS / 10 ... 30 V DC   |   | <b>i Cable length in dm <sup>1)</sup></b><br>0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']                             |
| <b>d Type of connection</b><br>1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   | <b>Optional on request</b><br>- special cable length<br>- stainless steel version<br>- other singleturn resolutions<br>- IP65 version for T6 |

|   |                         |
|---|-------------------------|
| <b>Mounting accessory for shaft encoders</b>                                | <b>Order no.</b>        |
| <b>Coupling</b><br>bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection Sendix 7063       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7083       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1091 X  |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0020 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 45 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short-circuit proof outputs</b>                  | yes <sup>3)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

1) Not applicable with connection types 1 and 2.  
2) Resolution, preset value and counting direction factory-programmable.  
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

|   |  |                 |
|---|--|-----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7063 / 7083 (shaft / hollow shaft)</b> | <b>SSI/BiSS</b> |
|---|--|-----------------|

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| SSI interface                            |  |
|--|--|
| <b>Output driver</b>                     | RS485 transceiver type   |
| <b>Permissible load / channel</b>        | max. +/- 20 mA   |
| <b>Signal level</b>                      | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V   |
| <b>Resolution singleturn</b>             | 10 ... 14 bit and 17 bit   |
| <b>Number of revolutions (multiturn)</b> | 4096 (12 bit)  |
| <b>Code</b>                              | binary or gray   |
| <b>SSI clock rate</b>                    | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>                 | ST resolution ≤ 14 bit < 1 μs<br>ST resolution ≥ 15 bit 4 μs   |
| <b>Monoflop time</b>                     | < 15 μs <sup>2)</sup>  |
| <b>Note:</b>                             | if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 14 bit and 17 bit  |
| <b>Number of revolutions (multiturn)</b> | 4096 (12 bit)   |
| <b>Code</b>                              | binary  |
| <b>Clock rate</b>                        | up to 10 MHz  |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings<br>– CRC data verification |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |      |       |        |  |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|------|-------|--------|--|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | Stat | ⊥     | ⊥      |  |
| 2         | 1, 2, A, B         | SET, DIR | Cable marking:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9    | YE/GN | shield |  |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 C+, C-: Clock signal  
 D+, D-: Data signal  
 SET: Set input

DIR: Direction input  
 Stat: Status output  
 ⊥: Protective earth

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull-up resistor 22 kOhm |
| <b>Permissible load</b>  | max. 20 mA  |
| <b>Signal level</b>  | HIGH +V<br>LOW < 1 V                              |
| <b>Active at</b>   | LOW   |
| The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation. |   |

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | HIGH active  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = Power supply) | HIGH min. 60 % of +V<br>max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Timeout after SET signal</b>            | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

# Absolute encoders – multiturn

|   |  |                 |
|---|--|-----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7063 / 7083 (shaft / hollow shaft)</b> | <b>SSI/BiSS</b> |
|---|--|-----------------|

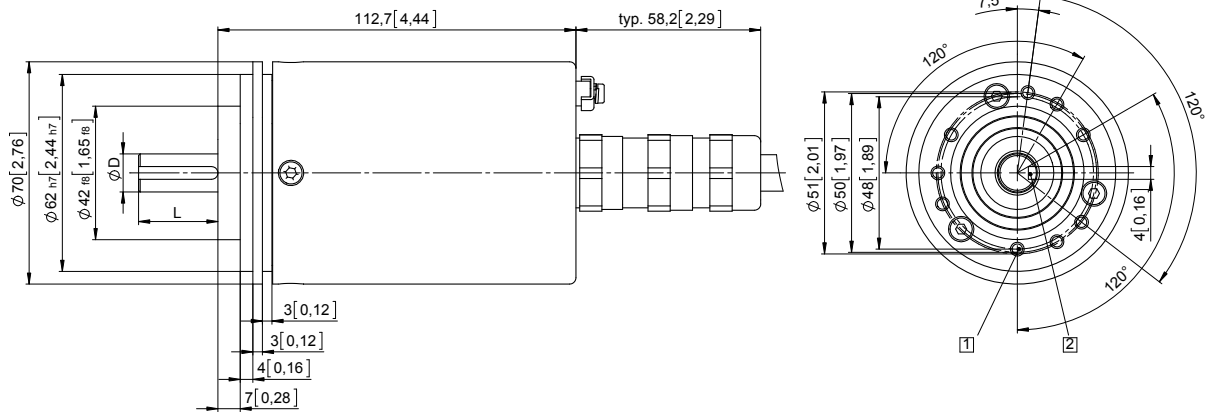
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

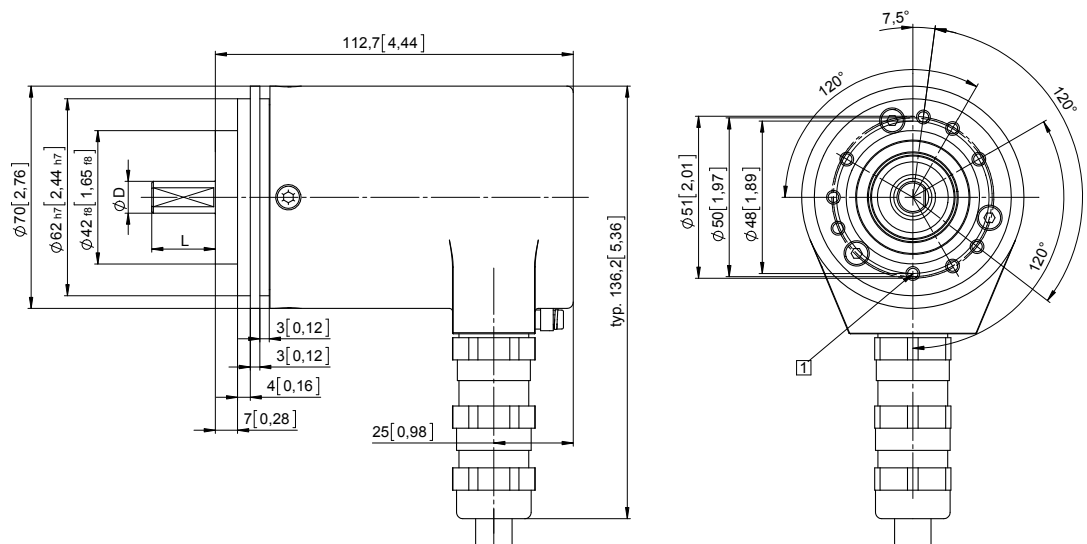


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21  
mechanical multiturn, optical**

**Sendix 7063 / 7083 (shaft / hollow shaft)**

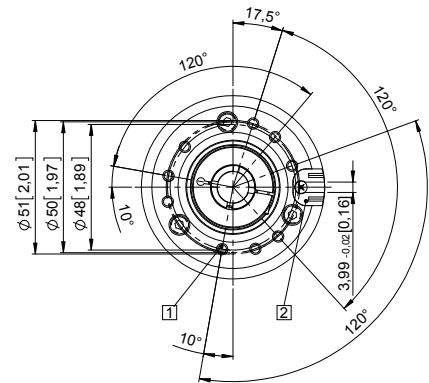
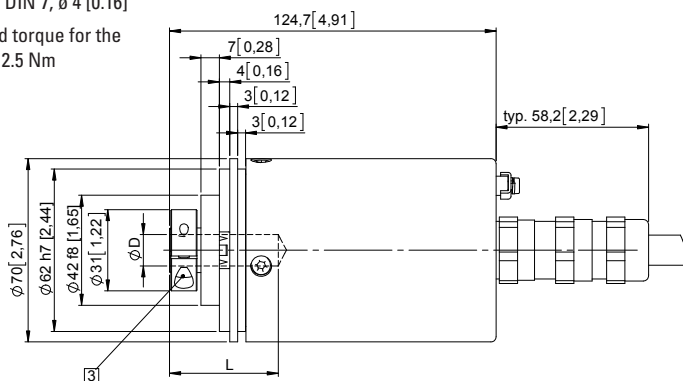
**SSI/BiSS**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



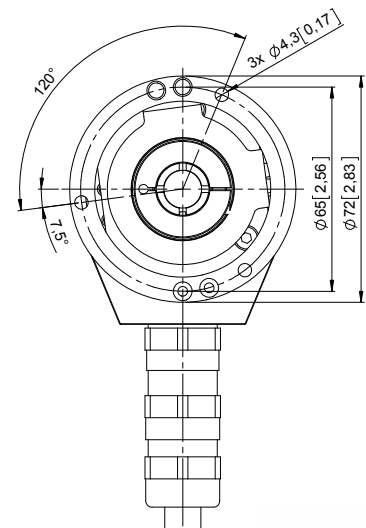
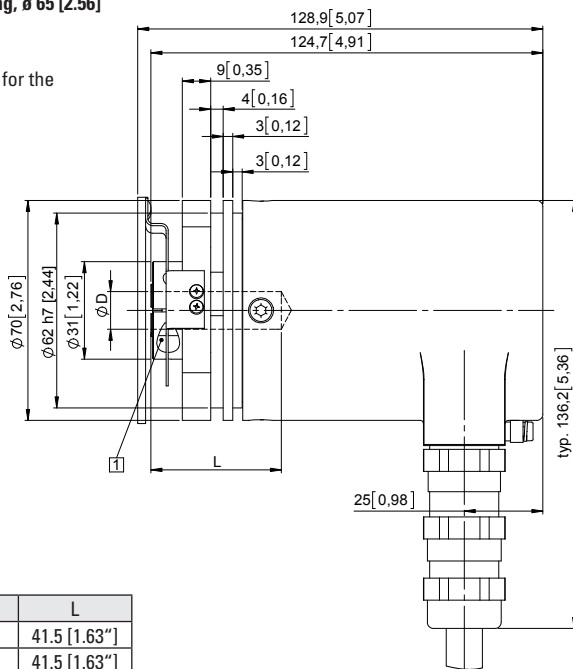
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

|   |                            |                   |
|---|----------------------------|-------------------|
| Standard, ATEX/IECEX – zone 1/21<br>SIL2/PLd, mechanical multiturn, optical | Sendix SIL 7063FS2 (shaft) | SSI/BiSS + SinCos |
|---|----------------------------|-------------------|



Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
|-------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|---------------------|-----------------------------|----------------|------------------|
|             |              |                       |                       |                          |                             |                      |                     |                             |                |                  |
| Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable |

## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Absolute encoders  
multiturn

|                      |                  |                                   |
|----------------------|------------------|-----------------------------------|
| <b>Order code</b>    | <b>8.7063FS2</b> | <b>. 1 X 4 X . X X 2 1 . XXXX</b> |
| <b>Shaft version</b> | Type             | a b c d e f g h i 1)              |

- |   |   |   |
|---|---|---|
| <p><b>a Flange</b><br/>1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b Shaft (ø x L)</b><br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c Interface / power supply</b><br/>4 = SSI, BiSS + 2048 ppr. SinCos / 10... 30 V DC</p> <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']<br/>preferred length see <b>i</b>, e. g.: 0100 = 10 m [32.81']</p> | <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f Resolution 2)</b><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/>3 = 13 bit ST + 12 bit MT<br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> | <p><b>g Inputs / outputs 2)</b><br/>2 = SET input</p> <p><b>h Options</b><br/>1 = no option</p> <p><b>i Cable length in dm 1)</b><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- special cable length<br/>- stainless steel version<br/>- other singleturn resolutions</p> |
|---|---|---|

1) Not applicable with connection types 1 and 2.  
2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders – multiturn

|   |   |                            |
|---|---|----------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, mechanical multiturn, optical</b> | <b>Sendix SIL 7063FS2 (shaft)</b>   | <b>SSI / BiSS + SinCos</b> |
| <b>Accessories</b>  |   | <b>Order no.</b>           |
| <b>EMC shield terminal</b>  | for top-hat rail mounting   | <b>8.0000.4G06.0000</b>    |
| <b>Screw retention</b>  | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b>    |
| <b>Bellows coupling, safety-oriented</b>  | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                            |
| <b>Safety modules Safety-M compact / modular</b>                                    | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                            |
| <b>LED SSI display 570 / 575</b>  | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection                   |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Notes regarding "Functional Safety"  |  |
|--|--|
| These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual. |  |

| Safety characteristics                     |   |
|--|---|
| <b>Classification</b>                      | PLd / SIL2  |
| <b>System structure</b>                    | 2 channel (Cat. 3)  |
| <b>PFH<sub>d</sub> value <sup>1)</sup></b> | 2.16 x 10 <sup>-8</sup> h <sup>-1</sup>                         |
| <b>Mission time / Proof test interval</b>  | 20 years  |
| <b>Relevant standards</b>                  | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 50 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short circuit proof outputs</b>                  | yes <sup>2)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.3 kg [45.86 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.  
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

|   |                                   |                          |
|---|-----------------------------------|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/PLd, mechanical multiturn, optical</b> | <b>Sendix SIL 7063FS2 (shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---|-----------------------------------|--------------------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit and 17 bit                                     |
| <b>Number of revolutions (multiturn)</b>  | 4096 (12 bit)  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 14 bit and 17 bit  |
| <b>Number of revolutions (multiturn)</b> | 4096 (12 bit)   |
| <b>Code</b>                              | binary  |
| <b>Clock rate</b>                        | up to 10 MHz  |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>1)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

| SET input                                  |  |
|--|--|
| <b>Input</b>                               | HIGH active  |
| <b>Input type</b>                          | comparator   |
| <b>Signal level</b><br>(+V = Power supply) | HIGH min. 60 % of +V<br>max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>                       | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b>           | 10 ms  |
| <b>Timeout after SET signal</b>            | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

Absolute encoders multiturn

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |   |           |   |           |         |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|---|-----------|---|-----------|---------|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |
| 4         | 1, 2, A, B         | SET      | Cable marking:  | 6   | 1  | 2  | 3  | 4  | 5  | 11  | 7 | 8         | 9 | 10        | shield  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21  
SIL2/PLd, mechanical multiturn, optical**

**Sendix SIL 7063FS2 (shaft)**

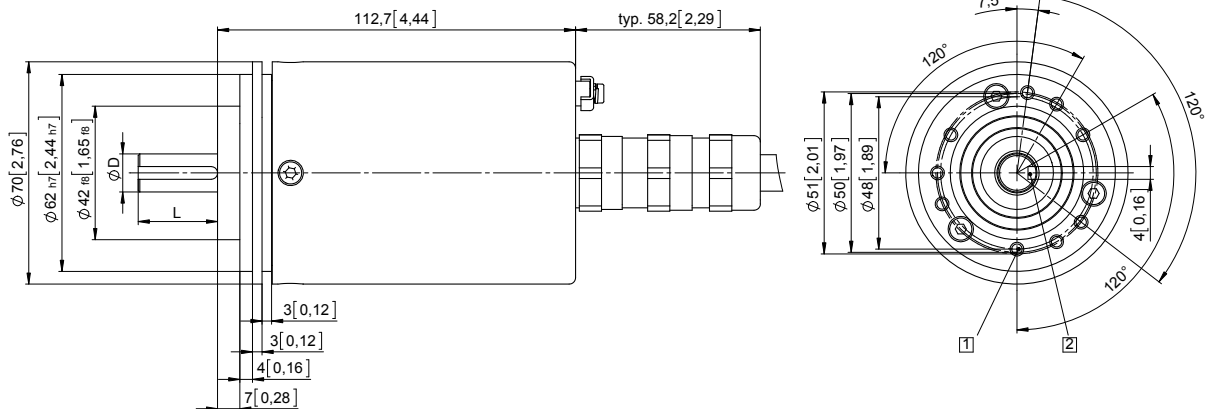
**SSI / BiSS + SinCos**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]  
Shaft type 1 with axial cable outlet**

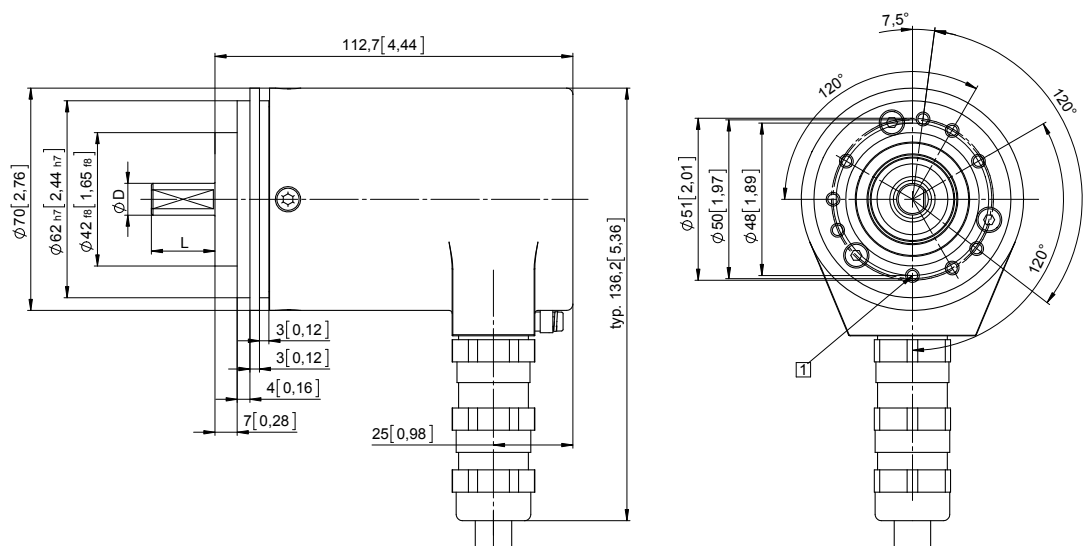
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]  
Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders – multiturn

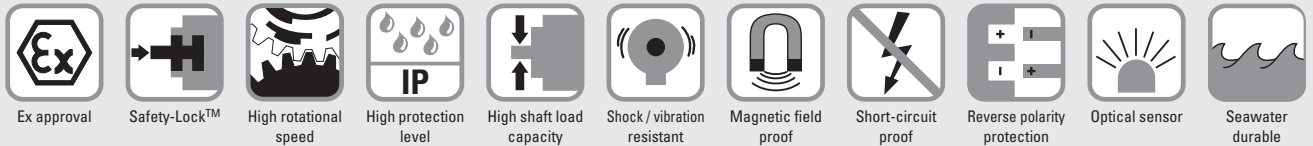
|  |                            |                   |
|--|----------------------------|-------------------|
| Standard, ATEX/IECEX – zone 1/21<br>SIL2/SIL3/PLe, mechanical multiturn, optical | Sendix SIL 7063FS3 (shaft) | SSI/BiSS + SinCos |
|--|----------------------------|-------------------|



Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



## Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Absolute encoders  
multiturn

|                      |                  |                                   |
|----------------------|------------------|-----------------------------------|
| <b>Order code</b>    | <b>8.7063FS3</b> | <b>. 1 X 4 X . X X 2 1 . XXXX</b> |
| <b>Shaft version</b> | Type             | a b c d e f g h i 1)              |

- |   |   |   |
|---|---|---|
| <p><b>a Flange</b><br/>1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b Shaft (ø x L)</b><br/>2 = 10 x 20 mm [0.39 x 0.79"], with flat<br/>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c Interface / power supply</b><br/>4 = SSI, BiSS + 2048 ppr. SinCos / 10... 30 V DC</p> <p><b>d Type of connection</b><br/>1 = axial cable, 2 m [6.56'] PUR<br/>2 = radial cable, 2 m [6.56'] PUR<br/>A = axial cable, length &gt; 2 m [6.56']<br/>B = radial cable, length &gt; 2 m [6.56']<br/>preferred length see <b>i</b>, e. g.: 0100 = 10 m [32.81']</p> | <p><b>e Code</b><br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> <p><b>f Resolution 2)</b><br/>A = 10 bit ST + 12 bit MT<br/>1 = 11 bit ST + 12 bit MT<br/>2 = 12 bit ST + 12 bit MT<br/>3 = 13 bit ST + 12 bit MT<br/>4 = 14 bit ST + 12 bit MT<br/>7 = 17 bit ST + 12 bit MT</p> | <p><b>g Inputs / outputs 2)</b><br/>2 = SET input</p> <p><b>h Options</b><br/>1 = no option</p> <p><b>i Cable length in dm 1)</b><br/>0050 = 5 m [16.40']<br/>0100 = 10 m [32.81']<br/>0150 = 15 m [49.21']</p> <p><i>Optional on request</i><br/>- special cable length<br/>- stainless steel version<br/>- other singleturn resolutions</p> |
|---|---|---|

1) Not applicable with connection types 1 and 2.  
2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders – multiturn

|  |   |                            |
|--|---|----------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/SIL3/PLe, mechanical multiturn, optical</b> | <b>Sendix SIL 7063FS3 (shaft)</b>   | <b>SSI / BiSS + SinCos</b> |
| <b>Accessories</b>   |   | Order no.                  |
| <b>EMC shield terminal</b>   | for top-hat rail mounting   | <b>8.0000.4G06.0000</b>    |
| <b>Screw retention</b>   | Loctite 243, 5 ml   | <b>8.0000.4G05.0000</b>    |
| <b>Bellows coupling, safety-oriented</b>   | You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under <a href="http://www.kuebler.com/accessories">www.kuebler.com/accessories</a> .                                 |                            |
| <b>Safety modules Safety-M compact / modular</b>   | You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under <a href="http://www.kuebler.com/safety">www.kuebler.com/safety</a> . |                            |
| <b>LED SSI display 570 / 575</b>   | Electronic position display up to 32 bit. You will find an overview in the accessories section or under <a href="http://www.kuebler.com/position_display">www.kuebler.com/position_display</a> .                            |                            |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection                   |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Notes regarding "Functional Safety"  |  |
|--|--|
| These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual. |  |

| Safety characteristics                     |   |
|--|---|
| <b>Classification</b>                      | PLe / SIL3  |
| <b>System structure</b>                    | 2 channel (Cat. 4)  |
| <b>PFH<sub>d</sub> value <sup>1)</sup></b> | 1.09 x 10 <sup>-8</sup> h <sup>-1</sup>                         |
| <b>Mission time / Proof test interval</b>  | 20 years  |
| <b>Relevant standards</b>                  | EN ISO 13849-1:2008<br>EN ISO 13849-2:2013<br>EN 61800-5-2:2007 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 50 mA   |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>Short circuit proof outputs</b>                  | yes <sup>2)</sup>  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>Machinery directive 2006/42/EC<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.3 kg [45.86 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 500 m/s <sup>2</sup> , 11 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 200 m/s <sup>2</sup> , 10 ... 150 Hz   |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL3.  
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

|  |                                   |                          |
|--|-----------------------------------|--------------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>SIL2/SIL3/PLe, mechanical multiturn, optical</b> | <b>Sendix SIL 7063FS3 (shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|--|-----------------------------------|--------------------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit and 17 bit                                     |
| <b>Number of revolutions (multiturn)</b>  | 4096 (12 bit)  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | ≤ 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 14 bit and 17 bit  |
| <b>Number of revolutions (multiturn)</b> | 4096 (12 bit)   |
| <b>Code</b>                              | binary  |
| <b>Clock rate</b>                        | up to 10 MHz  |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | <ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul> |

| SinCos interface           |                           |
|----------------------------|---------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                   |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10 %) |
| <b>Short circuit proof</b> | yes <sup>1)</sup>         |
| <b>Pulse rate</b>          | 2048 ppr                  |

| SET input                        |  |
|----------------------------------|--|
| <b>Input</b>                     | HIGH active  |
| <b>Input type</b>                | comparator   |
| <b>Signal level</b>              | HIGH min. 60 % of +V<br>max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>             | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b> | 10 ms  |
| <b>Timeout after SET signal</b>  | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

Absolute encoders  
multiturn

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |   |           |   |           |         |  |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|---|-----------|---|-----------|---------|--|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | A | $\bar{A}$ | B | $\bar{B}$ | $\perp$ |  |
| 4         | 1, 2, A, B         | SET      | Cable marking:  | 6   | 1  | 2  | 3  | 4  | 5  | 11  | 7 | 8         | 9 | 10        | shield  |  |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal
- $\perp$ : Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21  
SIL2/SIL3/PLe, mechanical multiturn, optical**

**Sendix SIL 7063FS3 (shaft)**

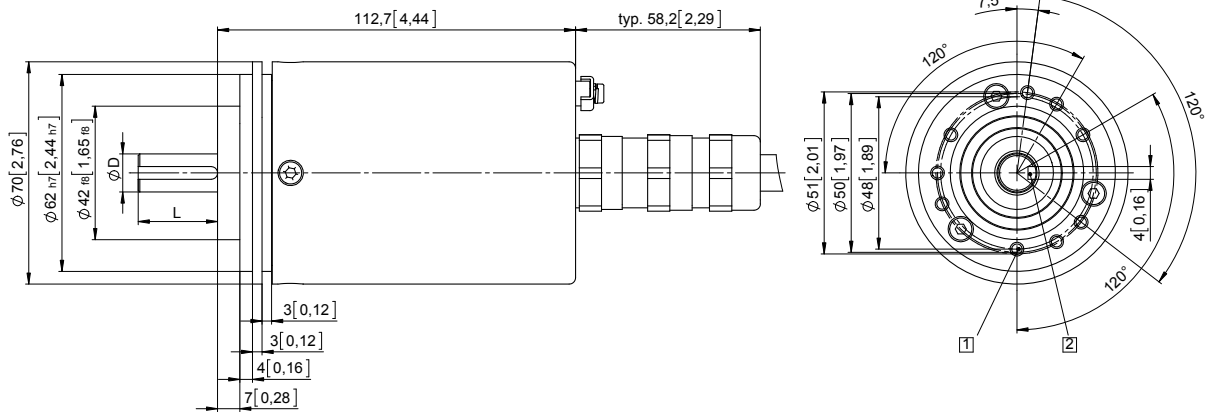
**SSI / BiSS + SinCos**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

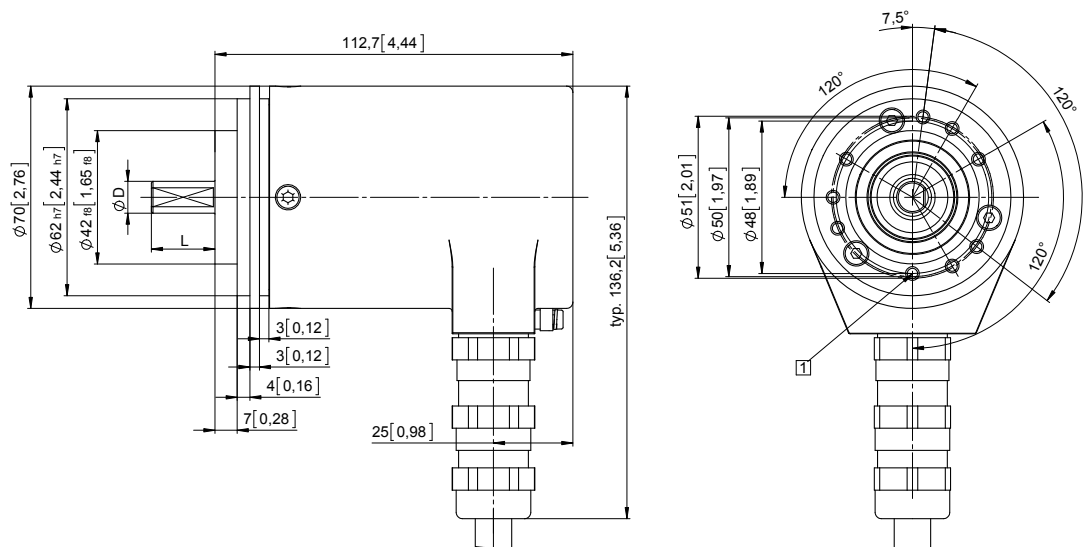
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|



The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



|             |                  |              |                       |                       |                          |                             |                      |                             |                |                  |
|-------------|------------------|--------------|-----------------------|-----------------------|--------------------------|-----------------------------|----------------------|-----------------------------|----------------|------------------|
|             |                  |              |                       |                       |                          |                             |                      |                             |                |                  |
| Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Seawater durable |

### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

 Absolute encoders  
multiturn

|                                   |   |  |
|-----------------------------------|---|--|
| <b>Order code</b>                 | <b>8.7068</b>   | <b>. 1 X 3 X . 31 11 . XXXX</b>  |
| <b>Shaft version</b>              | Type  | a b c d e f 1)   |
| <b>a Flange</b>                   | 1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]  | <b>d Type of connection</b>  |
| <b>b Shaft (ø x L)</b>            | 2 = 10 x 20 mm [0.39 x 0.79"], with flat<br>1 = 12 x 25 mm [0.47 x 0.98"], with keyway<br>for 4 x 4 mm [0.16 x 0.16"] key | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |
| <b>c Interface / power supply</b> | 3 = PROFIBUS DP V0 / 10 ... 30 V DC   | <b>e Fieldbus profile</b>  |
|                                   |   | 31 = PROFIBUS DP V0 encoder profile class 2  |
|                                   |   | <b>f Cable length in dm 1)</b>   |
|                                   |   | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |
|                                   |   | <i>Optional on request</i><br>- special cable length<br>- stainless steel version<br>- IP65 version for T6   |

|  |   |  |
|--|---|--|
| <b>Order code</b>  | <b>8.7088</b>   | <b>. XX 3 X . 31 11 . XXXX</b>   |
| <b>Hollow shaft</b>  | Type  | a b c d e f 1)   |
| <b>a Flange</b>  | 1 = with spring element, short<br>5 = with stator coupling, IP67, ø 65 mm [2.56"] | <b>d Type of connection</b>  |
| <b>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])</b> | 1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]  | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |
| <b>c Interface / Power supply</b>                                  | 3 = PROFIBUS DP V0 / 10 ... 30 V DC   | <b>e Fieldbus profile</b>  |
|  |   | 31 = PROFIBUS DP V0 encoder profile class 2  |
|  |   | <b>f Cable length in dm 1)</b>   |
|  |   | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |
|  |   | <i>Optional on request</i><br>- special cable length<br>- stainless steel version<br>- IP65 version for T6   |

1) Not applicable with connection types 1 and 2.

# Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21  
mechanical multiturn, optical**

**Sendix 7068 / 7088 (shaft / hollow shaft)**

**PROFIBUS DP**

## Mounting accessory for shaft encoders

Order no.

### Coupling

bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]

**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

### Explosion protection Sendix 7068

| ATEX                            |   |
|---------------------------------|---|
| EC type-examination certificate | PTB09 ATEX 1106 X   |
| Category (gas)                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| Category (dust)                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| Relevant standards              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| IECEX                           |   |
| Certificate of Conformity (CoC) | IECEX PTB 13.0026 X   |
| Category (gas)                  | Ex d IIC T4 - T6 Gb   |
| Category (dust)                 | Ex tb IIIC T135°C - T85°C Db                                |
| Relevant standards              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

### Explosion protection Sendix 7088

| ATEX                            |   |
|---------------------------------|---|
| EC type-examination certificate | IBExU 15 ATEX 1091 X  |
| Category (gas)                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| Category (dust)                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| Relevant standards              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| IECEX                           |   |
| Certificate of Conformity (CoC) | IECEX IBE 15.0020 X   |
| Category (gas)                  | Ex d IIC T4 - T6 Gb   |
| Category (dust)                 | Ex tb IIIC T135°C - T85°C Db                                |
| Relevant standards              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

### Mechanical characteristics

|   |  |
|---|--|
| Maximum speed                             | 6000 min <sup>-1</sup> (continuous)  |
| Starting torque – at 20°C [68°F]          | < 0.05 Nm  |
| Mass moment of inertia                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| Load capacity of shaft                    | radial 80 N<br>axial 40 N  |
| Weight                                    | approx. 1.5 kg [52.91 oz]  |
| Protection acc. to EN 60529               | IP67   |
| Ambient temperature                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| Material                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| Shock resistance acc. to EN 60068-2-27    | 2500 m/s <sup>2</sup> , 6 ms   |
| Vibration resistance acc. to EN 60068-2-6 | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

### Electrical characteristics

|  |  |
|--|--|
| Power supply                                 | 10 ... 30 V DC   |
| Current consumption (no load)                | max. 120 mA  |
| Reverse polarity protection for power supply | yes  |
| CE compliant acc. to                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

### EMC

|                    |  |
|--------------------|--|
| Relevant standards | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |
|--------------------|--|

# Absolute encoders – multiturn

|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

| Interface characteristics PROFIBUS DP    |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)   |
| <b>Number of revolutions (multiturn)</b> | 1 ... 4096 (12 bit), scalable  |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)   |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | specification according to<br>PROFIBUS DP 2.0 / standard<br>(DIN 19245 part 3) /<br>RS485 driver galvanically isolated     |
| <b>Protocol</b>                          | Profibus encoder profile V1.1<br>class 1 and class 2<br>with manufacturer-specific add-ons                                 |
| <b>Baud rate</b>                         | maximum 12 Mbit/s  |
| <b>Device address</b>                    | software controlled setting of the<br>device address via the SSA-service<br>with a CLASS 2-master,<br>default address: 125 |
| <b>Termination</b>                       | active termination can only be<br>switched on externally   |

### Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |         |         |         |          |          |
|-----------|--------------------|---|-----|----|---------|---------|---------|---------|----------|----------|
|           |                    | Signal:   | 0 V | +V | PB_A IN | PB_B IN | BUS_GND | BUS_VDC | PB_A OUT | PB_B OUT |
| 3         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4       | 5       | 6       | 7       | 8        | 9        |

 Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21  
mechanical multiturn, optical**

**Sendix 7068 / 7088 (shaft / hollow shaft)**

**PROFIBUS DP**

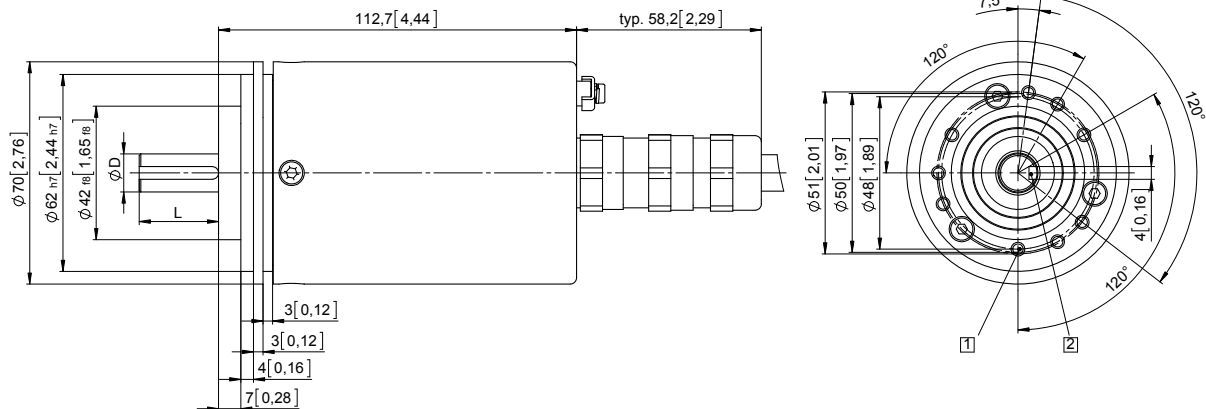
**Dimensions shaft version**

Dimensions in mm [inch]

**Clamping / synchronous flange, ø 70 [2.76]**

**Shaft type 1 with axial cable outlet**

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

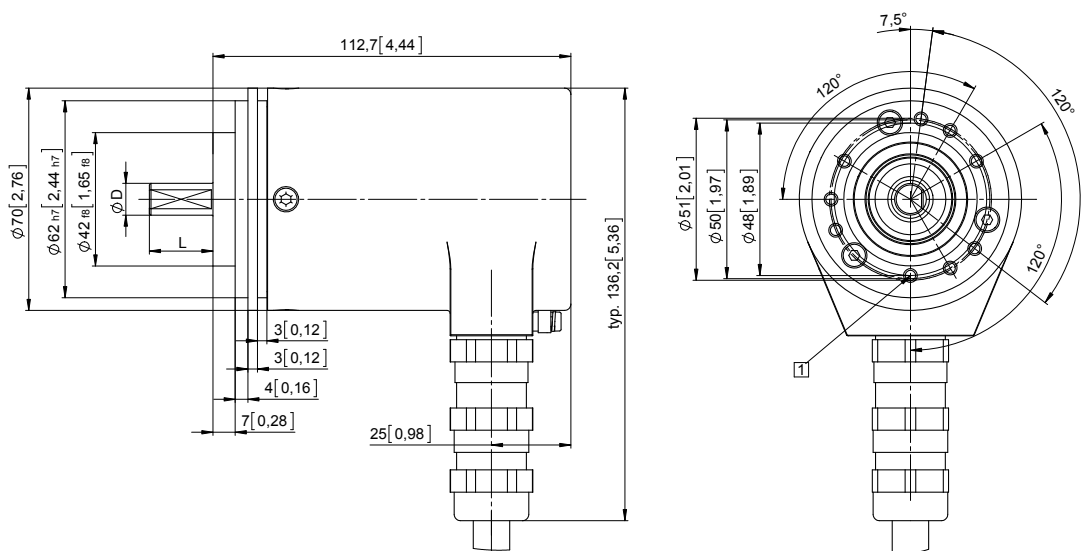


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange, ø 70 [2.76]**

**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |



# Absolute encoders – multiturn

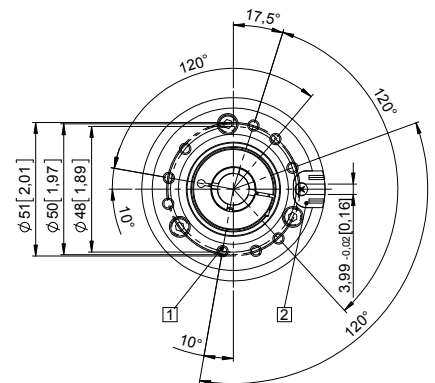
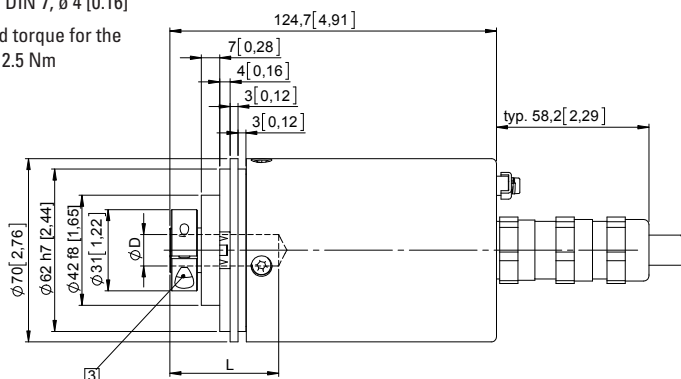
|   |  |                    |
|---|--|--------------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|---|--|--------------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



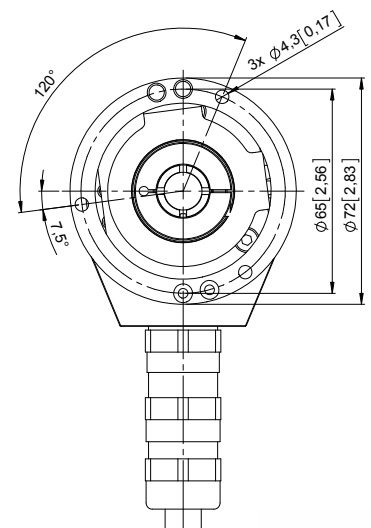
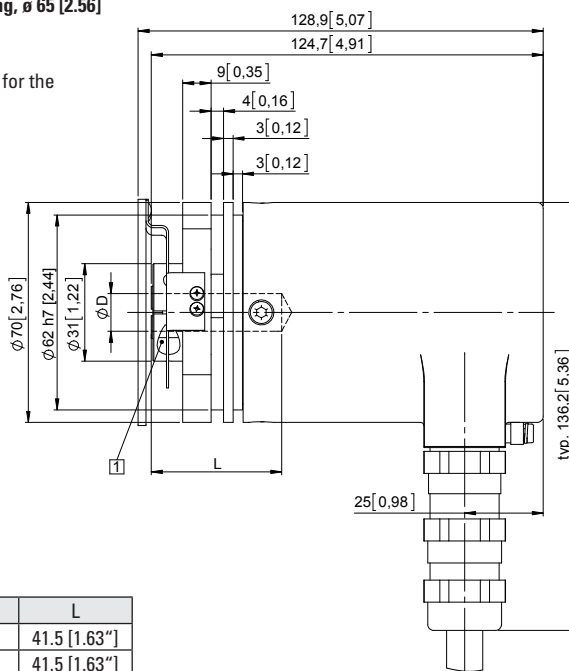
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

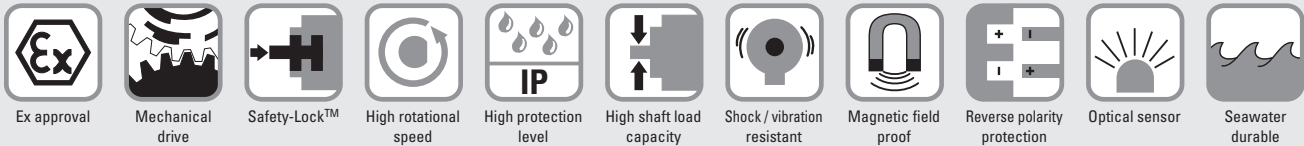
Standard, ATEX/IECEX – zone 1/21  
mechanical multiturn, optical

Sendix 7068 / 7088 (shaft / hollow shaft)

CANopen



The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology. These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

**Order code** 8.7068 . 1 X 2 X . 21 21 . XXXX  
**Shaft version** Type a b c d e f <sup>1)</sup>

- a** Flange  
1 = clamping / synchronous flange, IP67,  $\varnothing$  70 mm [2.76"]
- b** Shaft ( $\varnothing \times L$ )  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway  
for 4 x 4 mm [0.16 x 0.16"] key
- c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']
- e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']
- Optional on request*  
- special cable length  
- stainless steel version  
- IP65 version for T6

**Order code** 8.7088 . X X 2 X . 21 21 . XXXX  
**Hollow shaft** Type a b c d e f <sup>1)</sup>

- a** Flange  
1 = with spring element, short  
5 = with stator coupling, IP67,  $\varnothing$  65 mm [2.56"]
- b** Blind hollow shaft  
(insertion depth max. 41.5 mm [1.63"])  
1 =  $\varnothing$  12 mm [0.47"]  
2 =  $\varnothing$  14 mm [0.55"]
- c** Interface / power supply  
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']
- e** Fieldbus profile  
21 = CANopen encoder profile DS406 V3.2

- f** Cable length in dm <sup>1)</sup>  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']
- Optional on request*  
- special cable length  
- stainless steel version  
- IP65 version for T6

1) Not applicable with connection types 1 and 2.

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

|  |  |                         |
|--|--|-------------------------|
| <b>Mounting accessory for shaft encoders</b> |  | Order no.               |
| <b>Coupling</b>                              | bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"] | <b>8.0000.1102.1010</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Explosion protection Sendix 7068       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | PTB09 ATEX 1106 X   |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2009    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX PTB 13.0026 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2008 |

| Explosion protection Sendix 7088       |   |
|--|---|
| <b>ATEX</b>                            |   |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1091 X  |
| <b>Category (gas)</b>                  | II 2 G Ex d IIC T4 - T6 Gb                                  |
| <b>Category (dust)</b>                 | II 2D Ex tb IIIC T135°C - T85°C Db                          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014;<br>EN 60079-31:2014    |
| <b>IECEX</b>                           |   |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0020 X   |
| <b>Category (gas)</b>                  | Ex d IIC T4 - T6 Gb   |
| <b>Category (dust)</b>                 | Ex tb IIIC T135°C - T85°C Db                                |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014;<br>IEC 60079-31:2013 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 1.5 kg [52.91 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082)<br>cable PUR                       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 100 mA  |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

Absolute encoders  
multiturn

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard, ATEX/IECEX – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

| Interface characteristics CANopen        |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)                             |
| <b>Number of revolutions (multiturn)</b> | max. 4096 (12 bit)<br>scalable only via the total resolution                         |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)                 |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                     |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>                      | 1 ... 127<br>software configurable   |
| <b>Switchable termination</b>            | software configurable  |

## General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

## CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. measuring wheel circumference)  
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

## Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

## Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |       |       |         |       |       |         |
|-----------|--------------------|---|-----|----|-------|-------|---------|-------|-------|---------|
|           |                    | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
| 2         | 1, 2, A, B         | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
|           |                    | Cable marking:  | 1   | 2  | 4     | 5     | 6       | 7     | 8     | 9       |

# Absolute encoders – multiturn

|   |  |                |
|---|--|----------------|
| <b>Standard, ATEX/IECEx – zone 1/21<br/>mechanical multiturn, optical</b> | <b>Sendix 7068 / 7088 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|---|--|----------------|

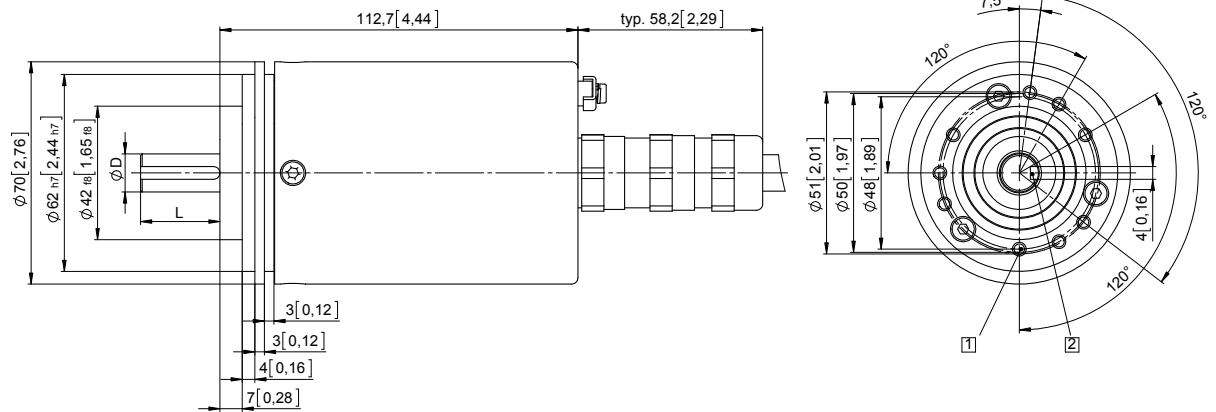
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

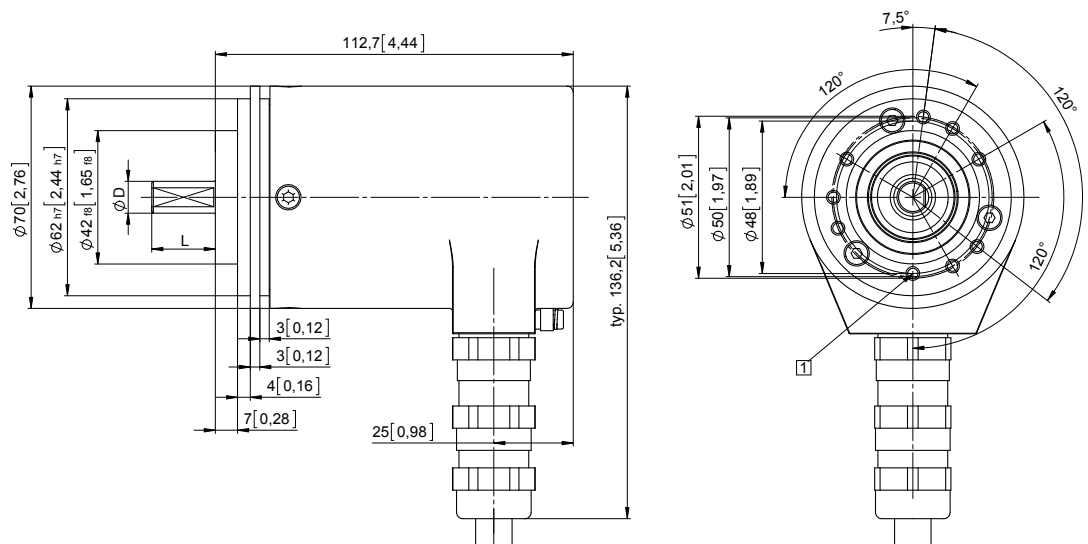


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21  
mechanical multiturn, optical**

**Sendix 7068 / 7088 (shaft / hollow shaft)**

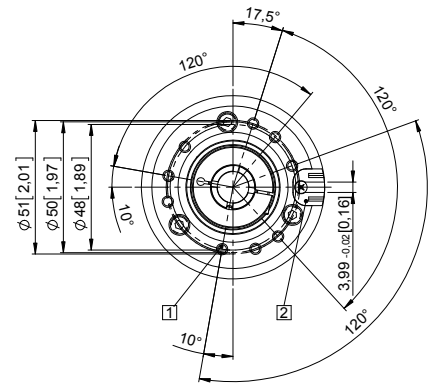
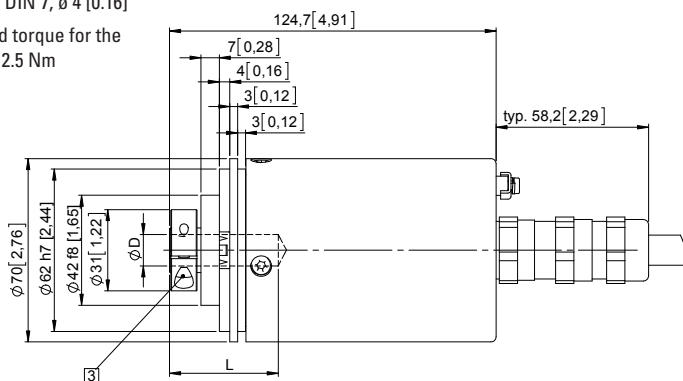
**CANopen**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



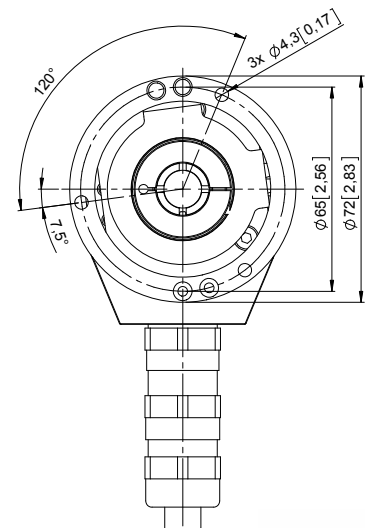
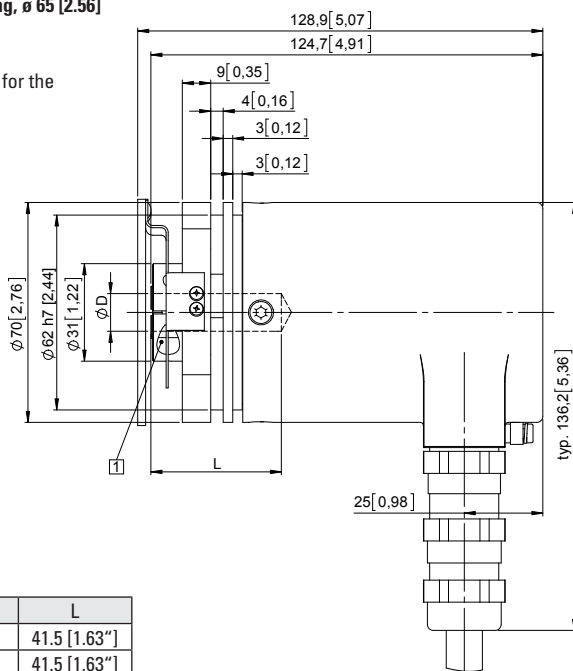
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

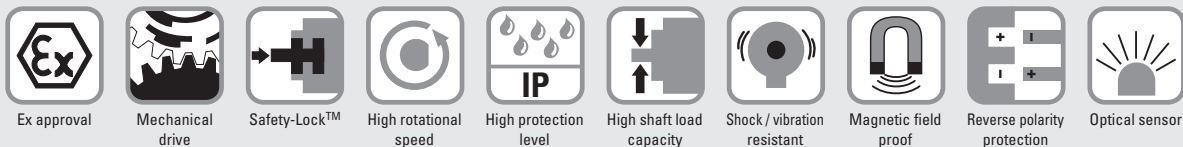
# Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining mechanical multiturn, optical**      **Sendix 7163 / 7183 (shaft / hollow shaft)**      **SSI/BiSS**



The Sendix 7163 / 7183 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with an SSI or BiSS interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available with axial and radial cable outlets.



### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Absolute encoders multiturn

**Order code**      **8.7163 . 2 X 2 X . X X 2 1 . XXXX**  
**Shaft version**      Type      a b c d e f g h i <sup>1)</sup>

**a Flange**  
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

**b Shaft (ø x L)**  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

**c Interface / power supply**  
2 = SSI, BiSS / 10 ... 30 V DC

**d Type of connection**  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

**e Code**  
B = SSI, binary  
C = BiSS, binary  
G = SSI, gray

**f Resolution <sup>2)</sup>**  
A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
3 = 13 bit ST + 12 bit MT  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

**g Inputs / outputs <sup>2)</sup>**  
2 = SET, DIR input  
additional status output

**h Options**  
1 = no option

**i Cable length in dm <sup>1)</sup>**  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

*Optional on request*  
- special cable length  
- other singleturn resolutions

1) Not applicable with connection types 1 and 2.  
2) Resolution, preset value and counting direction factory-programmable.

# Absolute encoders – multiturn

Standard, ATEX/IECEX – mining  
mechanical multiturn, optical

Sendix 7163 / 7183 (shaft / hollow shaft)

SSI/BiSS

Order code  
Hollow shaft

8.7183 . XX2X . XX21 . XXXX  
Type      a b c d      e f g h      i 1)

**a** Flange

2 = with spring element, short  
6 = with stator coupling, IP67, ø 65 mm [2.56"]

**b** Blind hollow shaft

(insertion depth max. 41.5 mm [1.63"])  
1 = ø 12 mm [0.47"]  
2 = ø 14 mm [0.55"]

**c** Interface / power supply

2 = SSI, BiSS / 10 ... 30 V DC

**d** Type of connection

1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']

**e** Code

B = SSI, binary  
C = BiSS, binary  
G = SSI, gray

**f** Resolution <sup>2)</sup>

A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
3 = 13 bit ST + 12 bit MT  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

**g** Inputs / outputs <sup>2)</sup>

2 = SET, DIR input  
additional status output

**h** Options

1 = no option

**i** Cable length in dm <sup>1)</sup>

0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

*Optional on request*

- special cable length  
- other singleturn resolutions

## Technical data

### Explosion protection 7163

**ATEX**

|                                 |                                     |
|---------------------------------|-------------------------------------|
| EC type-examination certificate | IBExU 14 ATEX 1047 X                |
| Category                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb        |
| Relevant standards              | EN 60079-0:2012;<br>EN 60079-1:2007 |

**IECEX**

|                                 |                                       |
|---------------------------------|---------------------------------------|
| Certificate of Conformity (CoC) | IECEX IBE 14.0023 X                   |
| Category                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| Relevant standards              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

### Explosion protection 7183

**ATEX**

|                                 |                                     |
|---------------------------------|-------------------------------------|
| EC type-examination certificate | IBExU 15 ATEX 1057 X                |
| Category                        | ⊕ I M2 Ex d I/IIC T4 Mb             |
| Relevant standards              | EN 60079-0:2012;<br>EN 60079-1:2014 |

**IECEX**

|                                 |                                       |
|---------------------------------|---------------------------------------|
| Certificate of Conformity (CoC) | IECEX IBE 15.0019 X                   |
| Category                        | Ex d I/IIC T4 Mb                      |
| Relevant standards              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

### Mechanical characteristics

|   |  |
|---|--|
| Maximum speed                             | 6000 min <sup>-1</sup> (continuous)  |
| Starting torque – at 20°C [68°F]          | < 0.05 Nm  |
| Mass moment of inertia                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| Load capacity of shaft                    | radial 80 N<br>axial 40 N  |
| Weight                                    | approx. 2.8 kg [98.77 oz]  |
| Protection acc. to EN 60529               | IP67   |
| Ambient temperature                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| Materials                                 | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| Shock resistance acc. to EN 60068-2-27    | 1000 m/s <sup>2</sup> , 6 ms   |
| Vibration resistance acc. to EN 60068-2-6 | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

### Electrical characteristics

|  |  |
|--|--|
| Power supply                                 | 10 ... 30 V DC   |
| Current consumption (no load)                | max. 45 mA   |
| Reverse polarity protection for power supply | yes  |
| Short-circuit proof outputs                  | yes <sup>3)</sup>  |
| CE compliant acc. to                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

### EMC

|                    |  |
|--------------------|--|
| Relevant standards | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |
|--------------------|--|

1) Not applicable with connection types 1 and 2

2) Resolution, preset value and counting direction factory-programmable.

3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.



# Absolute encoders – multiturn

|  |  |                 |
|--|--|-----------------|
| <b>Standard, ATEX/IECEX – mining mechanical multiturn, optical</b> | <b>Sendix 7163 / 7183 (shaft / hollow shaft)</b> | <b>SSI/BiSS</b> |
|--|--|-----------------|

| SSI interface   |  |
|---|--|
| <b>Output driver</b>  | RS485 transceiver type                                       |
| <b>Permissible load / channel</b>   | max. +/- 20 mA   |
| <b>Signal level</b>   | HIGH typ 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ 1.3 V |
| <b>Resolution singleturn</b>  | 10 ... 14 bit and 17 bit                                     |
| <b>Number of revolutions (multiturn)</b>  | 4096 (12 bit)  |
| <b>Code</b>   | binary or gray   |
| <b>SSI clock rate</b>   | 50 kHz ... 2 MHz   |
| <b>Data refresh rate</b>  | ST resolution ≤ 14 bit < 1 μs<br>ST resolution ≥ 15 bit 4 μs |
| <b>Monoflop time</b>  | < 15 μs  |
| <b>Note:</b> if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time. |  |

| BiSS interface                           |   |
|--|---|
| <b>Resolution singleturn</b>             | 10 ... 14 bit and 17 bit  |
| <b>Number of revolutions (multiturn)</b> | 4096 (12 bit)   |
| <b>Code</b>                              | binary  |
| <b>Clock rate</b>                        | up to 10 MHz  |
| <b>Max. update rate</b>                  | < 10 μs, depends on the clock rate and the data length  |
| <b>Data refresh rate</b>                 | ≤ 1 μs  |
| <b>Note:</b>                             | – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings<br>– CRC data verification |

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull-up resistor 22 kOhm |
| <b>Permissible load</b>  | max. 20 mA  |
| <b>Signal level</b>  | HIGH +V<br>LOW < 1 V                              |
| <b>Active at</b>   | LOW   |
| The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation. |   |

## Terminal assignment

| Interface | Type of connection | Features | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |     |     |      |       |        |
|-----------|--------------------|----------|---|-----|----|----|----|----|----|-----|-----|------|-------|--------|
|           |                    |          | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | Stat | ⊥     | ⊥      |
| 2         | 1, 2, A, B         | SET, DIR | Cable marking:  | 1   | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9    | YE/GN | shield |

+V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 C+, C-: Clock signal  
 D+, D-: Data signal  
 SET: Set input

| SET input                        |  |
|----------------------------------|--|
| <b>Input</b>                     | HIGH active  |
| <b>Input type</b>                | comparator   |
| <b>Signal level</b>              | HIGH min. 60 % of +V<br>(+V = Power supply) max. +V<br>LOW max. 25 % of +V |
| <b>Input current</b>             | < 0.5 mA   |
| <b>Min. pulse duration (SET)</b> | 10 ms  |
| <b>Timeout after SET signal</b>  | 14 ms  |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input   |      |
|---|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. |      |
| <b>Response time (DIR input)</b>  | 1 ms |

| Power-ON   |  |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. |  |
| Hot plugging of the encoder should be avoided.   |  |

Absolute encoders multiturn

# Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining  
mechanical multiturn, optical**

**Sendix 7163 / 7183 (shaft / hollow shaft)**

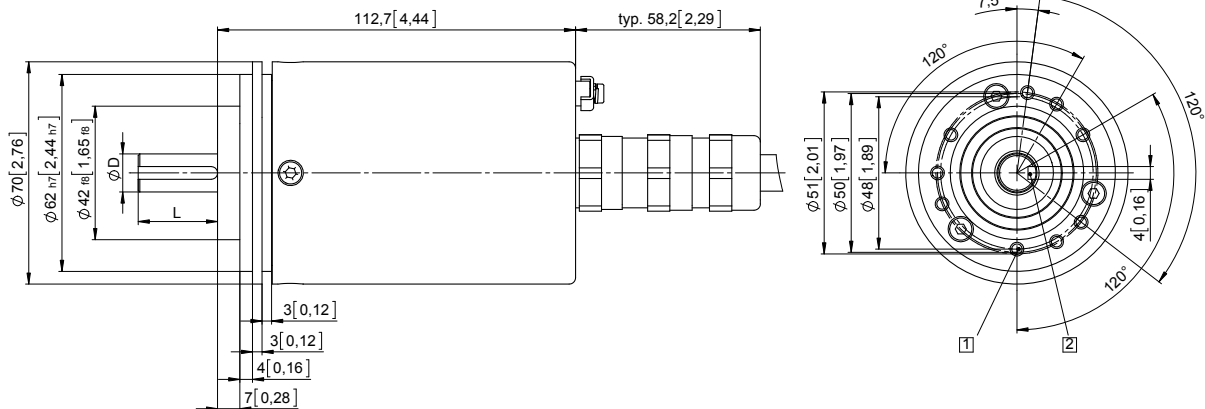
**SSI / BiSS**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

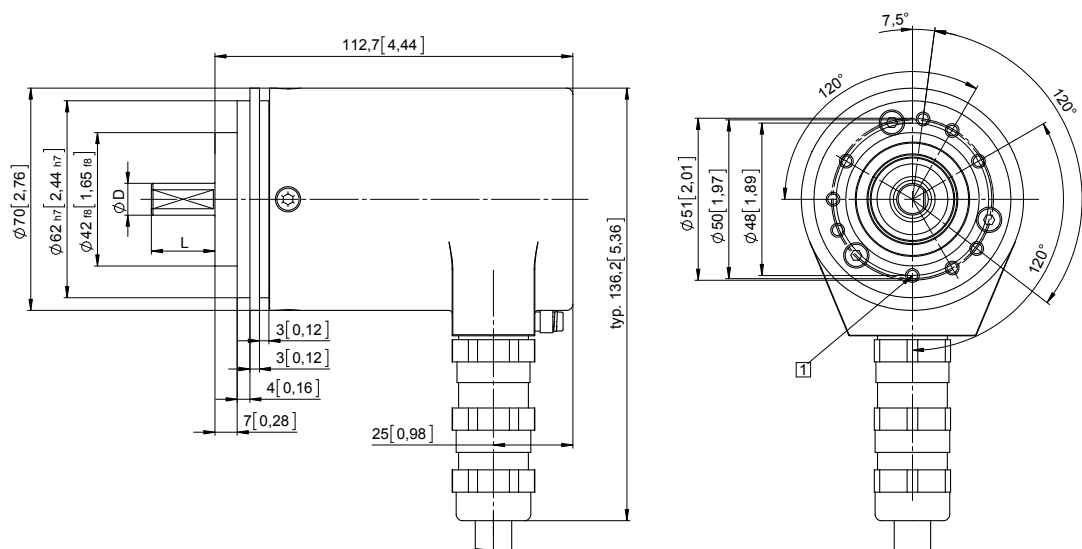
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

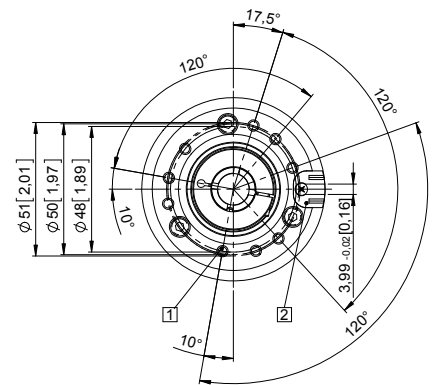
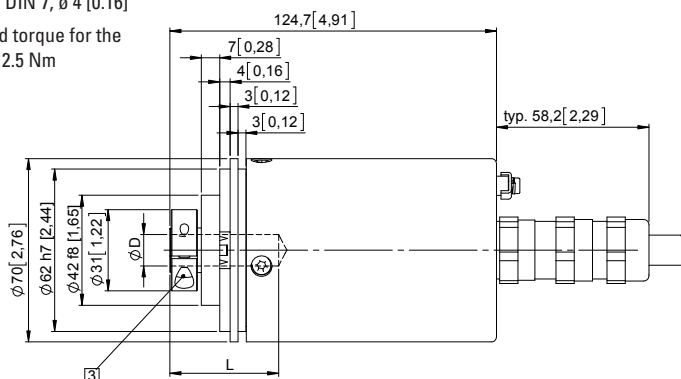
|  |  |                 |
|--|--|-----------------|
| <b>Standard, ATEX/IECEX – mining mechanical multiturn, optical</b> | <b>Sendix 7163 / 7183 (shaft / hollow shaft)</b> | <b>SSI/BiSS</b> |
|--|--|-----------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

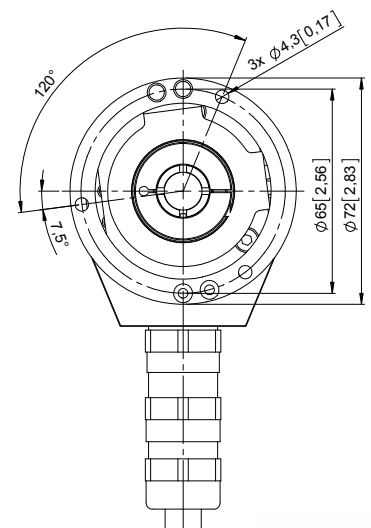
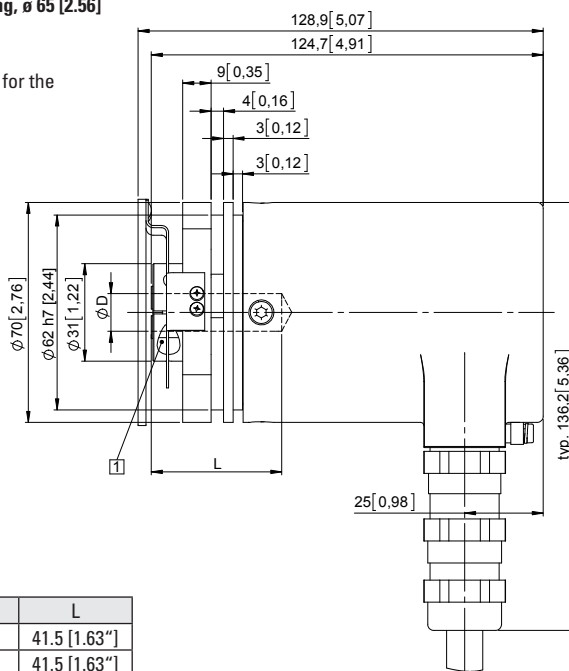


| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56] Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

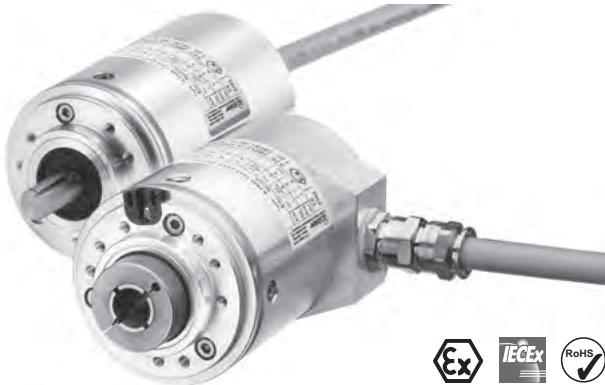
L = insertion depth max. blind hollow shaft

# Absolute encoders – multiturn

Standard, ATEX/IECEx – mining  
mechanical multiturn, optical

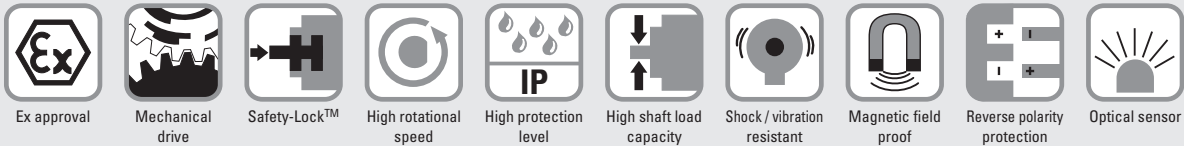
Sendix 7168 / 7188 (shaft / hollow shaft)

PROFIBUS DP



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



## Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

## Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

**Order code** 8.7168 . 2 X 3 X . 31 11 . XXXX  
**Shaft version** Type a b c d e f 1)

- a Flange**  
2 = clamping / synchronous flange, IP67,  $\varnothing$  70 mm [2.76"]
- b Shaft ( $\varnothing \times L$ )**  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c Interface / power supply**  
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d Type of connection**  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']
- e Fieldbus profile**  
31 = PROFIBUS DP V0 encoder profile class 2

- f Cable length in dm 1)**  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']
- Optional on request*  
- special cable length

**Order code** 8.7188 . X X 3 X . 31 11 . XXXX  
**Hollow shaft** Type a b c d e f 1)

- a Flange**  
2 = with spring element, short  
6 = with stator coupling, IP67,  $\varnothing$  65 mm [2.56"]
- b Blind hollow shaft**  
(insertion depth max. 41.5 mm [1.63"])  
1 =  $\varnothing$  12 mm [0.47"]  
2 =  $\varnothing$  14 mm [0.55"]
- c Interface / power supply**  
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d Type of connection**  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']
- e Fieldbus profile**  
31 = PROFIBUS DP V0 encoder profile class 2

- f Cable length in dm 1)**  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']
- Optional on request*  
- special cable length

1) Not applicable with connection types 1 and 2.

# Absolute encoders – multiturn

|  |  |                    |
|--|--|--------------------|
| <b>Standard, ATEX/IECEX – mining<br/>mechanical multiturn, optical</b> | <b>Sendix 7168 / 7188 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|--|--|--------------------|

## Technical data

| Explosion protection 7168              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Explosion protection 7188              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Materials</b>                                 | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to. EN 60068-2-27</b>   | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 120 mA  |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

 Absolute encoders  
multiturn

## Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining  
mechanical multiturn, optical**

**Sendix 7168 / 7188 (shaft / hollow shaft)**

**PROFIBUS DP**

| Interface characteristics PROFIBUS DP    |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65536 (16 bit), scalable<br>default: 8192 (13 bit)   |
| <b>Number of revolutions (multiturn)</b> | 1 ... 4096 (12 bit), scalable  |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)   |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | specification according to<br>PROFIBUS DP 2.0 / standard<br>(DIN 19245 Part 3) /<br>RS485 driver galvanically isolated     |
| <b>Protocol</b>                          | Profibus encoder profile V1.1<br>class 1 and class 2<br>with manufacturer-specific add-ons                                 |
| <b>Baud rate</b>                         | maximum 12 Mbit/s  |
| <b>Device address</b>                    | software controlled setting of the<br>device address via the SSA-service<br>with a CLASS 2-master,<br>default address: 125 |
| <b>Termination</b>                       | active termination can only be<br>switched on externally   |

### PROFIBUS encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The Encoder Profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

#### The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated

- Galvanic isolation of the Bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |         |         |         |         |          |          |
|-----------|--------------------|---|-----|----|---------|---------|---------|---------|----------|----------|
|           |                    | Signal:   | 0 V | +V | PB_A IN | PB_B IN | BUS_GND | BUS_VDC | PB_A OUT | PB_B OUT |
| 3         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4       | 5       | 6       | 7       | 8        | 9        |

# Absolute encoders – multiturn

|  |  |                    |
|--|--|--------------------|
| <b>Standard, ATEX/IECEX – mining<br/>mechanical multiturn, optical</b> | <b>Sendix 7168 / 7188 (shaft / hollow shaft)</b> | <b>PROFIBUS DP</b> |
|--|--|--------------------|

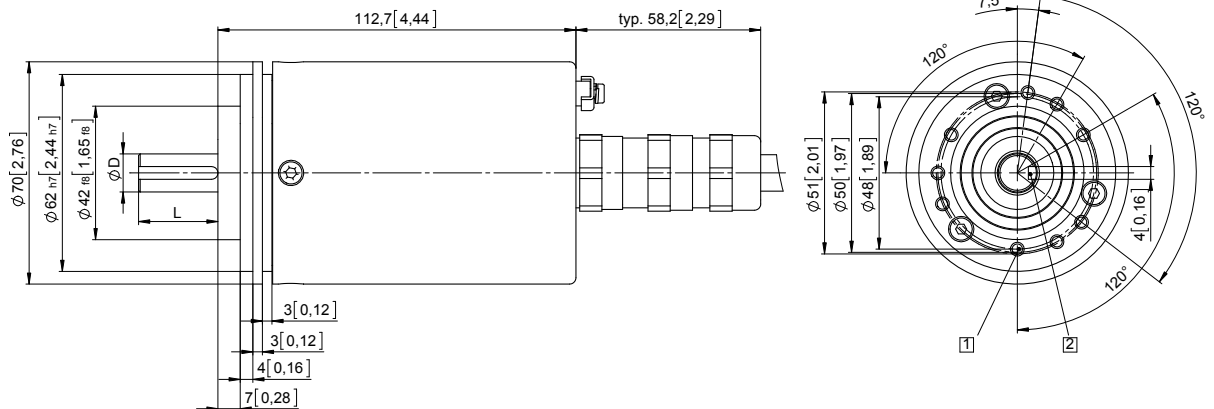
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 1 with axial cable outlet

- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key

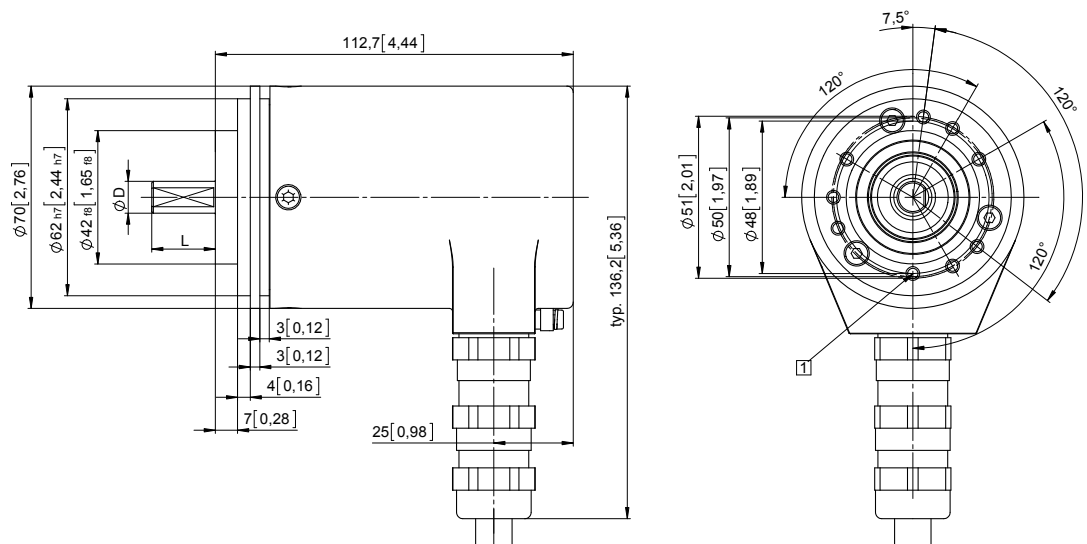


| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

### Clamping / synchronous flange, $\varnothing$ 70 [2.76]

#### Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

**Standard, ATEX/IECEx – mining  
mechanical multiturn, optical**

**Sendix 7168 / 7188 (shaft / hollow shaft)**

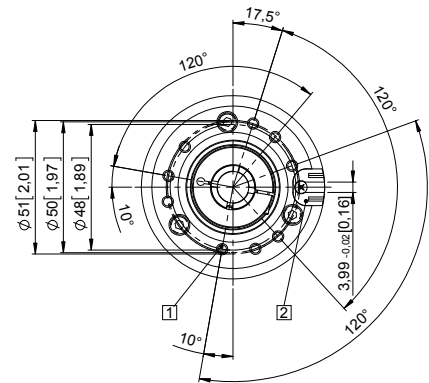
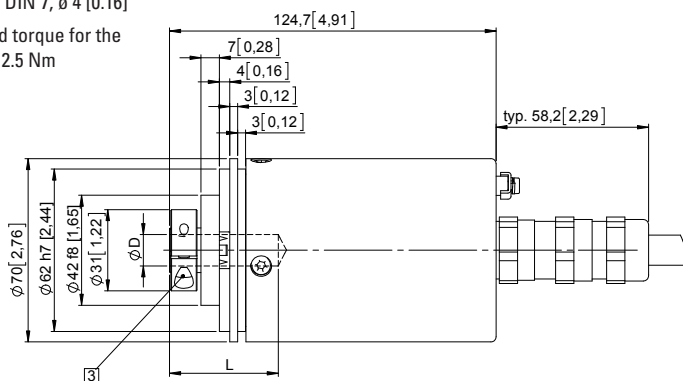
**PROFIBUS DP**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



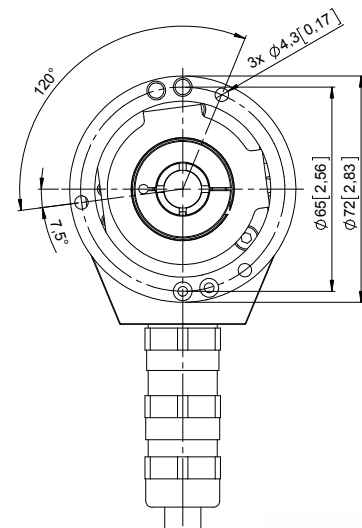
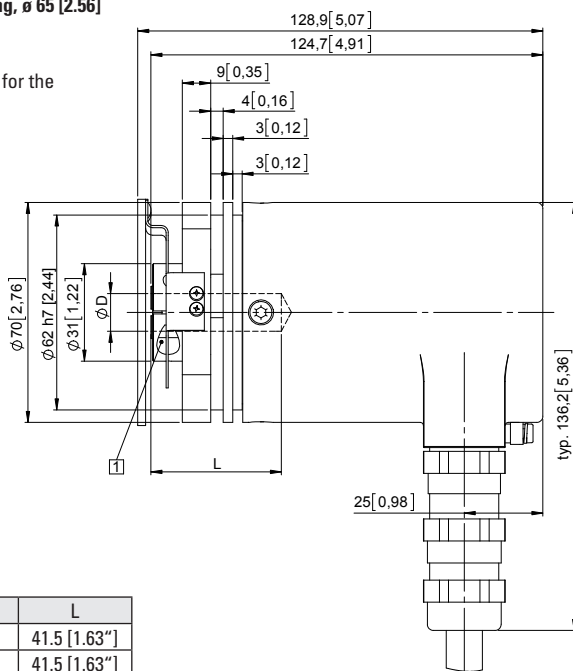
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft



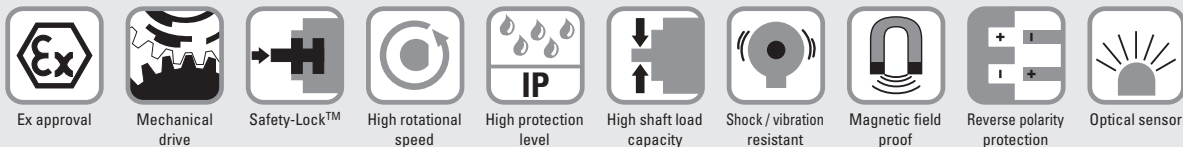
# Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining mechanical multiturn, optical**      **Sendix 7168 / 7188 (shaft / hollow shaft)**      **CANopen**



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Absolute encoders multiturn

|   |  |   |
|---|--|---|
| <b>Order code</b>                         | <b>8.7168</b>  | <b>. 2 X 2 X . 21 21 . XXXX</b>                   |
| <b>Shaft version</b>                      | Type   | a b c d e f <sup>1)</sup>                         |
| <b>a Flange</b>                           | 2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]   |   |
| <b>b Shaft (ø x L)</b>                    | 2 = 10 x 20 mm [0.39 x 0.79"], with flat<br>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key                                   |   |
| <b>c Interface / power supply</b>         | 2 = CANopen DS301 V4.02 / 10 ... 30 V DC   |   |
| <b>d Type of connection</b>               | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   |
| <b>e Fieldbus profile</b>                 | 21 = CANopen encoder profile DS406 V3.2  |   |
| <b>f Cable length in dm <sup>1)</sup></b> | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |   |
|   |  | <i>Optional on request - special cable length</i> |

|  |  |   |
|--|--|---|
| <b>Order code</b>  | <b>8.7188</b>  | <b>. X X 2 X . 21 21 . XXXX</b>                   |
| <b>Hollow shaft</b>  | Type   | a b c d e f <sup>1)</sup>                         |
| <b>a Flange</b>  | 2 = with spring element, short<br>6 = with stator coupling, IP67, ø 65 mm [2.56"]  |   |
| <b>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])</b> | 1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]   |   |
| <b>c Interface / power supply</b>                                  | 2 = CANopen DS301 V4.02 / 10 ... 30 V DC   |   |
| <b>d Type of connection</b>  | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   |
| <b>e Fieldbus profile</b>  | 21 = CANopen encoder profile DS406 V3.2  |   |
| <b>f Cable length in dm <sup>1)</sup></b>                          | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |   |
|  |  | <i>Optional on request - special cable length</i> |

1) Not applicable with connection types 1 and 2.

# Absolute encoders – multiturn

|  |  |                |
|--|--|----------------|
| <b>Standard, ATEX/IECEX – mining mechanical multiturn, optical</b> | <b>Sendix 7168 / 7188 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

## Technical data

| Explosion protection 7168              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb          |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2007   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X                   |
| <b>Category</b>                        | I M2 Ex d I/IIC T4 - T6 Mb            |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2007 |

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> (continuous)  |
| <b>Starting torque – at 20°C [68°F]</b>          | < 0.05 Nm  |
| <b>Mass moment of inertia</b>                    | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>                    | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                                    | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>               | IP67   |
| <b>Ambient temperature</b>                       | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                                  | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz  |

| Explosion protection 7188              |                                       |
|--|---------------------------------------|
| <b>ATEX</b>                            |                                       |
| <b>EC type-examination certificate</b> | IBExU 15 ATEX 1057 X                  |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 Mb               |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>EN 60079-1:2014   |
| <b>IECEX</b>                           |                                       |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X                   |
| <b>Category</b>                        | Ex d I/IIC T4 Mb                      |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014 |

| Electrical characteristics                          |  |
|---|--|
| <b>Power supply</b>                                 | 10 ... 30 V DC   |
| <b>Current consumption (no load)</b>                | max. 100 mA  |
| <b>Reverse polarity protection for power supply</b> | yes  |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>ATEX guideline 2014/34/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

# Absolute encoders – multiturn

|  |  |                |
|--|--|----------------|
| <b>Standard, ATEX/IECEX – mining mechanical multiturn, optical</b> | <b>Sendix 7168 / 7188 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

| Interface characteristics CANopen        |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)                             |
| <b>Number of revolutions (multiturn)</b> | max. 4096 (12 bit)<br>scalable only via the total resolution                         |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)                 |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                     |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>                      | 1 ... 127 software configurable  |
| <b>Switchable termination</b>            | software configurable  |

### General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

### CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

### CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. measuring wheel circumference)  
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

### Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |       |       |         |       |       |         |
|-----------|--------------------|---|-----|----|-------|-------|---------|-------|-------|---------|
|           |                    | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
| 2         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4     | 5     | 6       | 7     | 8     | 9       |

# Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining  
mechanical multiturn, optical**

**Sendix 7168 / 7188 (shaft / hollow shaft)**

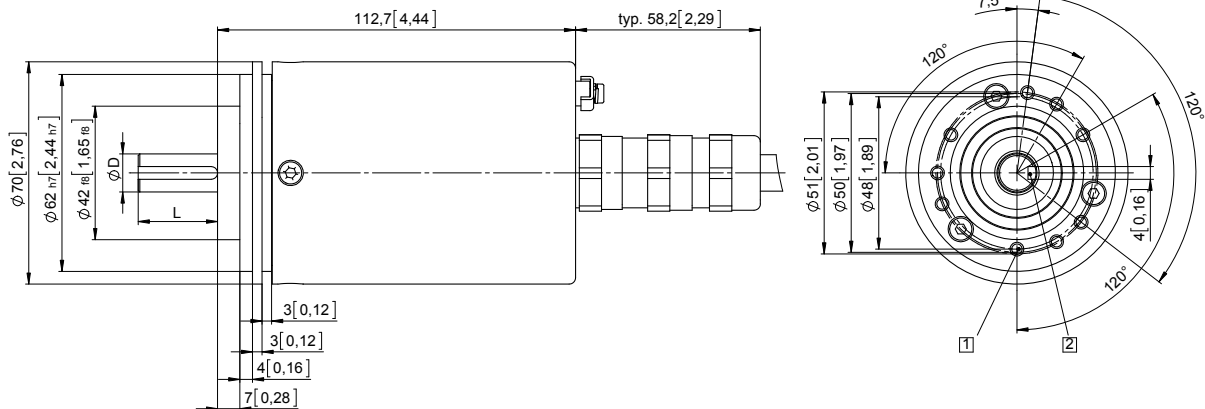
**CANopen**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

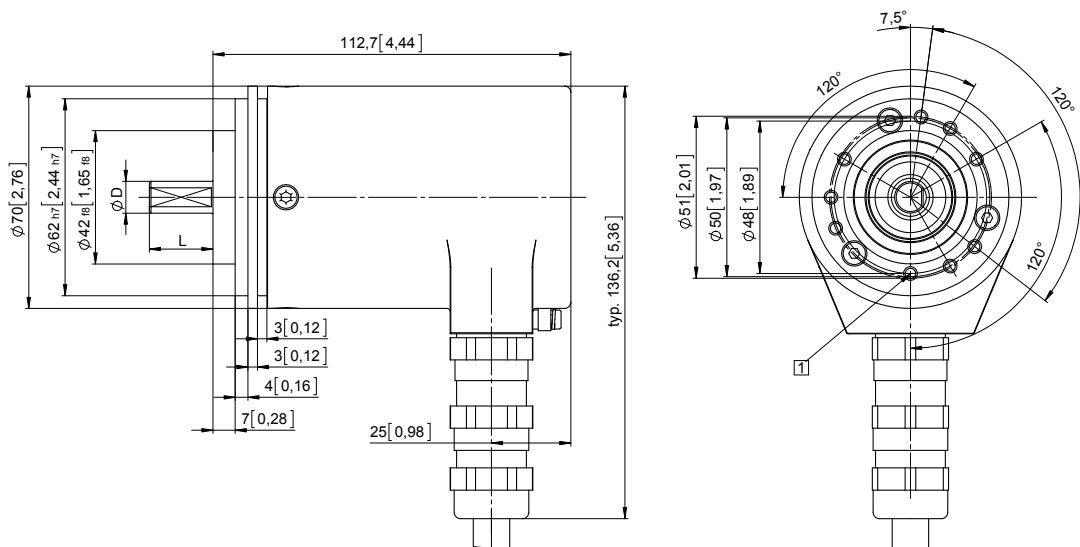
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

# Absolute encoders – multiturn

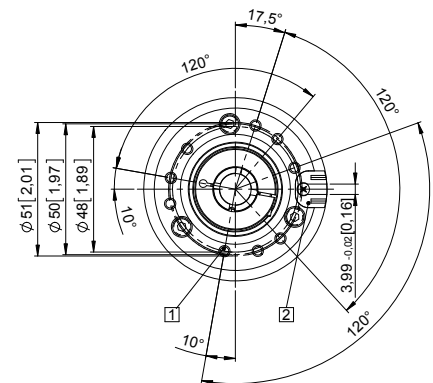
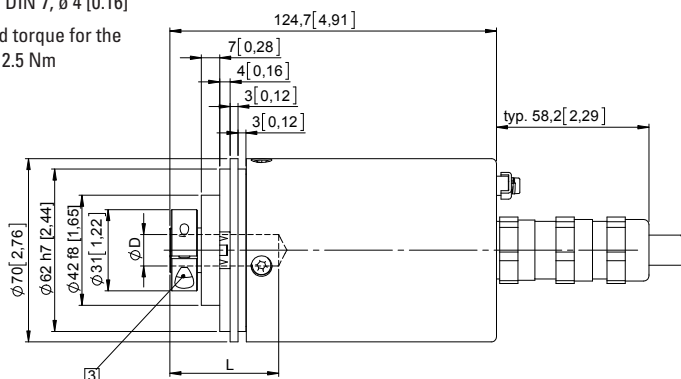
|  |  |                |
|--|--|----------------|
| <b>Standard, ATEX/IECEX – mining mechanical multiturn, optical</b> | <b>Sendix 7168 / 7188 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|--|--|----------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing$  4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



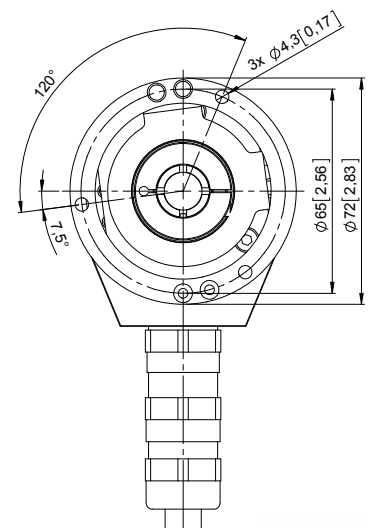
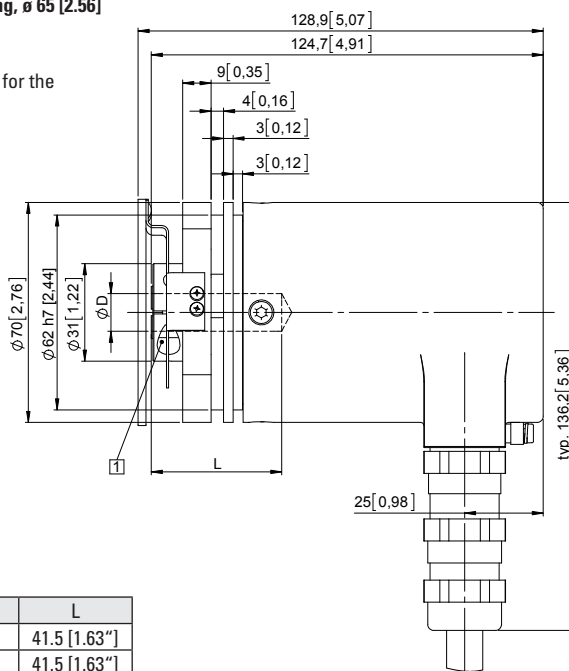
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing$ 65 [2.56]

#### Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

Absolute encoders  
multiturn

# Absolute encoders – multiturn

**Large hollow shaft  
optical / magnetic**

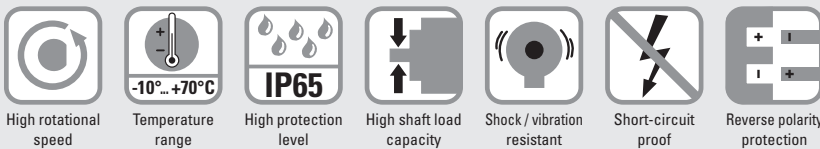
**9080 (hollow shaft)**

**PROFIBUS DP**



The multiturn encoder 9080 with Profibus interface and combined optical / mechanical sensor technology is perfect for Profibus applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.



### Adaptable

- With cable gland or M12 connector.
- Hollow shaft of 12 up to 28 mm.
- Programmable over the bus.

### User-friendly

- All relevant parameters programmable.
- Wide selection of shafts and fixing options.

### Order code Hollow shaft

**8.9080 . XX3X . 3001**  
Type                      a   b   c   d                      e

#### a Flange

- 1 = without mounting aid
- 2 = with spring element, short
- 3 = with spring element, long
- 4 = with mounting flange
- 5 = with tether arm, long

#### b Through hollow shaft

- 1 = ø 12 mm [0.47"]                      6 = ø 5/8"
- 2 = ø 15 mm [0.59"]                      7 = ø 1"
- 9 = ø 16 mm [0.63"]
- 3 = ø 20 mm [0.79"]
- 4 = ø 24 mm [0.94"]
- C = ø 25 mm [0.98"]
- 5 = ø 28 mm [1.10"]

#### c Interface / power supply

- 3 = PROFIBUS DP / 10 ... 30 V DC

#### e Fieldbus profile

- 3001 = Profibus class 2

#### d Type of connection, removable bus terminal cover

- 1 = with cable gland M16
- 2 = with 3 x M12 connector

### Mounting accessory for hollow shaft encoders

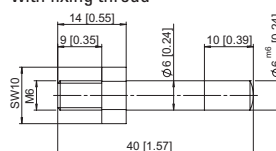
Dimensions in mm [inch]

Order no.

#### Cylindrical pin, long

for flange with spring element  
(flange type 2 + 3)

with fixing thread



**8.0010.4700.0003**

### Connection technology

Order no.

#### Cordset, pre-assembled

- M12 female connector with coupling nut for bus in, 5-pin  
5 m [16.40'] PUR cable
- M12 male connector with external thread for bus out, 5-pin  
5 m [16.40'] PUR cable
- M12 female connector with coupling nut for power supply, 4-pin  
2 m [5.56'] PUR cable

**05.00.6011.3211.005M**

**05.00.6011.3411.005M**

**05.00.6061.6211.002M**

#### Connector, self-assembly (straight)

- M12 female connector with coupling nut for bus in, 5-pin
- M12 male connector with external thread for bus out, 5-pin
- M12 female connector with coupling nut for power supply, 4-pin

**05.BMWS 8151-8.5**

**05.BMSWS 8151-8.5**

**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

# Absolute encoders – multiturn

|  |                            |                    |
|--|----------------------------|--------------------|
| <b>Large hollow shaft optical / magnetic</b> | <b>9080 (hollow shaft)</b> | <b>PROFIBUS DP</b> |
|--|----------------------------|--------------------|

## Technical data

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Mass moment of inertia</b>                    | approx. 72 x 10 <sup>-6</sup> kgm <sup>2</sup>               |
| <b>Starting torque</b>                           | < 0.2 Nm   |
| <b>Weight</b>                                    | approx. 0.9 kg [31.74 oz]                                    |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -10°C ... +70°C [+14°F ... +158°F]                           |
| <b>Material</b>                                  | hollow shaft stainless steel H7                              |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                        |

| Electrical characteristics                            |   |
|---|---|
| <b>Power supply</b>                                   | 10 ... 30 V DC  |
| <b>Power consumption</b>                              | 290 mA  |
| <b>Recommended fuse</b>                               | T 0.315 A   |
| <b>Performance against magnetic influence acc. to</b> | EN 61000-4-8, Severity level 5                        |
| <b>UL approval</b>                                    | file 224618   |
| <b>CE compliant acc. to</b>                           | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Interface characteristics PROFIBUS DP    |                                      |
|--|--------------------------------------|
| <b>Resolution singleturn</b>             | 1 ... 8192 (13 bit) scalable         |
| <b>Number of revolutions (multiturn)</b> | 1 ... 4096 (12 bit) scalable         |
| <b>Code</b>                              | binary                               |
| <b>Interface</b>                         | RS485                                |
| <b>Protocol</b>                          | PROFIBUS DP, encoder profile class 2 |
| <b>Baud rate</b>                         | max. 12 Mbit/s                       |
| <b>Device address</b>                    | adjustable with DIP-switches         |

### Profibus Encoder-Profile V1.1

The PROFIBUS-DP device profile describes the functionality of the communication and the user-specific component within the PROFIBUS field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer.

Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that PROFIBUS-compliant device systems can be used now with the guarantee that they are ready for the future too.

#### The following parameters can be programmed:

- Direction of rotation.
- Scaling factor
  - number of pulse/rotation.
  - total resolution.
- Preset value.
- Diagnostics mode.

#### The following functionality is integrated:

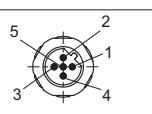
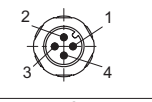
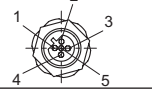
- Galvanic isolation of the fieldbus stage with DC/DC converter.
- Line driver according to RS485 max. 12 MB.
- Addressing by means of rotary switches.
- Diagnostics LED.
- Full class 1 and class 2 functionality.

Absolute encoders multiturn

### Terminal assignment terminal box

| Interface | Type of connection | Terminal box |       |     |        |   |   |         |   |     |      |       |        |    |
|-----------|--------------------|--------------|-------|-----|--------|---|---|---------|---|-----|------|-------|--------|----|
|           |                    | Signal:      | ENC.  |     | BUS IN |   |   | BUS OUT |   |     | ENC. |       | Shield |    |
| 3         | 1                  |              | +V DC | 0 V | 0 V    | B | A | A       | B | 0 V | 0 V  | +V DC | ⊥      |    |
|           |                    | Terminal:    | 1     | 2   | 3      | 4 | 5 | 6       | 7 | 8   | 9    | 10    | 11     | 12 |

### Terminal assignment M12 connector

| Interface | Type of connection | Function     | M12 connector |         |      |        |      |   |   |  |
|-----------|--------------------|--------------|---------------|---------|------|--------|------|---|---|--|
| 3         | 2                  | Bus in       | Signal:       | –       | PB_A | –      | PB_B | –   |  |  |
|           |                    |              | Pin:          | 1       | 2    | 3      | 4    | 5   |   |  |
|           |                    | Power supply | Signal:       | +V      | –    | 0 V    | –    |  |   |  |
|           |                    |              | Pin:          | 1       | 2    | 3      | 4    |   |   |  |
|           |                    | Bus out      | Signal:       | BUS_VDC | PB_A | PB_GND | PB_B | ⊥   |  |  |
|           |                    |              | Pin:          | 1       | 2    | 3      | 4    | 5   |   |  |

# Absolute encoders – multiturn

**Large hollow shaft  
optical / magnetic**

**9080 (hollow shaft)**

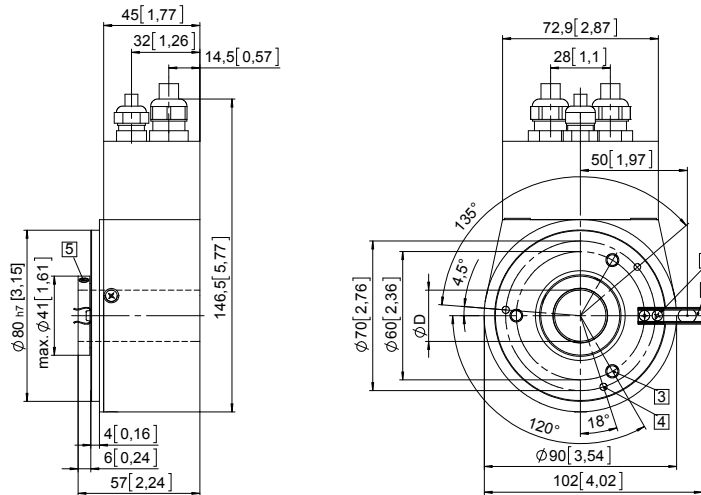
**PROFIBUS DP**

## Dimensions

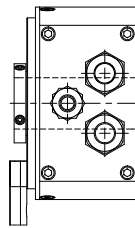
Dimensions in mm [inch]

### Flange with spring element

- 1 Spring element, short (flange no. 2) cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 2 Spring element, long (flange no. 3) cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 3 3 x M6, 10 [0.39] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the clamping ring 1.0 Nm

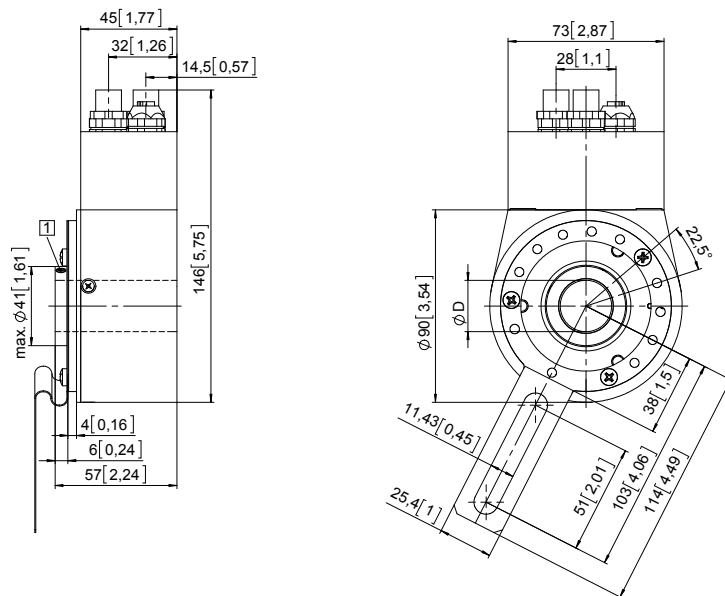


| D         | Fit |
|-----------|-----|
| 12 [0.47] | H7  |
| 15 [0.59] | H7  |
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |

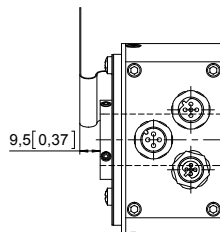


### Flange with tether arm, long

- 1 Recommended torque for the clamping ring 1.0 Nm



| D         | Fit |
|-----------|-----|
| 12 [0.47] | H7  |
| 15 [0.59] | H7  |
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |





# Absolute encoders – multiturn

|  |                            |                            |
|--|----------------------------|----------------------------|
| <b>Large hollow shaft<br/>optical / magnetic</b> | <b>9080 (hollow shaft)</b> | <b>CANopen / DeviceNet</b> |
|--|----------------------------|----------------------------|



The multiturn encoder 9080 with CANopen interface and combined optical / mechanical sensor technology is perfect for CANopen applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.



|                       |                   |                       |                          |                             |                     |                             |
|-----------------------|-------------------|-----------------------|--------------------------|-----------------------------|---------------------|-----------------------------|
|                       |                   |                       |                          |                             |                     |                             |
| High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short circuit proof | Reverse polarity protection |

### Adaptable

- With cable gland or M12 connector.
- Hollow shaft of 12 up to 28 mm.
- Programmable over the bus.

### User-friendly

- All relevant parameters programmable.
- Wide selection of shafts and fixing options.

Absolute encoders  
multiturn

|                                    |                       |                          |                    |
|------------------------------------|-----------------------|--------------------------|--------------------|
| <b>Order code<br/>Hollow shaft</b> | <b>8.9080</b><br>Type | <b>. XXXX</b><br>a b c d | <b>. XXXX</b><br>e |
|------------------------------------|-----------------------|--------------------------|--------------------|

- |   |  |  |   |
|---|--|--|---|
| <p><b>a Flange</b></p> <ul style="list-style-type: none"> <li>1 = without mounting aid</li> <li>2 = with spring element, short</li> <li>3 = with spring element, long</li> <li>4 = with mounting flange</li> <li>5 = with tether arm, long</li> </ul> | <p><b>b Through hollow shaft</b></p> <ul style="list-style-type: none"> <li>1 = ø 12 mm [0.47"]</li> <li>2 = ø 15 mm [0.59"]</li> <li>9 = ø 16 mm [0.63"]</li> <li>3 = ø 20 mm [0.79"]</li> <li>4 = ø 24 mm [0.94"]</li> <li>C = ø 25 mm [0.98"]</li> <li>5 = ø 28 mm [1.10"]</li> <li>6 = ø 5/8"</li> <li>7 = ø 1"</li> </ul> | <p><b>c Interface / power supply</b></p> <ul style="list-style-type: none"> <li>1 = DeviceNet / 10 ... 30 V DC</li> <li>2 = CANopen / 10 ... 30 V DC</li> </ul> <p><b>d Type of connection, removable bus terminal cover</b></p> <ul style="list-style-type: none"> <li>1 = with cable gland M16 <sup>1)</sup></li> <li>2 = with 3 x M12 connector, 5-pin</li> </ul> | <p><b>e Fieldbus profile</b></p> <ul style="list-style-type: none"> <li>1001 = DeviceNet</li> <li>2001 = CANopen encoder profile DSP 406</li> </ul> |
|---|--|--|---|

Includes EDS-file and documentation on CD  
Use **couplings** for the **BUS-IN** connection and **connectors** for the **BUS-OUT** connection.

1) Only in conjunction with CANopen.

# Absolute encoders – multiturn

| Large hollow shaft<br>optical / magnetic  | 9080 (hollow shaft)  | CANopen / DeviceNet                                |
|---|--|--|
| <b>Mounting accessory for hollow shaft encoders</b>                                   |  |  |
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 2 + 3) | Dimensions in mm [inch]<br>with fixing thread  | Order no.<br><b>8.0010.4700.0003</b>               |
|   |  |  |
| <b>Connection technology</b>  |  |  |
| <b>Cordset, pre-assembled</b>   | DeviceNet, M12 female connector with coupling nut for bus in, 5-pin<br>5 m [16.40'] PUR cable                          | <b>05.00.6021.2211.005M</b>                        |
|   | DeviceNet, M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PUR cable                        | <b>05.00.6021.2411.005M</b>                        |
|   | CANopen, M12 female connector with coupling nut for bus in, 5-pin<br>5 m [16.40'] PVC cable                            | <b>05.00.6091.A211.005M</b>                        |
|   | CANopen, M12 male connector with external thread for bus out, 5-pin<br>5 m [16.40'] PVC cable                          | <b>05.00.6091.A411.005M</b>                        |
| <b>Connector, self-assembly (straight)</b>  | M12 female connector with coupling nut for bus in, 5-pin<br>M12 male connector with external thread for bus out, 5-pin | <b>8.0000.5116.0000</b><br><b>8.0000.5111.0000</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data  |   |
|---|---|
| <b>Mechanical characteristics</b>                     |   |
| <b>Maximum speed</b>                                  | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)  |
| <b>Mass moment of inertia</b>                         | approx. 72 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Starting torque - at 20°C [68°F]</b>               | < 0.2 Nm  |
| <b>Weight</b>   | approx. 0.9 kg [31.74 oz]   |
| <b>Protection acc. to EN 60529</b>                    | IP65  |
| <b>Working temperature range</b>                      | -10°C ... +70°C [+14°F ... + 158°F]   |
| <b>Material</b>                                       | hollow shaft stainless steel H7   |
| <b>Shock resistance acc. to EN 60068-2-27</b>         | 2500 m/s <sup>2</sup> , 6 ms  |
| <b>Vibration resistance acc. to EN 60068-2-6</b>      | 100 m/s <sup>2</sup> , 55 ... 2000 Hz   |
| <b>Electrical characteristics</b>                     |   |
| <b>Power supply</b>                                   | 10 ... 30 V DC  |
| <b>Power consumption</b>                              | 290 mA  |
| <b>Recommended fuse</b>                               | T 0.315 A   |
| <b>Performance against magnetic influence acc. to</b> | EN 61000-4-8, severity level 5  |
| <b>UL approval</b>                                    | file 224618   |
| <b>CE compliant acc. to</b>                           | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |
| <b>Interface characteristics CANopen / DeviceNET</b>  |   |
| <b>Resolution singleturn</b>                          | 1 ... 8192 (13 bit) scalable<br>default: 8192 (13 bit)  |
| <b>Number of revolutions (multiturn)</b>              | max. 4096 (12 bit)<br>scalable only via the total resolution  |
| <b>Total resolution</b>                               | 1 ... 33.554.432 (25 bit), scalable<br>default: 33.554.432 (25 bit)   |
| <b>Code</b>   | binary  |
| <b>Interface</b>                                      | CAN HIGH-speed acc. to ISO/DIS 11898,<br>Basic and Full-CAN;<br>CAN specification 2.0 B<br>(11 and 29 bit Identifier) |
| <b>Protocol</b>                                       | CANopen according to profile<br>DSP 406 with additional functions.<br>DeviceNet profile for Encoder<br>Release V 2.0  |
| <b>Baud rate</b>                                      | 10 ... 1000 kbit/s<br>programmable via DIP switches   |
| <b>Basic identifier/node</b>                          | programmable via DIP switches   |

# Absolute encoders – multiturn

|  |                            |                            |
|--|----------------------------|----------------------------|
| <b>Large hollow shaft<br/>optical / magnetic</b> | <b>9080 (hollow shaft)</b> | <b>CANopen / DeviceNet</b> |
|--|----------------------------|----------------------------|

## CANopen - Device profile

### General description

The CANopen Device profiles describe the functionality of the communication and of that part of the CANopen fieldbus system specific to the manufacturer. Device profile 406 applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer; using devices that interface with CANopen offers the advantage of acquiring systems today that are prepared for the needs of the future.

### The following functionality is integrated:

- Class C2 functionality.
- NMT slave.
- Diagnostics (internal) 2 bit.
- CAN LED for bus status.
- CAN LED for operating mode.

### The following parameters can be programmed:

- Polling mode or auto mode with adjustable time.
- Code sequence (direction).
- Number of pulses/rotation 1 ... 8192.
- Number of revolutions 1 ... 4096.
- Total resolution.
- Preset.
- Offset.
- Number of revolutions.

## DeviceNet Encoder profile

### General description

The DeviceNet Device profile describes the functionality of the communication and of that part of the DeviceNet fieldbus system specific to the manufacturer. The Encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer.

### The following parameters can be programmed:

- Direction of rotation.
- Scaling factor
  - Number of pulses/rotation 1 ... 8192.
  - Total resolution.
- Number of revolutions 1 ... 4096.
- Preset value.
- Diagnostics mode.
- Resolution.

### The following functionality is integrated:

- Galvanic isolation of the fieldbus stage with DC/DC converter.
- Addressing via DIP switches or software.
- Diagnostic LED for network and mode.
- Baud rate 125, 250 and 500 kbit/s programmable via DIP switches.
- Node address 0 ... 63 and baud rate programmable via DIP switches.
- Polled mode.
- Cyclic mode.
- Change of state mode (COS).
- Combination of polled mode and cyclic mode.
- Combination of polled mode and COS mode.
- Offline connection set.
- Device heartbeat.
- "Out of box" configuration
- MAC ID and Baud rate preset value, MAC ID = 63.
- Baud rate = 125 kbit/s.
- 2 I/O Assembly: position value / position value and status.

 Absolute encoders  
multiturn

## Fieldbus encoders can be used in following applications:

### CANopen

- Elevators.
- Construction plant.
- Cranes.
- Agricultural vehicles.
- Mobile plant.
- Special purposes vehicles.

### DeviceNet

Especially suitable for applications in the USA.

## Terminal assignment terminal box

| Interface | Type of connection | Terminal box |   |       |     |     |        |   |   |         |     |     |       |    |        |
|-----------|--------------------|--------------|---|-------|-----|-----|--------|---|---|---------|-----|-----|-------|----|--------|
|           |                    | Signal:      |   | ENC.  |     |     | BUS IN |   |   | BUS OUT |     |     | ENC.  |    | shield |
| 1, 2      | 1                  |              |   | +V DC | 0 V | 0 V | B      | A | A | B       | 0 V | 0 V | +V DC | ±  |        |
|           |                    | Terminal:    | 1 | 2     | 3   | 4   | 5      | 6 | 7 | 8       | 9   | 10  | 11    | 12 |        |

## Terminal assignment M12 connector version

| Interface | Type of connection | Function | M12 connector, 5-pin |       |        |        |       |       | Diagram |
|-----------|--------------------|----------|----------------------|-------|--------|--------|-------|-------|---------|
|           |                    |          | Signal:              | DRAIN | + V DC | - V DC | CAN_H | CAN_L |         |
| 1, 2      | 2                  | Bus in   | Pin:                 | 1     | 2      | 3      | 4     | 5     |         |
|           |                    |          | Color:               | GY    | RD     | BK     | WH    | BU    |         |
|           |                    |          | Signal:              | DRAIN | + V DC | - V DC | CAN_H | CAN_L |         |
|           |                    | Bus out  | Pin:                 | 1     | 2      | 3      | 4     | 5     |         |
|           |                    |          | Color:               | GY    | RD     | BK     | WH    | BU    |         |
|           |                    |          | Signal:              | DRAIN | + V DC | - V DC | CAN_H | CAN_L |         |

# Absolute encoders – multiturn

## Large hollow shaft optical / magnetic

9080 (hollow shaft)

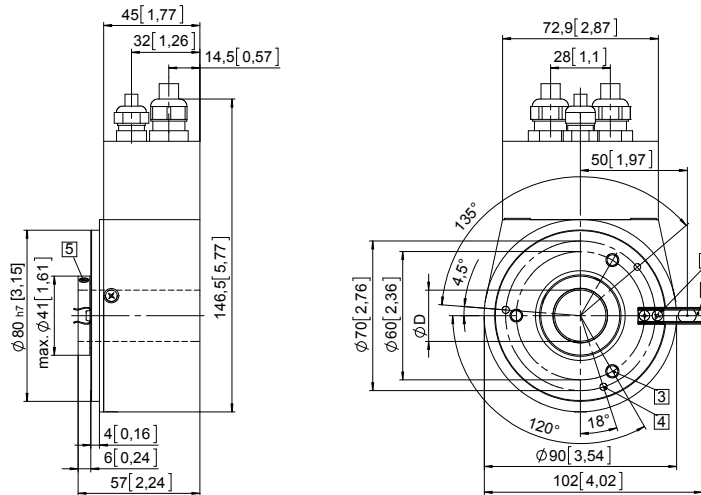
CANopen / DeviceNet

### Dimensions

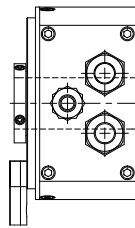
Dimensions in mm [inch]

#### Flange with spring element

- 1 Spring element, short (flange no. 2) cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 2 Spring element, long (flange no. 3) cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 3 3 x M6, 10 [0.39] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the clamping ring 1.0 Nm

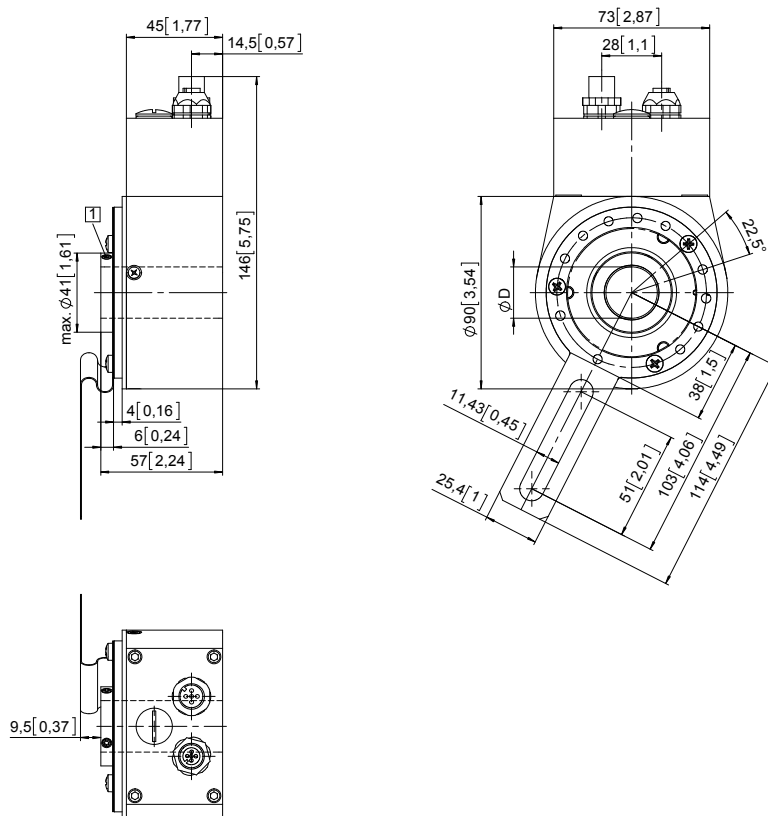


| D         | Fit |
|-----------|-----|
| 12 [0.47] | H7  |
| 15 [0.59] | H7  |
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |

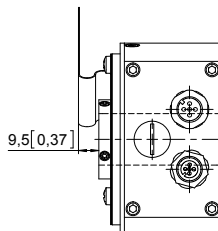


#### Flange with tether arm, long

- 1 Recommended torque for the clamping ring 1.0 Nm



| D         | Fit |
|-----------|-----|
| 12 [0.47] | H7  |
| 15 [0.59] | H7  |
| 16 [0.63] | H7  |
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 25 [0.98] | H7  |
| 28 [1.10] | H7  |
| 5/8"      | H7  |
| 1"        | H7  |



# Absolute encoders – multiturn

|  |                            |            |
|--|----------------------------|------------|
| <b>Large hollow shaft optical / magnetic</b> | <b>9081 (hollow shaft)</b> | <b>SSI</b> |
|--|----------------------------|------------|



The multiturn encoder 9081, with SSI interface and combined optical / mechanical sensor technology, has a through hollow shaft with a diameter up to 28 mm and offers resolutions up to 25 bits.



|                       |                   |                       |                             |                     |                             |
|-----------------------|-------------------|-----------------------|-----------------------------|---------------------|-----------------------------|
|                       |                   |                       |                             |                     |                             |
| High rotational speed | Temperature range | High protection level | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection |

### Optimized dimensions

- Hollow shaft up to max. 28 mm with an installation depth of just 47 mm.
- Outer diameter 90 mm.

Absolute encoders  
multiturn

|                               |   |                                   |  |
|-------------------------------|---|-----------------------------------|--|
| <b>Order code</b>             | <b>8.9081</b>   | <b>. 3 X 2 2 .</b>                | <b>2004</b>  |
| <b>Hollow shaft</b>           | Type  | a b c d                           | e  |
| <b>a Flange</b>               | 3 = with spring element, long   | <b>c Interface / power supply</b> | 2 = SSI with 4 status outputs / 5 ... 30 V DC                |
| <b>b Through hollow shaft</b> | 3 = ø 20 mm [0.79"]<br>4 = ø 24 mm [0.94"]<br>5 = ø 28 mm [1.10"]<br>6 = ø 5/8" | <b>d Type of connection</b>       | 2 = radial M23 connector, 12-pin without mating connector    |
|                               |   | <b>e SSI interface</b>            | 2004 = 8192 x 4096 (25 bit), gray                            |
|                               |   |                                   | <i>Optional on request</i><br>- other hollow shaft diameters |

| Mounting accessory for hollow shaft encoders                                      | Dimensions in mm [inch]   | Order no.                    |
|---|---|------------------------------|
| <b>Cylindrical pin, long</b><br>for flange with spring element<br>(flange type 3) | with fixing thread<br>  | <b>8.0010.4700.0003</b>      |
| Connection technology   |   | Order no.                    |
| <b>Cordset, pre-assembled</b>   | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable | <b>8.0000.6901.0002.0031</b> |
| <b>Connector, self-assembly (straight)</b>  | M23 female connector with coupling nut, 12-pin                          | <b>8.0000.5012.0000</b>      |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

# Absolute encoders – multiturn

|  |                            |            |
|--|----------------------------|------------|
| <b>Large hollow shaft<br/>optical / magnetic</b> | <b>9081 (hollow shaft)</b> | <b>SSI</b> |
|--|----------------------------|------------|

## Technical data

### Mechanical characteristics

|  |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Mass moment of inertia</b>                    | approx. 65 x 10 <sup>-6</sup> kgm <sup>2</sup>               |
| <b>Starting torque - at 20°C [68°F]</b>          | < 0.2 Nm   |
| <b>Weight</b>                                    | approx. 0.7 kg   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -20°C ... +70°C [-4°F ... +158°F]                            |
| <b>Materials</b>                                 | hollow shaft stainless steel H7                              |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                        |

### Electrical characteristics

|  |   |
|--|---|
| <b>Power supply</b>                                    | 5.0 ... 30 V DC <sup>1)</sup>                         |
| <b>Power consumption</b><br>(no load)                  | typ. 89 mA<br>max. 138 mA                             |
| <b>Short circuit proof outputs <sup>2)</sup></b>       | yes <sup>3)</sup>                                     |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Performance against magnetic influence acc. to</b>  | EN 61000-4-8, severity level 5                        |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

### Control inputs (V/R, SET)

|                          |  |
|--------------------------|--|
| <b>Voltage</b>           | 5 ... 30 V DC = +V                           |
| <b>Response time</b>     | 10 ms  |
| <b>Switching level</b>   | LOW max. 25% +V<br>HIGH min. 60% +V, max. +V |
| <b>Max. current load</b> | 0.5 mA                                       |

## Control inputs

### V/R input for change of direction

The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

The appropriate option can be selected via a hardware configuration of the V/R input BEFORE powering up the encoder.

The following table shows the function selection dependent on hardware and software settings:

| Hardware configuration of the V/R input: | Function:<br>increasing code value when the shaft is in the following direction |
|--|---|
| „LOW“<br>(0V) on the V/R input (=cw)     | cw  |
| „HIGH“<br>(+V) on the V/R input (= ccw)  | ccw   |
| „LOW“<br>(0V) on the V/R input (=cw)     | ccw   |
| „HIGH“<br>(+V) on the V/R input (= ccw)  | cw  |

1) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%).  
2) If power supply +V correctly applied.

### SSI interface

|  |   |
|--|---|
| <b>Output driver</b>                                   | RS485   |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA  |
| <b>Update rate for position data</b>                   | approx. 1600/s  |
| <b>SSI clock rate</b>                                  | min. / max. 100 kHz / 500 kHz                                 |
| <b>Signal level</b>                                    | HIGH typ. 3.8 V<br>LOW (I <sub>Load</sub> = 20 mA) typ. 1.3 V |
| <b>Resolution singleturn</b>                           | 1 ... 8192 (13 bit), scalable                                 |
| <b>Number of revolutions (multiturn)</b>               | 1 ... 4096 (12 bit), scalable                                 |
| <b>Falling edge time t<sub>f</sub> (without cable)</b> | max. 100 ns   |
| <b>Rising edge time t<sub>r</sub> (without cable)</b>  | max. 100 ns   |

### Control outputs

|  |  |
|--|--|
| <b>Output driver</b>                                   | Push-Pull                              |
| <b>Max. current output</b>                             | ± 10.0 mA                              |
| <b>Signal level</b>                                    | HIGH min. +V - 2.8 V<br>LOW max. 1.8 V |
| <b>Falling edge time t<sub>f</sub> (without cable)</b> | max. 1 µs                              |
| <b>Rising edge time t<sub>r</sub> (without cable)</b>  | max. 1 µs                              |

### Note:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!
- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!
- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved! This is due to internal conversion processes.
- The start-up procedure for the encoder should therefore follow this sequence:
  - Determine the count direction of the encoder either via the V/R input or via programming
  - Apply power to the encoder
  - Activate the SET function, if desired (see SET input below)
- If using a cable wire to configure the V/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V!
- The response time of the V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

3) Only one channel allowed to be shorted-out:  
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.  
at +V ≥ 5 ... 30 V DC short circuit to channel or 0 V is permitted.

# Absolute encoders – multiturn

|  |                            |            |
|--|----------------------------|------------|
| <b>Large hollow shaft<br/>optical / magnetic</b> | <b>9081 (hollow shaft)</b> | <b>SSI</b> |
|--|----------------------------|------------|

### SET input

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value. The default value is zero.

#### Notes:

- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values! In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered!
- The response time of the SET input with +V = 5 ... 30 V DC power supply is 10 ms.

### Output

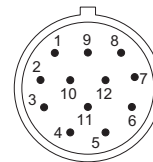
| Output | Default-function |
|--------|------------------|
| A1     | battery control  |

### Terminal assignment (SSI Synchronous Serial Interface with 12-pin connector)

| Interface | Type of connection | Features             | M23 connector, 12-pin |     |    |    |    |    |    |    |    |    |    |
|-----------|--------------------|----------------------|-----------------------|-----|----|----|----|----|----|----|----|----|----|
|           |                    |                      | Signal:               | 0 V | +V | C+ | C- | D+ | D- | ST | VR | A1 | ⊥  |
| 2         | 2                  | SET<br>Up/down input | Pin:                  | 1   | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | PH |
|           |                    |                      | Cable color:          | WH  | BN | GN | YE | GY | PK | BU | RD | BK |    |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input (High-Level = +V) is active, decreasing code values are transmitted when shaft turning clockwise.
- A1: Output battery monitoring
- ⊥ PH: Plug connector housing (Shield)

Top view of mating side, male contact base

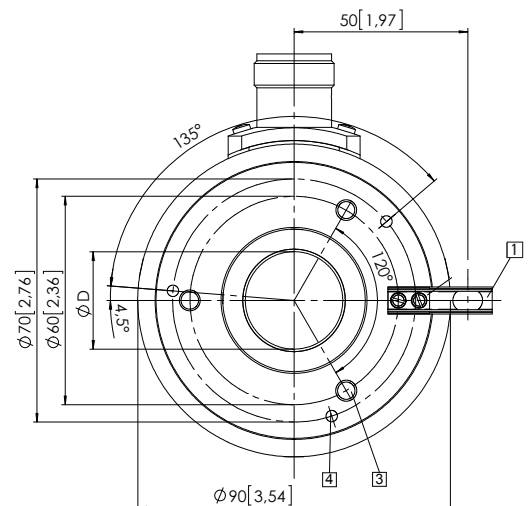
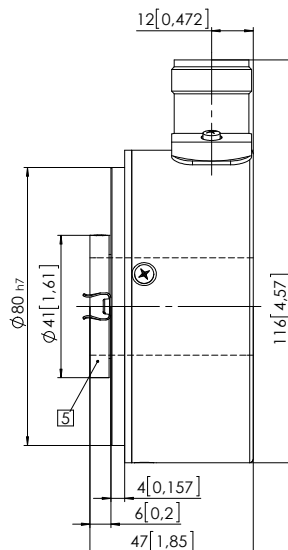


M23 connector, 12-pin

### Dimensions

Dimensions in mm [inch]

- 1 Spring element, long (flange no. 3)  
cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 3 3 x M6, 10 [0.4] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the  
clamping ring 1.0 Nm



| D         | Fit |
|-----------|-----|
| 20 [0.79] | H7  |
| 24 [0.94] | H7  |
| 28 [1.10] | H7  |
| 5/8"      | H7  |



Made in Germany  
**Kubler**  
Fritz Kubler GmbH  
www.kubler.com





Type: B L150-1111-2100  
S-Nr.: 1604711987  
4-20 mA VDC  $\approx$  60 mA

|     |    |    |   |    |
|-----|----|----|---|----|
| -I- | 0V | WH | B | 0V |
| +   | +V | BN | B | 0V |
| A   | A  | GN | 0 | PK |
| AI  | AI | YE | 0 | SU |
|     |    |    | 0 | RD |

CE  
⚠



## Bearingless encoders

| Series                                 |                      | Type  | Interface         | Page       |
|--|----------------------|---|-------------------|------------|
| <b>Incremental, standard</b>           | Magnetic             |  RLI20 (hollow shaft)  | Push-pull / RS422 | <b>470</b> |
|  | Zero pulse, magnetic |  RLI50 (hollow shaft)  | Push-pull / RS422 | <b>473</b> |
| <b>Incremental, standard</b>           | Magnetic             | RI20 / Limes LI20 (hollow shaft)  | Push-pull / RS422 | <b>476</b> |
|  | Zero pulse, magnetic | RI50 / Limes LI50 (hollow shaft)  | Push-pull / RS422 | <b>479</b> |
| <b>Incremental, large hollow shaft</b> | Magnetic             |  RLI200 (hollow shaft) | Push-pull / RS422 | <b>482</b> |
|  | Zero pulse, magnetic |  RLI500 (hollow shaft) | Push-pull / RS422 | <b>485</b> |

# Bearingless encoders

**Incremental, standard magnetic**

**RLI20 (hollow shaft)**

**Push-pull / RS422**



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 30 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

## Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

## Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

## Order code RLI20

**8.RLI20 . X 1 XX . XXXX . XXXX**  
Type                      a                      b                      c                      d                      e

### a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

### b Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

### c Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR \*)

\*) Available special lengths (connection type A):  
 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.RLI20.111A.0250.0080.0030 (for cable length 3 m)

### d Pulses per revolution <sup>1)</sup>

- 0250, 0360, 1000, 1024, 2500, 3600

### e Bore diameter

- 0080 = 8 mm [0.32"]      0095 = 3/8"
- 0100 = 10 mm [0.39"]    0158 = 5/8"
- 0120 = 12 mm [0.47"]    0254 = 1" <sup>2)</sup>
- 0150 = 15 mm [0.59"]
- 0180 = 18 mm [0.71"]
- 0200 = 20 mm [0.79"]
- 0250 = 25 mm [0.98"] <sup>2)</sup>
- 0300 = 30 mm [1.18"] <sup>2)</sup>

1) Other pulse rates on request.  
 2) Only possible for pulse rates 0360 and 3600.

# Bearingless encoders

|                                       |                             |                          |
|---------------------------------------|-----------------------------|--------------------------|
| <b>Incremental, standard magnetic</b> | <b>RLI20 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---------------------------------------|-----------------------------|--------------------------|

| Accessories / Display type 572   |  | Order no.             |
|----------------------------------|--|-----------------------|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface                            | <b>6.572.0116.D05</b> |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output | <b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface                            | <b>6.572.0118.D05</b> |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output | <b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics   |  |   |
|------------------------------|--|---|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |   |
| <b>Protection</b>            | Model 1  | IP67 acc. to EN 60529   |
|                              | Model 2  | IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |   |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |   |
| <b>Pole gap</b>              | 2 mm from pole to pole   |   |
| <b>Housing (sensor head)</b> | aluminum   |   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations |   |
| <b>Status LED</b>            | green  | pulse-index   |
|                              | red  | error; speed too high or magnetic fields too weak   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |   |

| Electrical characteristics           |                                   |                          |                 |             |             |
|--------------------------------------|-----------------------------------|--------------------------|-----------------|-------------|-------------|
| Output circuit                       | RS422                             | Push-pull                |                 |             |             |
| <b>Power supply</b>                  | 4.8 ... 26 VDC                    | 4.8 ... 30 VDC           |                 |             |             |
| <b>Power consumption (no load)</b>   | typ. 25 mA<br>max. 60 mA          | typ. 25 mA<br>max. 60 mA |                 |             |             |
| <b>Permissible load / channel</b>    | 120 Ohm                           |                          | +/- 20 mA       |             |             |
| <b>Min. pulse edge interval</b>      | 1 µs                              |                          |                 |             |             |
| <b>Signal level</b>                  | HIGH                              | min. 2.5 V               | min. +V - 2.0 V |             |             |
|                                      | LOW                               | max. 0.5 V               | max. 0.5 V      |             |             |
| <b>Reference signal</b>              | index periodical                  |                          |                 |             |             |
| <b>System accuracy</b>               | typ. 0.3° with shaft tolerance g6 |                          |                 |             |             |
| <b>Pulse rate [ppr]<sup>1)</sup></b> | <b>250, 360</b>                   | <b>1000</b>              | <b>1024</b>     | <b>2500</b> | <b>3600</b> |
| max. speed min <sup>-1</sup>         | 12000                             | 2400                     | 7000            | 3900        | 2700        |

Bearingless encoders

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |                      |
|----------------|--------------------|---|-----|----|----|----|----|----|----|----|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | Ā  | B  | B̄ | 0  | 0̄ | ⊥                    |
|                |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | shield <sup>2)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, Ā: Incremental output channel A / cosine signal
- B, B̄: Incremental output channel B / sine signal
- 0, 0̄: Reference signal
- ⊥: Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.  
 2) Shield is attached to connector housing.

# Bearingless encoders

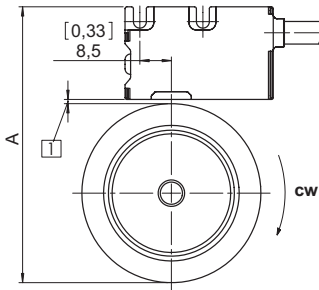
**Incremental, standard magnetic**

**RLI20 (hollow shaft)**

**Push-pull / RS422**

## Mounting orientation and permissible mounting tolerances

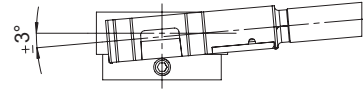
### Distances



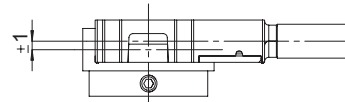
1 Distance sensor head / magnetic ring:  
0.1 ... 1.0 (0.4 [0.02] recommended)

| Pulse rate      | A<br>for distance sensor head /<br>magnetic ring: = 0.4 [0.02] |
|-----------------|--|
| 250, 1000, 2500 | 56.4 [2.22]  |
| 1024            | 66.6 [2.62]  |
| 360, 3600       | 70.4 [2.77]  |

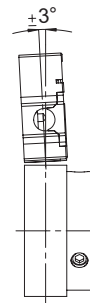
### Torsion



### Offset



### Tilting

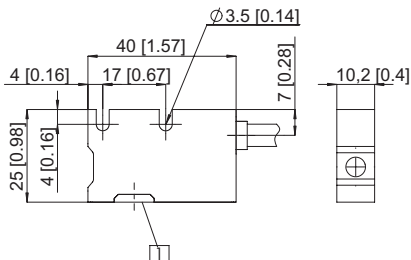


**Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!**

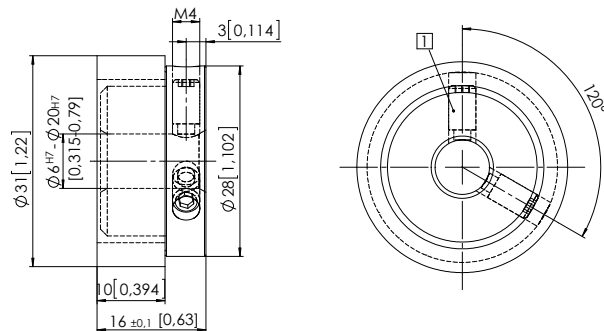
## Dimensions

Dimensions in mm [inch]

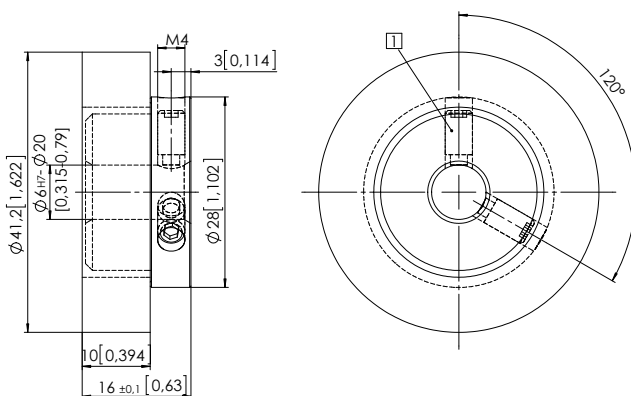
### Sensor head



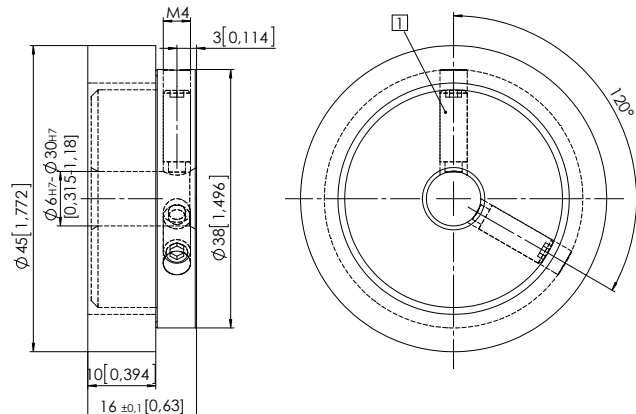
### Magnetic ring for pulse rate 250, 1000 or 2500



### Magnetic ring for pulse rate 1024



### Magnetic ring for pulse rate 360 or 3600



1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

# Bearingless encoders

|   |                             |                          |
|---|-----------------------------|--------------------------|
| <b>Incremental, standard zero pulse, magnetic</b> | <b>RLI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|-----------------------------|--------------------------|



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI20, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 35 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

## Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

## Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Bearingless encoders

## Order code RLI50

|                        |                             |                    |                  |
|------------------------|-----------------------------|--------------------|------------------|
| <b>8.RLI50</b><br>Type | <b>. X 1 X X .</b><br>a b c | <b>XXXX .</b><br>d | <b>XXXX</b><br>e |
|------------------------|-----------------------------|--------------------|------------------|

### a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

### b Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

### c Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR \*)

\*) Available special lengths (connection type A):  
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.RLI50.111A.2000.0080.0030 (for cable length 3 m)

### d Pulses per revolution <sup>1)</sup>

- 1000, 1024, 2000, 2048, 3600

### e Bore diameter

- 0060 = 6 mm [0.24"]      0158 = 5/8"
- 0080 = 8 mm [0.32"]      0254 = 1" <sup>2)</sup>
- 0100 = 10 mm [0.39"]
- 0120 = 12 mm [0.47"]
- 0150 = 15 mm [0.59"]
- 0200 = 20 mm [0.79"]
- 0250 = 25 mm [0.98"] <sup>2)</sup>
- 0300 = 30 mm [1.18"] <sup>2)</sup>
- 0350 = 35 mm [1.34"] <sup>3)</sup>

1) Other pulse rates on request.  
2) Only possible for pulse rates 1024, 2048 and 3600.  
3) Only possible for pulse rate 3600.

# Bearingless encoders

|   |                             |                          |
|---|-----------------------------|--------------------------|
| <b>Incremental, standard zero pulse, magnetic</b> | <b>RLI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|-----------------------------|--------------------------|

| Accessories / Display type 572   | Order no.   |
|----------------------------------|---|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0116.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0118.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

## Technical data

| Mechanical characteristics   |  |
|------------------------------|--|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |
| <b>Protection</b>            | model 1 IP67 acc. to EN 60529<br>model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Pole gap</b>              | 5 mm from pole to pole   |
| <b>Housing (sensor head)</b> | aluminum   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations                               |
| <b>Status LED</b>            | green pulse index<br>red error; speed too high or magnetic fields too weak   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

| Electrical characteristics                            |                                   |                               |             |             |             |
|---|-----------------------------------|-------------------------------|-------------|-------------|-------------|
| Output circuit  | RS422                             | Push-pull                     |             |             |             |
| <b>Power supply</b>                                   | 4.8 ... 26 V DC                   | 4.8 ... 30 V DC               |             |             |             |
| <b>Power consumption (no load)</b>                    | typ. 25 mA<br>max. 60 mA          | typ. 25 mA<br>max. 60 mA      |             |             |             |
| <b>Permissible load/channel</b>                       | 120 ohm                           | +/- 20 mA                     |             |             |             |
| <b>Min. pulse edge interval</b>                       | 1 µs                              | 1 µs                          |             |             |             |
| <b>Signal level</b>                                   | HIGH min. 2.5 V<br>LOW max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V |             |             |             |
| <b>Reference signal</b>                               | fixed                             |                               |             |             |             |
| <b>System accuracy</b>                                | typ. 0.3° with shaft tolerance g6 |                               |             |             |             |
| <b>Pulse rate [ppr]<sup>1)</sup></b>                  | <b>1000</b>                       | <b>1024</b>                   | <b>2000</b> | <b>2048</b> | <b>3600</b> |
| max. speed min <sup>-1</sup> without using zero pulse | 9000                              | 9000                          | 4000        | 4000        | 2500        |
| max. speed min <sup>-1</sup> using zero pulse         | 3000                              | 2000                          | 3000        | 2000        | 1700        |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |                      |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$              |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield <sup>2)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A / sine signal
- B,  $\bar{B}$ : Incremental output channel B / cosine signal
- 0,  $\bar{0}$ : Reference signal
- $\perp$ : Plug connector housing (shield)

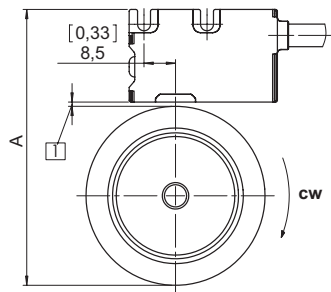
1) With an input frequency of the evaluation unit of 250 kHz.  
 2) Shield is attached to connector housing.

# Bearingless encoders

|   |                             |                          |
|---|-----------------------------|--------------------------|
| <b>Incremental, standard zero pulse, magnetic</b> | <b>RLI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|-----------------------------|--------------------------|

## Mounting orientation and permissible mounting tolerances

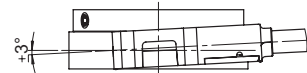
### Distances



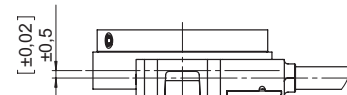
- 1 Distance sensor head / magnetic ring:  
0.1 ... 1.5 [0.004 ... 0.06]  
(1 [0.04] recommended)

| Pulse rate | A<br>for distance sensor head /<br>magnetic ring = 1 [0.04] |
|------------|---|
| 1000, 2000 | 57.0 [2.24]   |
| 1024, 2048 | 74.3 [2.93]   |
| 3600       | 80.7 [3.18]   |

### Torsion



### Offset



### Tilting

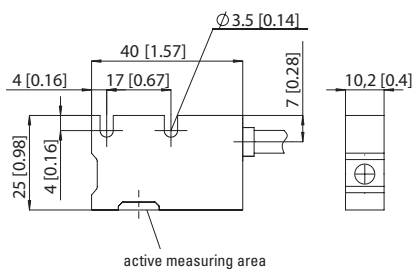


**Warning:** When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

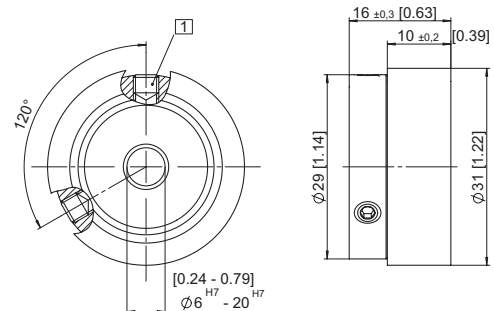
## Dimensions

Dimensions in mm [inch]

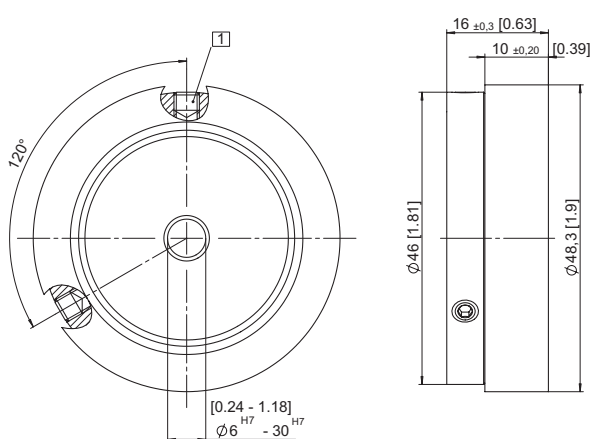
### Sensor head



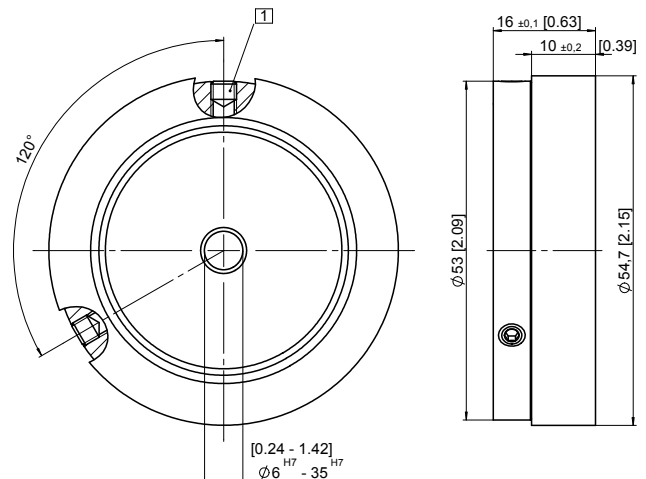
### Magnetic ring for pulse rate 1000 or 2000



### Magnetic ring for pulse rate 1024 or 2048



### Magnetic ring for pulse rate 3600



- 1 M4 set screw

# Bearingless encoders

**Incremental, standard magnetic**

**RI20 / Limes LI20 (hollow shaft)**

**Push-pull / RS422**



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI20 / Limes LI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

## Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

## Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

## Selection guide magnetic ring RI20 / Limes LI20

| Pulses per revolution <sup>1)</sup><br>(further ppr on request) | Order code<br>magnetic ring RI20 | Order code<br>sensor head Limes LI20 | Max. rotational speed<br>min <sup>-1</sup> <sup>2)</sup> |
|---|----------------------------------|--------------------------------------|--|
| 250   | 8.RI20.031.XXXX.111              | 8.LI20.11X1.2005                     | 12 000   |
| 1 000   | 8.RI20.031.XXXX.111              | 8.LI20.11X1.2020                     | 2 400  |
| 2 500   | 8.RI20.031.XXXX.111              | 8.LI20.11X1.2050                     | 3 900  |
| 1 024   | 8.RI20.041.XXXX.111              | 8.LI20.11X1.2016                     | 7 000  |
| 360   | 8.RI20.045.XXXX.111              | 8.LI20.11X1.2005                     | 12 000   |
| 3 600   | 8.RI20.045.XXXX.111              | 8.LI20.11X1.2050                     | 2 700  |

## Order code Magnetic ring RI20

8.RI20 . XXX . XXXX . 111  
Type                    a                    b

Min. order quantity for non-stock types: 10 pieces

### a Outer diameter

031 = 31 mm [1.22"]  
041 = 41.2 mm [1.62"]  
045 = 45 mm [1.77"]

### b Bore diameter

0800 = 8 mm [0.32"]      1800 = 18 mm [0.71"]      0952 = 3/8"  
1000 = 10 mm [0.39"]      2000 = 20 mm [0.79"]      1587 = 5/8"  
1200 = 12 mm [0.47"]      2500 = 25 mm [0.98"] <sup>3)</sup>      2540 = 1" <sup>3)</sup>  
1500 = 15 mm [0.59"]      3000 = 30 mm [1.18"] <sup>3)</sup>

### Stock types

8.RI20.031.0800.111  
8.RI20.031.1000.111  
8.RI20.031.1200.111  
8.RI20.031.1500.111  
8.RI20.041.0800.111  
8.RI20.045.1200.111  
8.RI20.045.1500.111  
8.RI20.045.2500.111  
8.RI20.045.2540.111  
8.RI20.045.3000.111

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.

2) With an input frequency of the evaluation unit of 250 kHz.

3) Only possible for outer diameter 045.



# Bearingless encoders

|                                       |   |                          |
|---------------------------------------|---|--------------------------|
| <b>Incremental, standard magnetic</b> | <b>RI20 / Limes LI20 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---------------------------------------|---|--------------------------|

|   |   |
|---|---|
| <b>Order code</b><br><b>Sensor head Limes LI20</b>  | <b>8.LI20.X1XX.2XXX</b><br><small>Type      a      b      c      d      e</small>   |
| <b>a Model</b><br>1 = IP67, standard<br>2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 | <b>c Type of connection</b><br>1 = cable, 2 m [6.56'] PUR<br>A = radial cable, special length PUR *)<br>*) Available special lengths (connection type A): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.LI20.111A.2005.0030 (for cable length 3 m) |
| <b>b Output circuit / power supply</b><br>1 = RS422 / 4.8 ... 26 V DC<br>2 = Push-pull / 4.8 ... 30 V DC          | <b>d Reference signal</b><br>2 = Index periodical<br><b>e Interpolation factor</b><br>005, 016, 020, 050  |
|   | <b>Stock types</b><br>8.LI20.1111.2005<br>8.LI20.1111.2020<br>8.LI20.1111.2050<br>8.LI20.1121.2005<br>8.LI20.1121.2020<br>8.LI20.1121.2050  |

| Accessories / Display type 572   | Order no.             |
|--|-----------------------|
| <b>Position display, 6-digit</b>   |                       |
| with 4 fast switch outputs and serial interface                            | <b>6.572.0116.D05</b> |
| with 4 fast switch outputs and serial interface and scalable analog output | <b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b>   |                       |
| with 4 fast switch outputs and serial interface                            | <b>6.572.0118.D05</b> |
| with 4 fast switch outputs and serial interface and scalable analog output | <b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics   |  |
|------------------------------|--|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |
| <b>Protection</b>            | Model 1 IP67 acc. to EN 60529<br>Model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Pole gap</b>              | 2 mm from pole to pole   |
| <b>Housing (sensor head)</b> | aluminum   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations                               |
| <b>Status LED</b>            | green pulse-index<br>red error; speed too high or magnetic fields too weak (8.LI20.XXXX.X050 and 8.LI20.XXXX.X250)                           |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

| Electrical characteristics         |                                   |                               |
|------------------------------------|-----------------------------------|-------------------------------|
| Output circuit                     | RS422                             | Push-pull                     |
| <b>Power supply</b>                | 4.8 ... 26 VDC                    | 4.8 ... 30 VDC                |
| <b>Power consumption (no load)</b> | typ. 25 mA<br>max. 60 mA          | typ. 25 mA<br>max. 60 mA      |
| <b>Permissible load / channel</b>  | 120 Ohm                           | +/- 20 mA                     |
| <b>Min. pulse edge interval</b>    | 1 μs                              |                               |
| <b>Signal level</b>                | HIGH min. 2.5 V<br>LOW max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V |
| <b>Reference signal</b>            | index periodical                  |                               |
| <b>System accuracy</b>             | typ. 0.3° with shaft tolerance g6 |                               |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |                      |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$              |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield <sup>1)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A / cosine signal
- B,  $\bar{B}$ : Incremental output channel B / sine signal
- 0,  $\bar{0}$ : Reference signal
- $\perp$ : Plug connector housing (shield)

1) Shield is attached to connector housing.

# Bearingless encoders

**Incremental, standard magnetic**

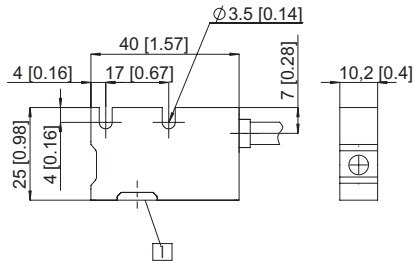
**RI20 / Limes LI20 (hollow shaft)**

**Push-pull / RS422**

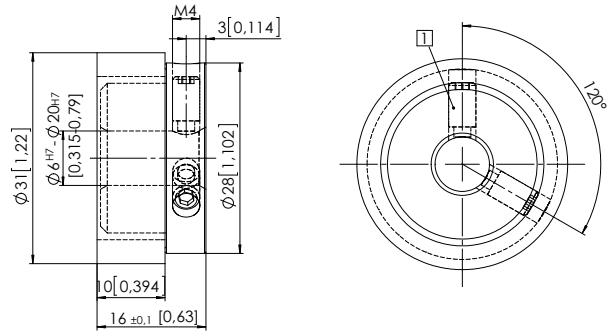
## Dimensions

Dimensions in mm [inch]

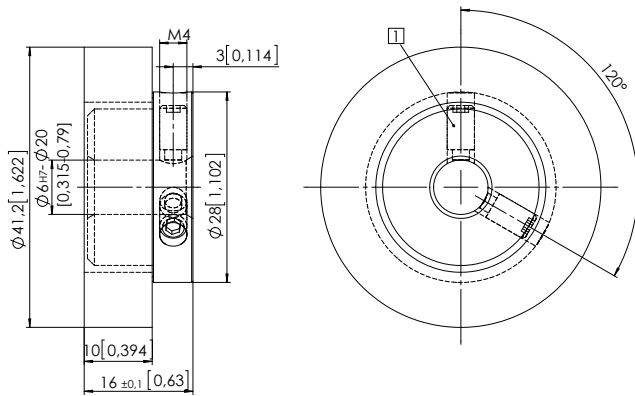
### Sensor head Limes LI20



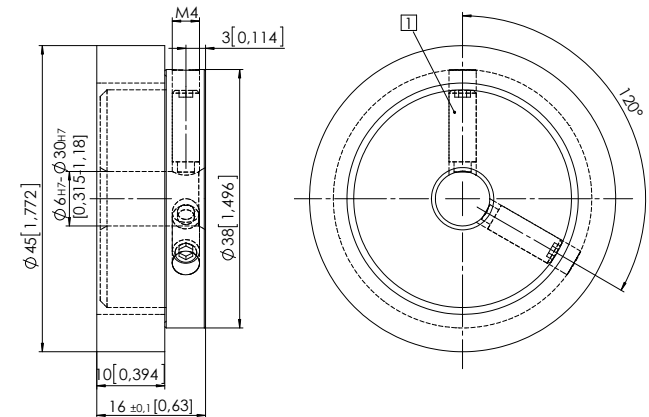
### Magnetic ring, $\varnothing$ 31 [1.22], 8.RI20.031.XXXX.111



### Magnetic ring, $\varnothing$ 41.2 [1.62], 8.RI20.041.XXXX.111



### Magnetic ring, $\varnothing$ 45 [1.77], 8.RI20.045.XXXX.111

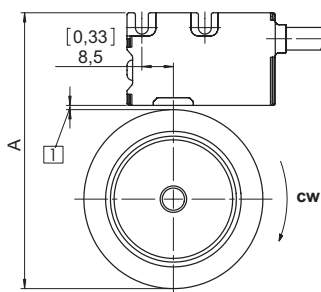


1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

## Mounting orientation and permissible mounting tolerances

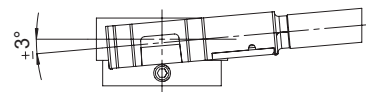
### Distances



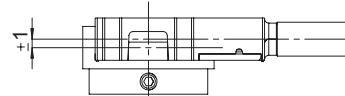
1 Distance sensor head / magnetic ring:  
0.1 ... 1.0 (0.4 [0.02] recommended)

| Magnetic ring       | A<br>for distance sensor head /<br>magnetic ring: = 0.4 [0.02] |
|---------------------|--|
| 8.RI20.031.XXXX.111 | 56.4 [2.22]  |
| 8.RI20.041.XXXX.111 | 66.6 [2.62]  |
| 8.RI20.045.XXXX.111 | 70.4 [2.77]  |

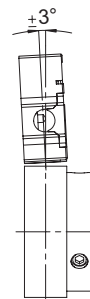
### Torsion



### Offset



### Tilting



**Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!**

# Bearingless encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Incremental, standard zero pulse, magnetic</b> | <b>RI50 / Limes LI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI50 / Limes LI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RI20 / Limes LI20, a single zero pulse is also implemented here.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

## Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

## Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Bearingless encoders

## Selection guide magnetic ring RI50 / Limes LI50

| Pulse per revolution <sup>1)</sup> | Order code<br>magnetic ring RI50 | Order code<br>sensor head Limes LI50 | Max. rotational speed min <sup>-1</sup> (electronic) <sup>2)</sup> |                    |
|------------------------------------|----------------------------------|--------------------------------------|--|--------------------|
|                                    |                                  |                                      | without using index signal   | using index signal |
| 1000                               | 8.RI50.031.XXXX.112              | 8.LI50.11X1.1050                     | 9000   | 3000               |
| 2000                               | 8.RI50.031.XXXX.112              | 8.LI50.11X1.1100                     | 4000   | 3000               |
| 1024                               | 8.RI50.048.XXXX.112              | 8.LI50.11X1.1032                     | 9000   | 2000               |
| 2048                               | 8.RI50.048.XXXX.112              | 8.LI50.11X1.1064                     | 4000   | 2000               |
| 3600                               | 8.RI50.055.XXXX.112              | 8.LI50.11X1.1100                     | 2500   | 1700               |

|   |                        |                                    |                                    |             |  |
|---|------------------------|------------------------------------|------------------------------------|-------------|--|
| <b>Order code</b><br>Magnetic ring RI50 | <b>8.RI50</b><br>Type  | <b>.XXX</b><br>a                   | <b>.XXXX</b><br>b                  | <b>.112</b> | Min. order quantity for non-stock types: 10 pieces |
| <b>a</b> Outer diameter                 | <b>b</b> Bore diameter |                                    |                                    |             | Stock types  |
| 031 = 31 mm [1.22"]                     | 0600 = 6 mm [0.24"]    | 1500 = 15 mm [0.59"]               | 3500 = 35 mm [1.34"] <sup>4)</sup> |             | 8.RI50.048.2000.112                                |
| 048 = 48.3 mm [1.90"]                   | 0800 = 8 mm [0.32"]    | 2000 = 20 mm [0.79"]               |                                    |             |  |
| 055 = 54.7 mm [2.15"]                   | 1000 = 10 mm [0.39"]   | 2500 = 25 mm [0.98"] <sup>3)</sup> | 1587 = 5/8"                        |             |  |
|   | 1200 = 12 mm [0.47"]   | 3000 = 30 mm [1.18"] <sup>3)</sup> | 2540 = 1" <sup>3)</sup>            |             |  |

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.  
 2) With an input frequency of the evaluation unit of 250 kHz.  
 3) Only possible for outer diameters 048 and 055.  
 4) Only possible for outer diameter 055.

# Bearingless encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Incremental, standard<br/>zero pulse, magnetic</b> | <b>RI50 / Limes LI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

|  |   |  |  |   |   |   |   |     |   |     |      |  |   |  |   |   |  |   |   |  |  |   |  |  |
|--|---|--|--|---|---|---|---|-----|---|-----|------|--|---|--|---|---|--|---|---|--|--|---|--|--|
| <b>Order code<br/>Sensor head Limes LI50</b>   | <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">8.LI50</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">XXX</td> </tr> <tr> <td style="font-size: 8px;">Type</td> <td></td> <td style="font-size: 8px;">a</td> <td></td> <td style="font-size: 8px;">b</td> <td style="font-size: 8px;">c</td> <td></td> <td style="font-size: 8px;">d</td> <td style="font-size: 8px;">e</td> </tr> </table> | 8.LI50   | .                                      | X | 1 | X | X | .   | 1 | XXX | Type |  | a |  | b | c |  | d | e | <table border="0"> <tr> <td style="vertical-align: top; padding-right: 10px;"> <b>a Model</b><br/>           1 = IP67, standard<br/>           2 = IP68 / IP69k and humidity tested<br/>             acc. to EN 60068-3-38, EN 60068-3-78<br/><br/> <b>b Output circuit / Power supply</b><br/>           1 = RS422 / 4.8 ... 26 V DC<br/>           2 = Push-pull / 4.8 ... 30 V DC         </td> <td style="vertical-align: top; padding-right: 10px;"> <b>c Type of connection</b><br/>           1 = radial cable, 2 m [6.56'] PUR<br/>           A = radial cable, special length PUR *)<br/><br/>           *) Available special lengths (connection type A):<br/>           3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br/>           order code expansion .XXXX = length in dm<br/>           ex.: 8.LI50.111A.1032.0030 (for cable length 3 m)         </td> <td style="vertical-align: top;"> <b>d Reference signal</b><br/>           1 = separate index signal<br/>           (linked with A and B)<br/><br/> <b>e Interpolation factor</b><br/>           032, 050, 064, 100         </td> <td style="vertical-align: top;"> <b>Stock types</b><br/>           8.LI50.1121.1032         </td> </tr> </table> | <b>a Model</b><br>1 = IP67, standard<br>2 = IP68 / IP69k and humidity tested<br>acc. to EN 60068-3-38, EN 60068-3-78<br><br><b>b Output circuit / Power supply</b><br>1 = RS422 / 4.8 ... 26 V DC<br>2 = Push-pull / 4.8 ... 30 V DC | <b>c Type of connection</b><br>1 = radial cable, 2 m [6.56'] PUR<br>A = radial cable, special length PUR *)<br><br>*) Available special lengths (connection type A):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.LI50.111A.1032.0030 (for cable length 3 m) | <b>d Reference signal</b><br>1 = separate index signal<br>(linked with A and B)<br><br><b>e Interpolation factor</b><br>032, 050, 064, 100 | <b>Stock types</b><br>8.LI50.1121.1032 |
| 8.LI50   | .   | X  | 1                                      | X | X | . | 1 | XXX |   |     |      |  |   |  |   |   |  |   |   |  |  |   |  |  |
| Type   |   | a  |  | b | c |   | d | e   |   |     |      |  |   |  |   |   |  |   |   |  |  |   |  |  |
| <b>a Model</b><br>1 = IP67, standard<br>2 = IP68 / IP69k and humidity tested<br>acc. to EN 60068-3-38, EN 60068-3-78<br><br><b>b Output circuit / Power supply</b><br>1 = RS422 / 4.8 ... 26 V DC<br>2 = Push-pull / 4.8 ... 30 V DC | <b>c Type of connection</b><br>1 = radial cable, 2 m [6.56'] PUR<br>A = radial cable, special length PUR *)<br><br>*) Available special lengths (connection type A):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 8.LI50.111A.1032.0030 (for cable length 3 m)   | <b>d Reference signal</b><br>1 = separate index signal<br>(linked with A and B)<br><br><b>e Interpolation factor</b><br>032, 050, 064, 100 | <b>Stock types</b><br>8.LI50.1121.1032 |   |   |   |   |     |   |     |      |  |   |  |   |   |  |   |   |  |  |   |  |  |

| Accessories / Display type 572   | Order no.   |
|----------------------------------|---|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0116.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0118.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

## Technical data

| Mechanical characteristics   |  |         |                       |         |   |
|------------------------------|--|---------|-----------------------|---------|---|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |         |                       |         |   |
| <b>Protection</b>            | <table border="0"> <tr> <td style="padding-right: 10px;">model 1</td> <td>IP67 acc. to EN 60529</td> </tr> <tr> <td>model 2</td> <td>IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78</td> </tr> </table> | model 1 | IP67 acc. to EN 60529 | model 2 | IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| model 1                      | IP67 acc. to EN 60529  |         |                       |         |   |
| model 2                      | IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78  |         |                       |         |   |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |         |                       |         |   |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |         |                       |         |   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |         |                       |         |   |
| <b>Pole gap</b>              | 5 mm from pole to pole   |         |                       |         |   |
| <b>Housing (sensor head)</b> | aluminum   |         |                       |         |   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations   |         |                       |         |   |
| <b>Status LED</b>            | <table border="0"> <tr> <td style="padding-right: 10px;">green</td> <td>pulse index</td> </tr> <tr> <td>red</td> <td>error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)</td> </tr> </table>                           | green   | pulse index           | red     | error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)           |
| green                        | pulse index  |         |                       |         |   |
| red                          | error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)  |         |                       |         |   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |         |                       |         |   |

| Electrical characteristics         | RS422   | Push-Pull                |            |     |            |   |                 |  |            |  |
|------------------------------------|---|--------------------------|------------|-----|------------|---|-----------------|--|------------|--|
| <b>Output circuit</b>              |   |                          |            |     |            |   |                 |  |            |  |
| <b>Power supply</b>                | 4.8 ... 26 V DC   | 4.8 ... 30 V DC          |            |     |            |   |                 |  |            |  |
| <b>Power consumption (no load)</b> | typ. 25 mA<br>max. 60 mA  | typ. 25 mA<br>max. 60 mA |            |     |            |   |                 |  |            |  |
| <b>Permissible load/channel</b>    | 120 ohm   | +/- 20 mA                |            |     |            |   |                 |  |            |  |
| <b>Min. pulse edge interval</b>    | 1 µs  | 1 µs                     |            |     |            |   |                 |  |            |  |
| <b>Signal level</b>                | <table border="0"> <tr> <td style="padding-right: 10px;">HIGH</td> <td>min. 2.5 V</td> </tr> <tr> <td>LOW</td> <td>max. 0.5 V</td> </tr> </table> | HIGH                     | min. 2.5 V | LOW | max. 0.5 V | <table border="0"> <tr> <td style="padding-right: 10px;">min. +V - 2.0 V</td> <td></td> </tr> <tr> <td>max. 0.5 V</td> <td></td> </tr> </table> | min. +V - 2.0 V |  | max. 0.5 V |  |
| HIGH                               | min. 2.5 V  |                          |            |     |            |   |                 |  |            |  |
| LOW                                | max. 0.5 V  |                          |            |     |            |   |                 |  |            |  |
| min. +V - 2.0 V                    |   |                          |            |     |            |   |                 |  |            |  |
| max. 0.5 V                         |   |                          |            |     |            |   |                 |  |            |  |
| <b>Reference signal</b>            | fixed   |                          |            |     |            |   |                 |  |            |  |
| <b>System accuracy</b>             | typ. 0.3° with shaft tolerance g6   |                          |            |     |            |   |                 |  |            |  |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |                      |
|----------------|--------------------|---|-----|----|----|----|----|----|----|----|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | Ā  | B  | B̄ | 0  | 0̄ | ⊥                    |
|                |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | shield <sup>1)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, Ā: Incremental output channel A / sine signal
- B, B̄: Incremental output channel B / cosine signal
- 0, 0̄: Reference signal
- ⊥: Plug connector housing (shield)

1) Shield is attached to connector housing.

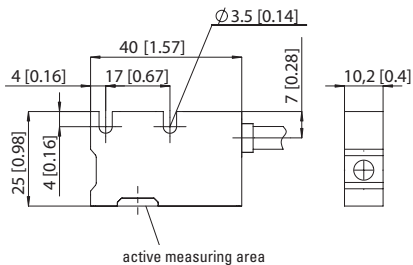
# Bearingless encoders

|   |   |                          |
|---|---|--------------------------|
| <b>Incremental, standard zero pulse, magnetic</b> | <b>RI50 / Limes LI50 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|---|--------------------------|

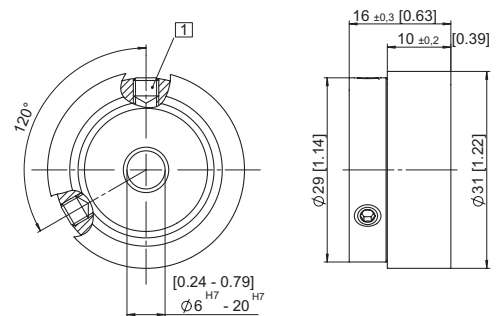
## Dimensions

Dimensions in mm [inch]

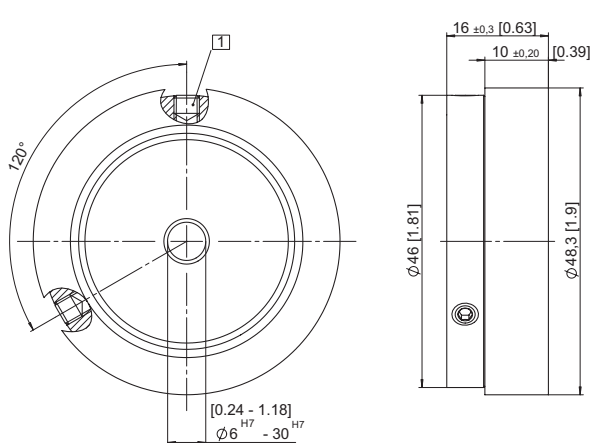
### Sensor head Limes LI50



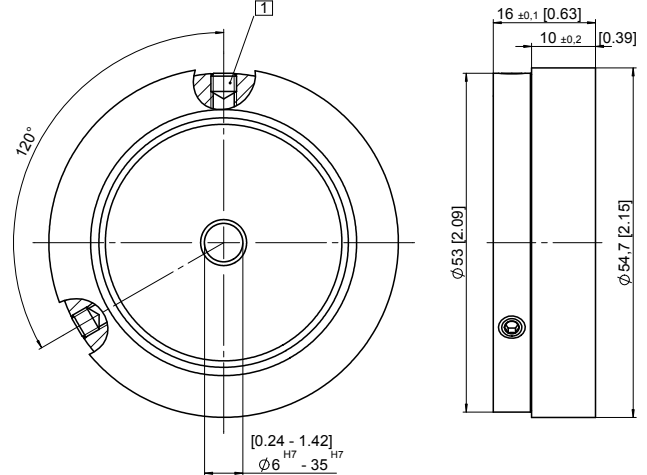
### Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



### Magnetic ring, ø 48.3 [1.90], 8.RI50.048.XXXX.112



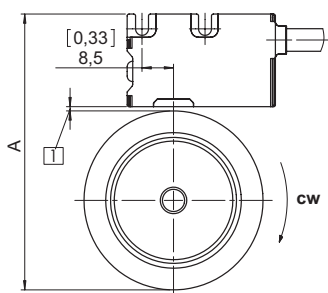
### Magnetic ring, ø 54.7 [2.15], 8.RI50.055.XXXX.112



1 M4 Set screw

## Mounting orientation and permissible mounting tolerances

### Distances

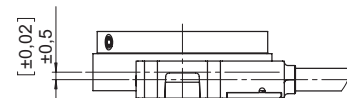


1 Distance sensor head / magnetic ring:  
0.1 ... 1.5 [0.004 ... 0.06]  
(1 [0.04] recommended)

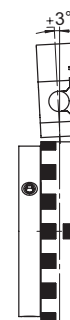
### Torsion



### Offset



### Tilting



| Magnetic ring       | A<br>for distance sensor head /<br>magnetic ring = 1 [0.04] |
|---------------------|---|
| 8.RI50.031.XXXX.112 | 57.0 [2.24]   |
| 8.RI50.048.XXXX.112 | 74.3 [2.93]   |
| 8.RI50.055.XXXX.112 | 80.7 [3.18]   |

**Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!**

Bearingless encoders

# Bearingless encoders

**Incremental, large hollow shaft magnetic**

**RLI200 (hollow shaft)**

**Push-pull / RS422**



Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI200, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 390 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

## Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

## Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

## Order code RLI200

8.RLI200 . XX1XX . XXXXX . XXXX  
Type                    a b                    c d                    e                    f

### a Magnetic ring mounting method

- 1 = Press fit
- 2 = Hub screw <sup>1)</sup>
- 3 = Screwed flange <sup>1)</sup>

### b Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

### c Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

### d Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR \*)

\*) Available special lengths (connection type A):  
 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
 order code expansion .XXXX = length in dm  
 ex.: 8.RLI200.1111A.7000.0760.0030 (for cable length 3 m)

### e Pulses per revolution

- 700, 2240, 2800, 7000 (for hollow shaft ø 76 mm)
- 1600, 5120, 6400, 16000 (for hollow shaft ø 180 mm)
- (e.g.: 1600 pulses => 01600)

### f Hollow shaft diameter

- 0760 = 76 mm [2.99"] <sup>2)</sup>
- 1800 = 180 mm [7.09"] <sup>2)</sup>

*Optional on request*  
 - other pulse rates  
 - other hollow shaft diameter (up to max. 390 mm)

### Press fit



### Hub screw



### Screwed flange



1) On request.

2) With magnetic ring mounting method 2 or 3 on request.

# Bearingless encoders

|   |                              |                          |
|---|------------------------------|--------------------------|
| <b>Incremental, large hollow shaft magnetic</b> | <b>RLI200 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|------------------------------|--------------------------|

| Accessories / Display type 572   | Order no.   |
|----------------------------------|---|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0116.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0118.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics   |  |
|------------------------------|--|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |
| <b>Protection</b>            | Model 1 IP67 acc. to EN 60529<br>Model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Pole gap</b>              | 2 mm from pole to pole   |
| <b>Housing (sensor head)</b> | aluminum   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations                               |
| <b>Status LED</b>            | green pulse-index<br>red error; speed too high or magnetic fields too weak   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

| Electrical characteristics           |                                   |                               |             |              |
|--------------------------------------|-----------------------------------|-------------------------------|-------------|--------------|
| Output circuit                       | RS422                             | Push-pull                     |             |              |
| <b>Power supply</b>                  | 4.8 ... 26 VDC                    | 4.8 ... 30 VDC                |             |              |
| <b>Power consumption (no load)</b>   | typ. 25 mA<br>max. 60 mA          | typ. 25 mA<br>max. 60 mA      |             |              |
| <b>Permissible load / channel</b>    | 120 Ohm                           | +/- 20 mA                     |             |              |
| <b>Min. pulse edge interval</b>      | 1 µs                              |                               |             |              |
| <b>Signal level</b>                  | HIGH min. 2.5 V<br>LOW max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V |             |              |
| <b>Reference signal</b>              | index periodical                  |                               |             |              |
| <b>System accuracy</b>               | typ. 0.3° with shaft tolerance g6 |                               |             |              |
| <b>Pulse rate [ppr]<sup>1)</sup></b> | <b>700</b>                        | <b>2240</b>                   | <b>2800</b> | <b>7000</b>  |
| max. speed min <sup>-1</sup>         | 12000                             | 6600                          | 5300        | 2100         |
|                                      | <b>1600</b>                       | <b>5120</b>                   | <b>6400</b> | <b>16000</b> |
| max. speed min <sup>-1</sup>         | 9300                              | 2900                          | 2300        | 900          |

Bearingless encoders

### Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |           |    |           |    |           |                      |
|----------------|--------------------|---|-----|----|----|-----------|----|-----------|----|-----------|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$              |
|                |                    | Cable color:  | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield <sup>2)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A / cosine signal
- B,  $\bar{B}$ : Incremental output channel B / sine signal
- 0,  $\bar{0}$ : Reference signal
- $\perp$ : Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.  
2) Shield is attached to connector housing.

# Bearingless encoders

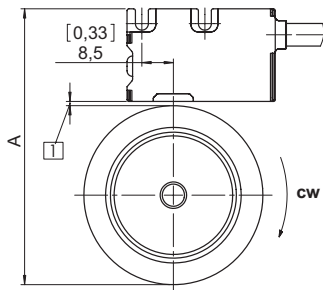
**Incremental, large hollow shaft magnetic**

**RLI200 (hollow shaft)**

**Push-pull / RS422**

## Mounting orientation and permissible mounting tolerances

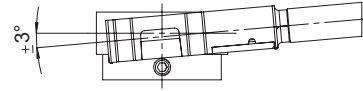
### Distances



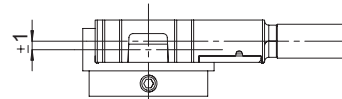
1 Distance sensor head / magnetic ring:  
0.1 ... 1.0 (0.4 [0.02] recommended)

| Pulse rate              | A<br>for distance sensor head /<br>magnetic ring = 0.4 mm [0.02] |
|-------------------------|--|
| 700, 2240, 2800, 7000   | 112.5 [4.43]   |
| 1600, 5120, 6400, 16000 | 227.7 [8.96]   |

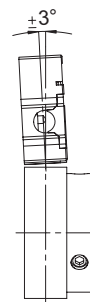
### Torsion



### Offset



### Tilting

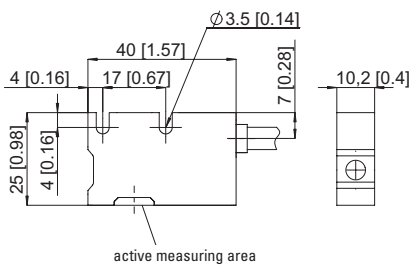


**Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!**

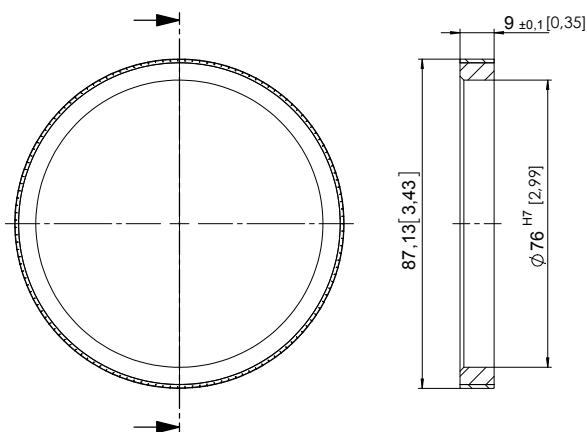
## Dimensions

Dimensions in mm [inch]

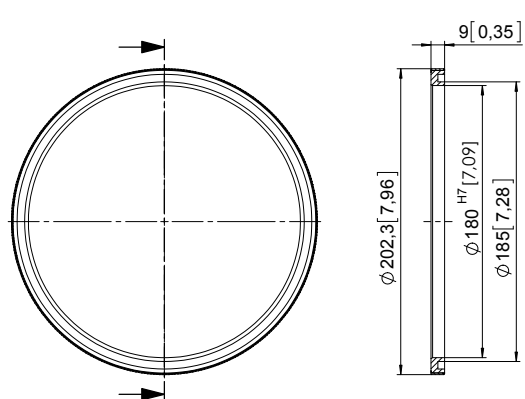
### Sensor head



### Magnetic ring (press fit) for pulse rate 700, 2240, 2800, 7000



### Magnetic ring (press fit) for pulse rate 1600, 5120, 6400, 16000





# Bearingless encoders

|   |                              |                          |
|---|------------------------------|--------------------------|
| <b>Incremental, large hollow shaft zero pulse, magnetic</b> | <b>RLI500 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|------------------------------|--------------------------|



Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI500, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI200, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 350 mm.



|                       |                       |                             |                             |
|-----------------------|-----------------------|-----------------------------|-----------------------------|
|                       |                       |                             |                             |
| High rotational speed | High protection level | Shock / vibration resistant | Reverse polarity protection |

### Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

### Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Bearingless encoders

|                             |                 |                  |                |               |
|-----------------------------|-----------------|------------------|----------------|---------------|
| <b>Order code</b><br>RLI500 | <b>8.RLI500</b> | <b>. XX 1 XX</b> | <b>. XXXXX</b> | <b>. 0700</b> |
|                             | Type            | a b c d          | e              | f             |

- a** *Magnetic ring mounting method*
- 1 = Press fit <sup>1)</sup>
  - 2 = Hub screw
  - 3 = Screwed flange <sup>1)</sup>

- b** *Model*
- 1 = IP67, standard
  - 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

- c** *Output circuit / Power supply*
- 1 = RS422 / 4.8 ... 26 V DC
  - 2 = Push-pull / 4.8 ... 30 V DC

- d** *Type of connection*
- 1 = radial cable, 2 m [6.56'] PUR
  - A = radial cable, special length PUR \*)
- \*) Available special lengths (connection type A):  
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.RLI500.21112A.4096.0700.0030 (for cable length 3 m)

- e** *Pulses per revolution*
- 2048, 3200, 4096, 6400 (for hollow shaft ø 70 mm)  
(e.g.: 2048 pulses => 02048)

- f** *Hollow shaft diameter*
- 0700 = 70 mm [2.76"] <sup>2)</sup>

*Optional on request*

- other pulse rates
- other hollow shaft diameter (up to max. 350 mm)

#### Press fit



#### Hub screw



#### Screwed flange



1) On request.  
2) With magnetic ring mounting method 1 or 3 on request.

# Bearingless encoders

|   |                              |                          |
|---|------------------------------|--------------------------|
| <b>Incremental, large hollow shaft<br/>zero pulse, magnetic</b> | <b>RLI500 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|------------------------------|--------------------------|

| Accessories / Display type 572   | Order no.   |
|----------------------------------|---|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0116.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface<br><b>6.572.0118.D05</b>                            |
|                                  | with 4 fast switch outputs and serial interface and scalable analog output<br><b>6.572.0118.D95</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

## Technical data

| Mechanical characteristics   |  |
|------------------------------|--|
| <b>Maximum speed</b>         | 12000 min <sup>-1</sup>  |
| <b>Protection</b>            | model 1 IP67 acc. to EN 60529<br>model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78 |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |
| <b>Shock resistance</b>      | 5000 m/s <sup>2</sup> , 1 ms   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Pole gap</b>              | 5 mm from pole to pole   |
| <b>Housing (sensor head)</b> | aluminum   |
| <b>Cable</b>                 | 2 m [6.56'] long, PUR 8 x 0.14 mm <sup>2</sup> [AWG 26], shielded, may be used in trailing cable installations                               |
| <b>Status LED</b>            | green pulse index<br>red error; speed too high or magnetic fields too weak   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

| Electrical characteristics           |                                   |                               |             |             |
|--------------------------------------|-----------------------------------|-------------------------------|-------------|-------------|
| Output circuit                       | RS422                             | Push-pull                     |             |             |
| <b>Power supply</b>                  | 4.8 ... 26 V DC                   | 4.8 ... 30 V DC               |             |             |
| <b>Power consumption (no load)</b>   | typ. 25 mA<br>max. 60 mA          | typ. 25 mA<br>max. 60 mA      |             |             |
| <b>Permissible load/channel</b>      | 120 ohm                           | +/- 20 mA                     |             |             |
| <b>Min. pulse edge interval</b>      | 1 µs                              | 1 µs                          |             |             |
| <b>Signal level</b>                  | HIGH min. 2.5 V<br>LOW max. 0.5 V | min. +V - 2.0 V<br>max. 0.5 V |             |             |
| <b>Reference signal</b>              | fixed                             |                               |             |             |
| <b>System accuracy</b>               | typ. 0.3° with shaft tolerance g6 |                               |             |             |
| <b>Pulse rate [ppr]<sup>1)</sup></b> | <b>2048</b>                       | <b>3200</b>                   | <b>4096</b> | <b>6400</b> |
| max. speed min <sup>-1</sup>         | 7300                              | 4600                          | 3600        | 2300        |

## Terminal assignment

| Output circuit | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |    |    |    |    |    |    |                      |
|----------------|--------------------|---|-----|----|----|----|----|----|----|----|----------------------|
| 1, 2           | 1, A               | Signal:   | 0 V | +V | A  | Ā  | B  | B̄ | 0  | 0̄ | ⊥                    |
|                |                    | Cable color:  | WH  | BN | GN | YE | GY | PK | BU | RD | shield <sup>2)</sup> |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, Ā: Incremental output channel A / sine signal
- B, B̄: Incremental output channel B / cosine signal
- 0, 0̄: Reference signal
- ⊥: Plug connector housing (shield)

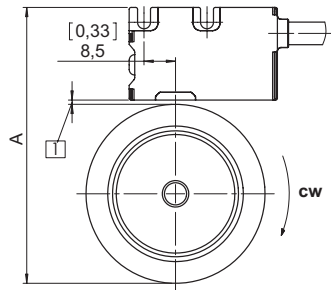
1) With an input frequency of the evaluation unit of 250 kHz.  
2) Shield is attached to connector housing.

# Bearingless encoders

|   |                              |                          |
|---|------------------------------|--------------------------|
| <b>Incremental, large hollow shaft<br/>zero pulse, magnetic</b> | <b>RLI500 (hollow shaft)</b> | <b>Push-pull / RS422</b> |
|---|------------------------------|--------------------------|

## Mounting orientation and permissible mounting tolerances

### Distances



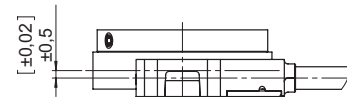
- 1 Distance sensor head / magnetic ring:  
0.1 ... 1.5 [0.004 ... 0.06]  
(1 [0.04] recommended)

| Impulsions par tour    | A<br>for distance sensor head /<br>magnetic ring = 1 mm [0.04] |
|------------------------|--|
| 2048, 3200, 4096, 6400 | 128.0 [5.04]   |

### Torsion



### Offset



### Tilting

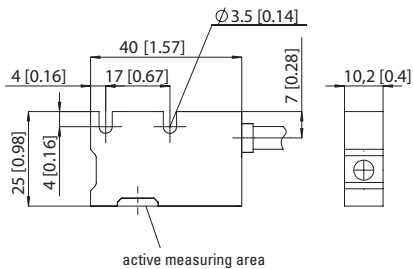


**Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!**

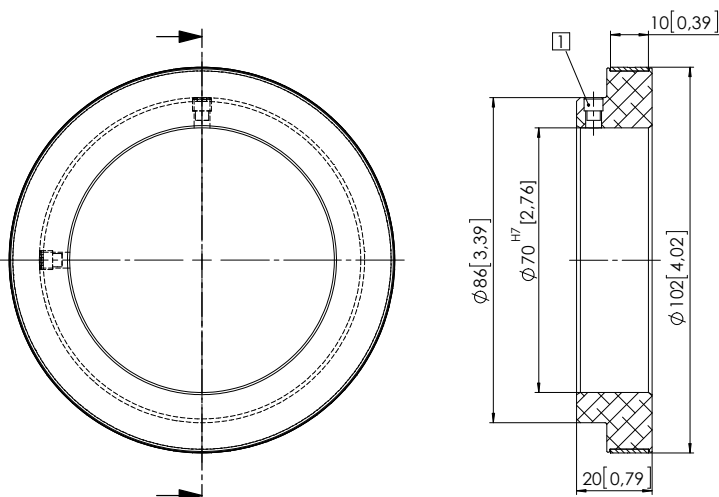
## Dimensions

Dimensions in mm [inch]

### Sensor head



### Magnetic ring (hub screw) pulse rate 2048, 3200, 4096, 6400



- 1 M5 set screw M4



## Linear measuring technology

|  |                               | Type                                       | Description                  | Page       |
|--|-------------------------------|--|------------------------------|------------|
| <b>Incremental magnetic measurement system</b> | Sensor head, magnetic band    | Limes LI20 / B1                            | Resolution min. 10 µm        | <b>490</b> |
|  | Sensor head, magnetic band    | Limes LI50 / B2                            | Resolution min. 5 µm         | <b>493</b> |
| <b>Absolute magnetic measurement system</b>    | Sensor head, magnetic band    | Limes LA10 / BA1                           | Resolution min. 1 µm         | <b>496</b> |
|  | Sensor head, magnetic band    | Limes LA50 / BA5                           | Resolution min. 10 µm        | <b>500</b> |
| <b>Draw wire mechanics</b>                     | With analog sensor            | Draw wire encoder A30                      | Measuring length max. 0.6 m  | <b>504</b> |
|  | With analog sensor            | Draw wire encoder A40                      | Measuring length max. 1 m    | <b>506</b> |
|  | With encoder or analog sensor | Draw wire encoder A50                      | Measuring length max. 1.25 m | <b>508</b> |
|  | With incremental encoder      | Draw wire encoder A40                      | Measuring length max. 2 m    | <b>513</b> |
|  | With analog sensor            | Draw wire encoder A41                      | Measuring length max. 2 m    | <b>506</b> |
|  | With absolute encoder         | Draw wire encoder A41                      | Measuring length max. 2 m    | <b>515</b> |
|  | With encoder or analog sensor | Draw wire encoder B75                      | Measuring length max. 3 m    | <b>518</b> |
|  | With encoder or analog sensor | Draw wire encoder B80                      | Measuring length max. 3 m    | <b>522</b> |
|  | With encoder                  | Draw wire encoder C105                     | Measuring length max. 6 m    | <b>528</b> |
|  | With encoder or analog sensor | Draw wire encoder C120                     | Measuring length max. 6 m    | <b>531</b> |
| With encoder or analog sensor                  | Draw wire encoder D135        | Measuring length max. 42.5 m               | <b>537</b>                   |            |
| <b>Lift measuring system</b>                   | For shaft-copying             | Encoder mounting fixture, guided-belt, LM3 | Max. height 53 m             | <b>544</b> |
| <b>Length measuring kit</b>                    | With encoder                  | Mini measurement system                    | Incremental                  | <b>546</b> |
|  | With encoder / preset counter | With rack and pinion                       | Incremental / absolute       | <b>547</b> |
|  | With encoder / preset counter | Measuring wheelsystem                      | Incremental / absolute       | <b>548</b> |
|  | Flexible fastening            | Spring encoder arm                         |                              | <b>549</b> |
|  | Measuring wheels              | Various wheel coatings                     |                              | <b>550</b> |

# Linear measuring technology

**Incremental magnetic measurement system  
sensor head, magnetic band**

**Limes LI20 / B1**

**Resolution min. 10 µm**



The non-contact incremental magnetic linear measurement system Limes LI20 / B1 - made up of the sensor head LI20 and of the magnetic band B1 - reaches a resolution up to 10 µm with a maximum distance of 1 mm between the sensor and the band.

For outdoor use with extremely sturdy aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



Temperature range



High protection level



Shock / vibration resistant



Reverse polarity protection

## Robust

- Sturdy housing with IP67 protection.  
Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

## Easy installation

- Simple glued assembly of the magnetic band.
- Large mounting tolerances.
- Requires very little installation space.
- Warning signals via LED if the magnetic field is too weak.

## Order code sensor head Limes LI20

**8.LI20.X1X1.2XXX**  
Type      a      b      c      d      e      f

### a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

### b Pulse edge interval

- 1 = standard

### c Output circuit / power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

### d Type of connection

- 1 = cable, 2 m [6.56'] PUR

### e Reference signal

- 2 = index periodic

### f Code (resolution)<sup>1)</sup>

- 005 = 100 µm
- 020 = 25 µm
- 050 = 10 µm

### Stock types

- 8.LI20.1111.2005
- 8.LI20.1111.2020
- 8.LI20.1111.2050
- 8.LI20.1121.2005
- 8.LI20.1121.2020
- 8.LI20.1121.2050

## Order code magnetic band Limes B1

**8.B1.10.010.XXXX**  
Type      a      b

### a Width

- 10 = 10 mm

### b Length

- 0010 = 1 m      0060 = 6 m
- 0020 = 2 m      0100 = 10 m
- 0040 = 4 m      0200 = 20 m
- 0050 = 5 m

### Optional on request

- other lengths up to 70 m

### Stock types

- 8.B1.10.010.0010

<sup>1)</sup> With quadruple evaluation (only connected with magnetic band Limes B1)

# Linear measuring technology

|   |                        |                              |
|---|------------------------|------------------------------|
| <b>Incremental magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LI20 / B1</b> | <b>Resolution min. 10 µm</b> |
|---|------------------------|------------------------------|

| Accessories / display type 572   |   | Order no.             |
|----------------------------------|---|-----------------------|
| <b>Position display, 6-digit</b> | with 4 fast switch outputs and serial interface                         | <b>6.572.0116.D05</b> |
|                                  | with 4 fast switch outputs, serial interface and scalable analog output | <b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b> | with 4 fast switch outputs and serial interface                         | <b>6.572.0118.D05</b> |
|                                  | with 4 fast switch outputs, serial interface and scalable analog output | <b>6.572.0118.D95</b> |

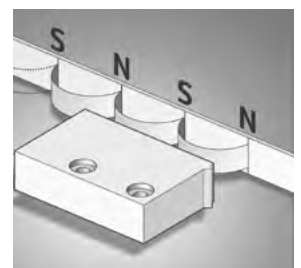
Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Sensor head Limes LI20   |  |
|--|--|
| <b>Output circuit</b>  | Push-pull RS422  |
| <b>Power supply</b>  | 4.8 ... 30 V DC 4.8 ... 26 V DC  |
| <b>Permissible load / channel</b>  | ±20 mA 120 Ω   |
| <b>Max. cable length</b>   | max. 30 m [98.43'] RS422 standard  |
| <b>Power consumption (no load)</b>                                       | typ. 25 mA, max. 60 mA   |
| <b>Short circuit proof <sup>1)</sup></b>                                 | yes yes <sup>2)</sup>  |
| <b>Min. pulse edge interval</b>  | 1 µs (corresponds to 4 µs/cycle see signal figures below)  |
| <b>Output signal</b>   | A, $\bar{A}$ , B, $\bar{B}$ , 0, $\bar{0}$   |
| <b>Reference signal</b>  | index periodical   |
| <b>Accuracy</b>  |  |
| <b>System accuracy:</b>  | typ. +200 µm, max. ± (0.04 + 0.02 × L) mm (L in [m], up to L = 70 m, at T = 20°C [+68°F] and gap sensor head/magnetic band = 0.4 mm) |
| <b>Repeat accuracy</b>   | ±1 increment   |
| <b>Resolution and speed <sup>3)</sup></b>                                | 100 µm (quadruple), max. 25 m/s<br>25 µm (quadruple), max. 4 m/s<br>10 µm (quadruple), max. 6.5 m/s                                  |
| <b>Permissible alignment tolerance (see draft „mounting tolerances“)</b> |  |
| <b>Gap sensor head / magnetic band</b>                                   | 0.1 ... 1.0 mm, recommended 0.4 mm   |
| <b>Offset</b>  | max. ±1 mm   |
| <b>Tilting</b>   | max. 3°  |
| <b>Torsion</b>   | max. 3°  |
| <b>General data</b>  |  |
| <b>Working temperature</b>   | -20°C ... +80°C [-4°F ... +176°F]  |
| <b>Shock resistance</b>  | 5000 m/s <sup>2</sup> , 1 ms   |
| <b>Vibration resistance</b>  | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Protection</b>  | model 1 IP67 acc. to EN 60529<br>model 2 IP68 / IP69k acc. to EN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78      |
| <b>Housing</b>   | aluminum   |
| <b>Cable</b>   | 2 m [6.56'] PUR 8 x 0.14 mm <sup>2</sup> [AWG25] shielded, may be used in trailing cable installations                               |
| <b>Status LED</b>  | green pulse-index<br>red error; speed too high or magnetic fields too weak (8.LI20.XXXX.X020 and 8.LI20.XXXX.X050)                   |
| <b>CE compliant acc. to</b>  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

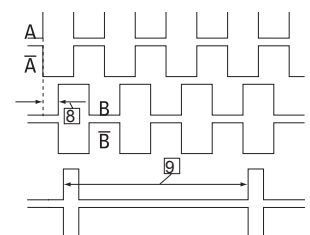
| Magnetic band Limes B1         |   |
|--------------------------------|---|
| <b>Pole gap</b>                | 2 mm from pole to pole  |
| <b>Dimensions</b>              | width 10 mm<br>thickness 1.97 mm incl. masking tape   |
| <b>Temperature coefficient</b> | 16 x 10 <sup>-6</sup> /K  |
| <b>Working temperature</b>     | -20°C ... +80°C [-4°F ... +176°F]<br>-20°C ... +65°C [-4°F ... +144°F]<br>(when mounted solely with adhesive tape)                  |
| <b>Storage temperature</b>     | -20°C ... +80°C [-4°F ... +176°F]   |
| <b>Mounting</b>                | adhesive joint  |
| <b>Measuring</b>               | 0.1 m (to receive an optimal result of measurement, the magnetic band should be ca. 0.1 m longer than the desired measuring length) |
| <b>Bending radius</b>          | ≥ 150 mm<br>(when mounted solely with adhesive tape)  |
| <b>Material metal tape</b>     | precision steel strip 1.4404 acc. to EN 10088-3   |

### Function principle



### Signal figures

- 8) Pulse edge interval:  
Pay attention to the instructions in the technical data
- 9) Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-signal can change



- 1) If power supply correctly applied.
- 2) Only one channel allowed to be shorted-out.  
If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted.  
If +V = 5 ... 30 V, short-circuit to channel or 0 V is permitted.
- 3) At the listed rotational speed the min. pulse edge interval is 1 µs, this corresponds to 250 kHz. For the max. rotational speed range a counter with a count input frequency of not less than 250 kHz should be provided.

# Linear measuring technology

|   |                        |                              |
|---|------------------------|------------------------------|
| <b>Incremental magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LI20 / B1</b> | <b>Resolution min. 10 µm</b> |
|---|------------------------|------------------------------|

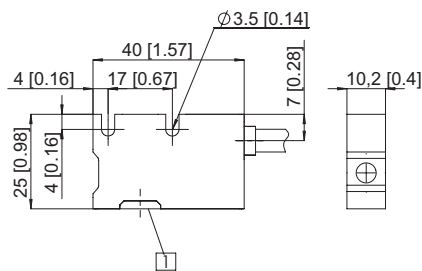
## Terminal assignment

| Output circuit | Type of connection | Cable        |     |    |    |           |    |           |    |           |                      |
|----------------|--------------------|--------------|-----|----|----|-----------|----|-----------|----|-----------|----------------------|
| 1, 2           | 1                  | Signal:      | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$              |
|                |                    | Cable color: | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield <sup>1)</sup> |

## Dimensions

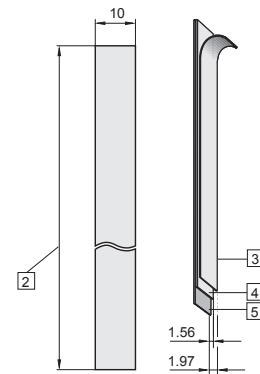
Dimensions in mm [inch]

### Sensor head Limes LI20



1 Active measuring area

### Magnetic band Limes B1



2 Length L, max. 70 m

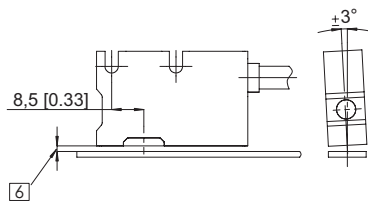
3 Masking tape

4 Magnetic band

5 Carrier band

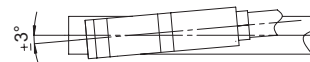
## Permissible mounting tolerances

### Tilting

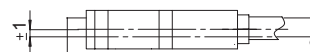


6 Distance sensor head / magnetic band:  
0.1 ... 1.0 mm (recommended 0.4 mm)

### Torsion



### Offset



1) Shield is attached to connector housing



# Linear measuring technology

|   |                        |                             |
|---|------------------------|-----------------------------|
| <b>Incremental magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LI50 / B2</b> | <b>Resolution min. 5 µm</b> |
|---|------------------------|-----------------------------|



The non-contact incremental magnetic linear measurement system Limes LI50 / B2 - made up of the sensor head LI50 and of the magnetic band B2 - reaches a resolution up to 5 µm with a maximum distance of 2 mm between the sensor and the band.

For outdoor use with extremely sturdy aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



**-20...+80°C**  
Temperature range



**IP**  
High protection level



Shock / vibration resistant



Reverse polarity protection

## Robust

- Sturdy housing with IP67 protection.  
Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

## Easy installation

- Simple glued assembly of the magnetic tape.
- Large mounting tolerances.
- Requires very little installation space.
- Warning signals via status LED if the magnetic field is too weak.

## Order code sensor head Limes LI50

**8.LI50.X1X1.2XXX**  
Type      a   b   c   d   e   f

### a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

### b Pulse edge interval

- 1 = standard

### c Output circuit / power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

### d Type of connection

- 1 = cable, 2 m [6.56'] PUR

### e Reference signal

- 2 = index periodic

### f Code (resolution)<sup>1)</sup>

- 050 = 25 µm
- 250 = 5 µm

### Stock types

- 8.LI50.1111.2050
- 8.LI50.1111.2250
- 8.LI50.1121.2050
- 8.LI50.1121.2250

## Order code magnetic band Limes B2

**8.B2.10.010.XXXX**  
Type      a      b

### a Width

- 10 = 10 mm

### b Length

- 0010 = 1 m      0060 = 6 m
- 0020 = 2 m      0100 = 10 m
- 0040 = 4 m      0200 = 20 m
- 0050 = 5 m

### Optional on request

- other lengths up to 70 m

### Stock types

- 8.B2.10.010.0020

<sup>1)</sup> With quadruple evaluation (only connected with magnetic band Limes B2)

# Linear measuring technology

| Incremental magnetic measurement system<br>sensor head, magnetic band | Limes LI50 / B2  | Resolution min. 5 µm  |
|---|--|-----------------------|
| <b>Accessories / Display type 572</b>                                 |  | Order no.             |
| <b>Position display, 6-digit</b>                                      | with 4 fast switch outputs<br>and serial interface                         | <b>6.572.0116.D05</b> |
|   | with 4 fast switch outputs, serial interface and<br>scalable analog output | <b>6.572.0116.D95</b> |
| <b>Position display, 8-digit</b>                                      | with 4 fast switch outputs<br>and serial interface                         | <b>6.572.0118.D05</b> |
|   | with 4 fast switch outputs, serial interface and<br>scalable analog output | <b>6.572.0118.D95</b> |

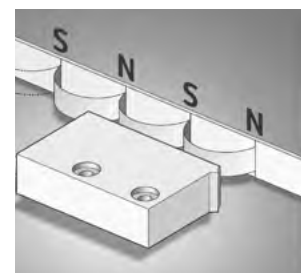
Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Sensor head Limes LI50  |  |  |
|---|--|--|
| <b>Output circuit</b>   | Push-pull  | RS422  |
| <b>Power supply</b>   | 4.8 ... 30 V DC  | 4.8 ... 26 V DC  |
| <b>Permissible load / channel</b>                                 | ±20 mA   | 120 Ω  |
| <b>Max. cable length</b>  | max. 30 m  | RS422 standard   |
| <b>Power consumption<br/>(no load)</b>                            | typ. 25 mA, max. 60 mA   |  |
| <b>Short circuit proof <sup>1)</sup></b>                          | yes  | yes <sup>2)</sup>  |
| <b>Min. pulse edge interval</b>                                   | 1 µs (corresponds to 4 µs/cycle see signal figures below)  |  |
| <b>Output signal</b>  | A, $\bar{A}$ , B, $\bar{B}$ , 0, $\bar{0}$   |  |
| <b>Reference signal</b>   | index periodical   |  |
| Accuracy  |  |  |
| <b>System accuracy</b>  | typ. +200 µm, max. ± (0.06 + 0.02 x L) mm<br>(L in [m], up to L = 70 m, at T = 20°C [+68°F] and<br>gap sensor head/magnetic band = 1.0 mm) |  |
| <b>Repeat accuracy</b>  | ±1 increment   |  |
| <b>Resolution and<br/>speed <sup>3)</sup></b>                     | 25 µm (quadruple), max. 16.25 m/s<br>5 µm (quadruple), max. 3.25 m/s   |  |
| Permissible alignment tolerance (see draft „mounting tolerances“) |  |  |
| <b>Gap sensor head /<br/>magnetic band</b>                        | 0.1 ... 2.0 mm, 1.0 mm recommended   |  |
| <b>Offset</b>   | max. ±1 mm [0.4"]  |  |
| <b>Tilting</b>  | max. 3°  |  |
| <b>Torsion</b>  | max. 3°  |  |
| General data  |  |  |
| <b>Working temperature</b>  | -20°C ... +80°C [-4°F ... +176°F]  |  |
| <b>Shock resistance</b>   | 5000 m/s <sup>2</sup> , 1 ms   |  |
| <b>Vibration resistance</b>                                       | 300 m/s <sup>2</sup> , 10 ... 2000 Hz  |  |
| <b>Protection</b>   | model 1  | IP67 acc. to EN 60529  |
|   | model 2  | IP68 / IP69k acc. to EN 60529 and humidity tested<br>acc. to EN 60068-3-38, EN 60068-3-78    |
| <b>Housing</b>  | aluminum   |  |
| <b>Cable</b>  | 2 m [6.56'] PUR 8 x 0.14 mm <sup>2</sup> [AWG 25]<br>shielded, may be used in trailing cable installations                                 |  |
| <b>Status LED</b>   | green  | pulse-index  |
|   | red  | error; speed too high or magnetic fields too weak<br>(8.LI50.XXXX.X050 and 8.LI50.XXXX.X250) |
| <b>CE compliant acc. to</b>                                       | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |  |

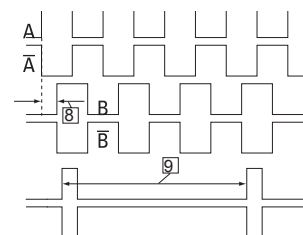
| Magnetic band Limes B2         |   |
|--------------------------------|---|
| <b>Pole gap</b>                | 5 mm from pole to pole  |
| <b>Dimensions</b>              | width 10 mm<br>thickness 1.97 mm incl. masking tape   |
| <b>Temperature coefficient</b> | 16 x 10 <sup>-6</sup> /K  |
| <b>Working temperature</b>     | -20°C ... +80°C [-4°F ... +176°F]<br>-20°C ... +65°C [-4°F ... +144°F]<br>(when mounted solely with adhesive tape)                        |
| <b>Storage temperature</b>     | -20°C ... +80°C [-4°F ... +176°F]   |
| <b>Mounting</b>                | adhesive joint  |
| <b>Measuring</b>               | 0.1 m (to receive an optimal result of measurement,<br>the magnetic band should be ca. 0.1 m<br>longer than the desired measuring length) |
| <b>Bending radius</b>          | ≥ 150 mm<br>(when mounted solely with adhesive tape)  |
| <b>Material metal tape</b>     | precision steel strip 1.4404 acc. to EN 10088-3   |

### Function principle



### Signal figures

- 8) Pulse edge interval:  
pay attention to the instructions in  
the technical data
- 9) Periodic index signal  
every 5 mm [0.20"];  
the logical assignment A, B and  
0-Signal can change



- 1) If power supply correctly applied.
- 2) Only one channel allowed to be shorted-out.  
If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted.  
If +V = 5 ... 30 V, short-circuit to channel or 0 V is permitted.
- 3) At the listed rotational speed the min. pulse edge interval is 1 µs, this corresponds to 250 kHz.  
For the max. rotational speed range a counter with a count input frequency of not less than  
250 kHz should be provided.

# Linear measuring technology

|   |                        |                             |
|---|------------------------|-----------------------------|
| <b>Incremental magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LI50 / B2</b> | <b>Resolution min. 5 µm</b> |
|---|------------------------|-----------------------------|

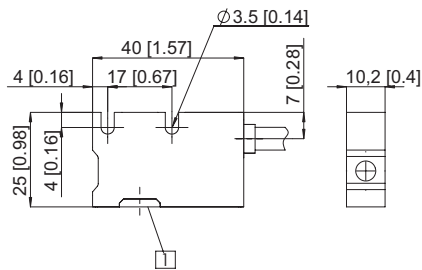
## Terminal assignment

| Output circuit | Type of connection | Cable        |     |    |    |           |    |           |    |           |                      |
|----------------|--------------------|--------------|-----|----|----|-----------|----|-----------|----|-----------|----------------------|
| 1, 2           | 1                  | Signal:      | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ | $\perp$              |
|                |                    | Cable color: | WH  | BN | GN | YE        | GY | PK        | BU | RD        | shield <sup>1)</sup> |

## Dimensions

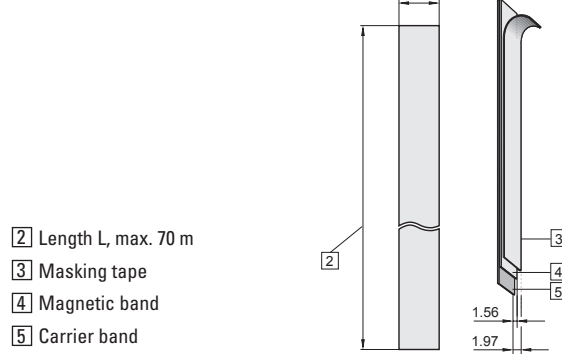
Dimensions in mm [inch]

### Sensor head Limes LI50



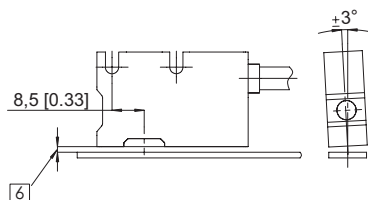
1 Active measuring area

### Magnetic band Limes B2



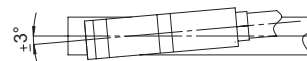
## Permissible mounting tolerances

### Tilting

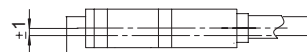


6 Distance sensor head / magnetic band:  
0.1 ... 2.0 mm (recommended 1 mm)

### Torsion



### Offset



1) PH = Shield is attached to connector housing.

# Linear measuring technology

**Absolute magnetic measurement system  
sensor head, magnetic**

**Limes LA10 / BA1**

**Measuring length max. 8 m  
Resolution min. 1 µm**



The non-contact absolute magnetic linear measurement system Limes LA10 / BA1 - made up of the sensor head LA10 and of the magnetic band BA1 - reaches a resolution up to 1 µm with a maximum distance of 0.2 mm between the sensor and the band (incl. masking tape).

The additional SinCos interface makes the measurement system LA10 / BA1 the optimal equipment for use in the linear drive technology.



|                          |                       |                                 |               |                 |             |                             |  |                       |               |
|--------------------------|-----------------------|---------------------------------|---------------|-----------------|-------------|-----------------------------|--|-----------------------|---------------|
| <b>DC</b><br>10 ... 30 V | <b>8 m</b>            | <b>0,2 mm</b>                   | <b>10 m/s</b> | <b>1 µm</b>     | <b>IP64</b> | <b>+</b><br><b>-</b>        | <b>Shock / vibration<br/>resistant</b> | <b>-10° ... +70°C</b> | <b>SinCos</b> |
| Power supply             | Max. measuring length | Max. distance to measuring tape | Max. speed    | High resolution | Protection  | Reverse polarity protection | Shock / vibration resistant            | Temperature range     | SinCos        |

### Robust and versatile

- High resolution - 1 µm / measuring length max. 8 m.
- Non-contact magnetic absolute measuring technology – therefore no wear – no referencing movement required.
- Sturdy housing with IP64 protection.
- For highly dynamic control.
- Optional SinCos signal (1 Vpp) for dynamic movement control with 1 mm pole pitch.
- Masking tape protecting the magnetic band.

### Easy installation

- Simple glued assembly of the magnetic band.
- Requires very little installation space.
- Robust measuring principle – insensitive to dirt, smoke and humidity.

### Order code sensor head Limes LA10

**8.LA10** . **12X2**  
Type                      **a** **b** **c** **d**

|  |  |  |
|--|--|--|
| <b>a</b> Model<br>1 = IP64, standard                   | <b>c</b> Output circuit / Power supply<br>1 = SSI, 25 bit Gray-Code / 10 ... 30 V DC<br>2 = SSI, 25 bit Gray-Code, SinCos 1 Vpp / 10 ... 30 V DC<br>3 = CANopen, without bus terminating resistor / 10 ... 30 V DC<br>4 = CANopen, with bus terminating resistor / 10 ... 30 V DC<br>5 = CANopen, SinCos 1 Vpp, without bus terminating resistor / 10 ... 30 V DC<br>6 = CANopen, SinCos 1 Vpp, with bus terminating resistor / 10 ... 30 V DC | <b>d</b> Type of connection<br>2 = standard, M12 connector, 12 pin |
| <b>b</b> baud rate<br>2 = standard<br>(CANopen, 250 k) |  | Stock types<br>8.LA10.1212      8.LA10.1232<br>8.LA10.1242         |
|  |  | Scope of delivery<br>sensor head + spacing template                |

### Order code magnetic band Limes BA1

**8.BA1** . **10** . **010** . **XXXX**  
Type                      **a**                      **b**

|                              |  |  |                                   |
|------------------------------|--|--|-----------------------------------|
| <b>a</b> Width<br>10 = 10 mm | <b>b</b> Length (measuring range = length - 0.1 m)<br>0005 = 0.5 m      0040 = 4 m<br>0010 = 1 m      0060 = 6 m<br>0020 = 2 m      0080 = 8 m<br>0030 = 3 m | Optional on request<br>- other lengths | Stock types<br>8.BA11.10.010.0080 |
|------------------------------|--|--|-----------------------------------|

# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA10 / BA1</b> | <b>Measuring length max. 8 m<br/>Resolution min. 1 µm</b> |
|--|-------------------------|---|

| Accessories  |  | Order no.                             |
|--|--|---------------------------------------|
| <b>SSI display type 570</b><br>Position display, 6-digit | with 2 relay outputs and serial interface<br>DC power supply   | <b>0.570.010.305</b>                  |
|  | with 2 fast switch outputs<br>AC/DC power supply   | <b>0.570.011.E00</b>                  |
|  | with scalable analog output<br>AC/DC power supply  | <b>0.570.012.E90</b>                  |
|  | RS232 / RS485 interface<br>AC/DC power supply  | <b>0.570.012.E05</b>                  |
| Connection technology                                    |  | Order no.                             |
| <b>Connector, self-assembly (straight)</b>               | M12 female connector with coupling nut, 12 pin, A coded  | <b>8.0000.5162.0000</b>               |
| <b>Cordset, pre-assembled</b>                            | M12 female connector with coupling nut, 12 pin,<br>5 m [16.4'] PUR cable 6 x 2 x 0.14 mm <sup>2</sup> [AWG 26] | <b>05.00.60B1.B211.005M</b>           |
| <b>Unprepared cable, cut to length</b>                   | 6 x 2 x 0.14 mm <sup>2</sup> [AWG 26] PVC cable  | <b>8.0000.6900.XXXX</b> <sup>1)</sup> |
|  | 6 x 2 x 0.14 mm <sup>2</sup> [AWG 26] PUR cable  | <b>8.0000.6Y00.XXXX</b> <sup>1)</sup> |
|  | 5 x 2 x 0.14 mm <sup>2</sup> [AWG 26] PVC cable  | <b>8.0000.6Z00.XXXX</b> <sup>1)</sup> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics                       |  |
|--|--|
| <b>Weight</b>                                    | approx. 0.1 kg [3.53 oz]                                   |
| <b>Working temperature</b>                       | -10°C ... +70°C [+14°F ... +158°F]<br>(non condensing)     |
| <b>Storage temperature</b>                       | -25°C ... +85°C [-13°F ... +185°F]                         |
| <b>Protection acc. to EN 60529</b>               | IP64   |
| <b>Housing</b>                                   | aluminum   |
| <b>Max. traverse speed</b>                       | SinCos reading 10 m/s                                      |
|  | permanent absolute positions reading 1 m/s                 |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 5000 m/s <sup>2</sup> , 1 ms                               |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                      |
| <b>Distance sensor head / magnetic band</b>      | 0.01 ... 0.2 mm incl. masking tape<br>(recommended 0.2 mm) |
| <b>Measuring length</b>                          | max. 8 m   |
| <b>Type of connection (standard)</b>             | M12 connector, 12 pin                                      |

| Electrical characteristics         |   |
|------------------------------------|---|
| <b>Power supply</b>                | 10 ... 30 V DC ±10%                                   |
| <b>Residual ripple</b>             | < 10 %  |
| <b>Current consumption</b>         | max. 150 mA   |
| <b>Reverse polarity protection</b> | yes   |
| <b>Short circuit proof</b>         | yes   |
| <b>CE compliant acc. to</b>        | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Accuracy                               |   |
|--|---|
| <b>Measuring principle</b>             | absolute + incremental (option)                           |
| <b>System accuracy at 20°C [+68°F]</b> | max. ± (10 + 20 x L) µm<br>L = measuring length in meters |
| <b>Repeat accuracy</b>                 | ±1 increment  |
| <b>Resolution</b>                      | 0.001 mm  |
| <b>LED, red</b>                        | lights up when distance too large                         |

| SSI interface                     |   |
|-----------------------------------|---|
| <b>Output driver</b>              | RS485 transceiver type                      |
| <b>Permissible load / channel</b> | max. ±20 mA                                 |
| <b>Signal level</b>               | HIGH typ. 3.8 V                             |
|                                   | LOW at I <sub>Load</sub> = 20 mA typ. 1.3 V |
| <b>Clock rate</b>                 | 25 bit<br>(24 + 1 failurebit for distance)  |
| <b>Code</b>                       | Gray  |
| <b>SSI clock rate</b>             | 80 kHz ... 0.4 MHz                          |
| <b>Monoflop time</b>              | ≤ 40 µs                                     |
| <b>Data refresh rate</b>          | ≤ 250 µs                                    |

| CANopen interface   |   |
|---------------------|---|
| <b>Interface</b>    | CAN High-Speed acc. to ISO 11898,<br>Basic and Full CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>     | CANopen   |
| <b>Baud rate</b>    | 250 kbit/s;<br>125 ... 1000 kbit/s configurable                                     |
| <b>Termination</b>  | yes via order code  |
| <b>Node address</b> | 1 (optional on request)   |

| Option SinCos interface    |                          |
|----------------------------|--------------------------|
| <b>Max. frequency -3dB</b> | 400 kHz                  |
| <b>Signal level</b>        | 1 V <sub>pp</sub> (±10%) |
| <b>Short circuit proof</b> | yes                      |
| <b>Pulse rate</b>          | 1 SinCos per 1 mm pole   |

1) XXXX = cable length in meters (e.g. 10 m = 0010).

# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA10 / BA1</b> | <b>Measuring length max. 8 m<br/>Resolution min. 1 µm</b> |
|--|-------------------------|---|

| Magnetic band Limes BA1          |  |
|----------------------------------|--|
| <b>Pole gap</b>                  | basic pole pitch 1 mm  |
| <b>Dimensions</b>                | width 10 mm  |
|                                  | thickness 1.97 mm incl. masking tape   |
| <b>Relative linear expansion</b> | $\Delta L = L \times \alpha \times \Delta \delta$<br><br>L = measuring length in meters<br>$\alpha = 16 \times 10^{-6} 1/K$ temperature coefficient<br>$\Delta \delta$ = relative temperature change based on 20°C [+68°F] in °K |

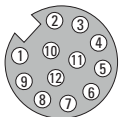
|  |   |
|--|---|
| <b>Working temperature</b>             | -20°C ... +70°C [-4°F ... +158°F]<br>(in case of mounting with adhesive tape only)  |
| <b>Storage temperature</b>             | -20°C ... +80°C [-4°F ... +176°F]   |
| <b>Mounting</b>                        | adhesive joint  |
| <b>Additional length</b>               | 100 mm<br>in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than the required measuring length |
| <b>Min. bending radius for storage</b> | ≥ 150 mm  |
| <b>Material metal tape</b>             | precision steel strip 1.4404 acc. to EN 10088-3   |

## Terminal assignment

|                |                    |                       |     |    |       |       |    |    |   |           |   |           |    |    |
|----------------|--------------------|-----------------------|-----|----|-------|-------|----|----|---|-----------|---|-----------|----|----|
| Output circuit | Type of connection | M12 connector, 12 pin |     |    |       |       |    |    |   |           |   |           |    |    |
| 1              | 2                  | Signal:               | 0 V | +V | C+    | C-    | D+ | D- | - | -         | - | -         | -  | -  |
|                |                    | Pin:                  | 1   | 2  | 3     | 4     | 5  | 6  | 7 | 8         | 9 | 10        | 11 | 12 |
| Output circuit | Type of connection | M12 connector, 12 pin |     |    |       |       |    |    |   |           |   |           |    |    |
| 2              | 2                  | Signal:               | 0 V | +V | C+    | C-    | D+ | D- | A | $\bar{A}$ | B | $\bar{B}$ | -  | -  |
|                |                    | Pin:                  | 1   | 2  | 3     | 4     | 5  | 6  | 7 | 8         | 9 | 10        | 11 | 12 |
| Output circuit | Type of connection | M12 connector, 12 pin |     |    |       |       |    |    |   |           |   |           |    |    |
| 3, 4           | 2                  | Signal:               | 0 V | +V | CAN_L | CAN_H | -  | -  | - | -         | - | -         | -  | -  |
|                |                    | Pin:                  | 1   | 2  | 3     | 4     | 5  | 6  | 7 | 8         | 9 | 10        | 11 | 12 |
| Output circuit | Type of connection | M12 connector, 12 pin |     |    |       |       |    |    |   |           |   |           |    |    |
| 5, 6           | 2                  | Signal:               | 0 V | +V | CAN_L | CAN_H | -  | -  | A | $\bar{A}$ | B | $\bar{B}$ | -  | -  |
|                |                    | Pin:                  | 1   | 2  | 3     | 4     | 5  | 6  | 7 | 8         | 9 | 10        | 11 | 12 |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Cosine signal
- B,  $\bar{B}$ : Sine signal

| Connection cable color assignment with M12 female connector | Connection cable with M12 connector, 12 pin (accessory) – for example 05.00.60B1.B211.005M |    |    |    |    |    |    |    |    |    |    |       |       |
|---|--|----|----|----|----|----|----|----|----|----|----|-------|-------|
|   | Color:   | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY/PK | RD/BU |
|   | Pin:   | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11    | 12    |



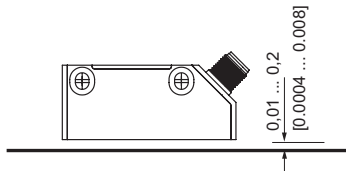
# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA10 / BA1</b> | <b>Measuring length max. 8 m<br/>Resolution min. 1 µm</b> |
|--|-------------------------|---|

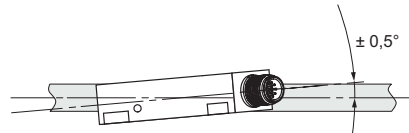
## Permissible mounting tolerances

Dimensions in mm [inch]

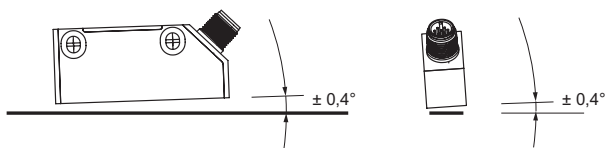
Distance sensor head / magnetic band (incl. masking tape)



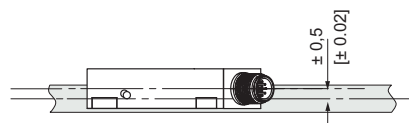
Torsion



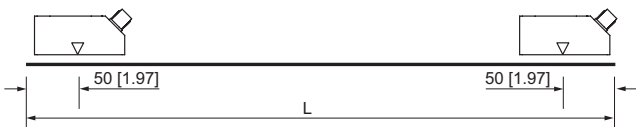
Tilting



Offset



Measuring range



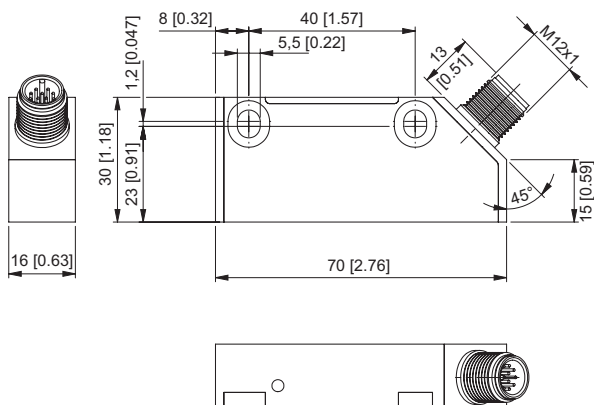
Observe mounting direction



## Dimensions

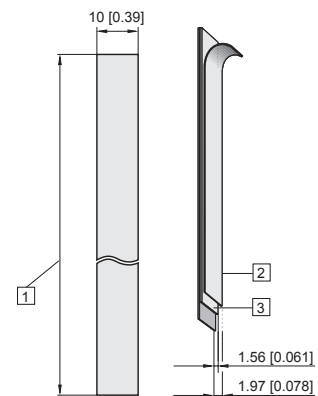
Dimensions in mm [inch]

**Sensor head Limes LA10**



**Magnetic band Limes BA1**

- 1 Length L, max. 8 m
- 2 Masking tape
- 3 Magnetic band



# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA50 / BA5</b> | <b>Measuring length max. 20 m<br/>Resolution min. 10 µm</b> |
|--|-------------------------|---|



The non-contact absolute magnetic linear measurement system Limes LA50 / BA5 - made up of the sensor head LA50 and of the magnetic band BA5 - reaches a resolution up to 10 µm with a maximum distance of 1.5 mm between the sensor and the band.



|  |                                      |  |                            |                                   |                           |                                    |                                    |  |                        |
|--|--------------------------------------|--|----------------------------|-----------------------------------|---------------------------|------------------------------------|------------------------------------|--|------------------------|
| <b>DC</b><br>10 ... 30 V<br>Power supply | <b>20 m</b><br>Max. measuring length | <b>1,5 mm</b><br>Max. distance to measuring tape | <b>4 m/s</b><br>Max. speed | <b>0.01 mm</b><br>High resolution | <b>IP40</b><br>Protection | <b>Reverse polarity protection</b> | <b>Shock / vibration resistant</b> | <b>-10° ... +70°C</b><br>Temperature range | <b>Magnetic sensor</b> |
|--|--------------------------------------|--|----------------------------|-----------------------------------|---------------------------|------------------------------------|------------------------------------|--|------------------------|

### Robust and versatile

- Resolution 0.01 mm / measuring lengths max. 20 m.
- Rugged die-cast zinc housing.
- Positions changes are also detected when de-energized no referencing movement required – no wear.
- Automatic distance detection in case of too high distance between the sensor and the magnetic band.
- Masking tape protecting the magnetic band.
- Address, baud rate, bus termination can be modified via microswitches.
- Interfaces: SSI, CANopen.

### Easy installation

- Simple glued assembly of the magnetic band.
- Large mounting tolerances.
- Requires very little installation space.
- LED warning signals in case of too weak magnetic field.

|  |                              |   |   |   |  |
|--|------------------------------|---|---|---|--|
| <b>Order code<br/>sensor head Limes LA50</b> | <b>8.LA50 . 12X1</b><br>Type | <b>a</b> Model<br>1 = IP40, standard                | <b>c</b> Output circuit / power supply<br>1 = SSI 25 bit / 10 ... 30 V DC<br>3 = CANopen / 10 ... 30 V DC | <b>d</b> Type of connection<br>1 = cable, 1.5 m PUR | <b>Stock types</b><br>8.LA50.1211<br>8.LA50.1231 |
|  |                              | <b>b</b> baud rate<br>2 = standard (CANopen, 250 k) |   |   |  |

|   |  |                              |  |   |
|---|--|------------------------------|--|---|
| <b>Order code<br/>magnetic band Limes BA5</b> | <b>8.BA5 . 20 . 010 . XXXX</b><br>Type | <b>a</b> Width<br>20 = 20 mm | <b>b</b> Length (measuring range = length - 0.1 m)<br>0010 = 1 m      0060 = 6 m<br>0020 = 2 m      0100 = 10 m<br>0040 = 4 m      0200 = 20 m<br>0050 = 5 m | <b>Stock types</b><br>8.BA5.20.010.0200 |
|---|--|------------------------------|--|---|



# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA50 / BA5</b> | <b>Measuring length max. 20 m<br/>Resolution min. 10 µm</b> |
|--|-------------------------|---|

| Accessories  |  | Order no.            |
|--|--|----------------------|
| <b>SSI display type 570</b><br>Position display, 6-digit | with 2 relay outputs and serial interface<br>DC power supply | <b>0.570.010.305</b> |
|  | with 2 fast switch outputs<br>AC/DC power supply             | <b>0.570.011.E00</b> |
|  | with scalable analog output<br>AC/DC power supply            | <b>0.570.012.E90</b> |
|  | RS232 / RS485 interface<br>AC/DC power supply                | <b>0.570.012.E05</b> |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Technical data

| Mechanical characteristics   |   |
|--|---|
| <b>Weight</b>  | ca. 0.19 kg [6.70 oz]                                     |
| <b>Working temperature</b>   | -10°C ... +70°C [+14°F ... +158°F]<br>(non condensing)    |
| <b>Storage temperature</b>   | -25°C ... +85°C [-13°F ... +185°F]                        |
| <b>Protection acc. to EN 60529</b>                                 | IP40  |
| <b>Housing</b>   | zinc die-cast   |
| <b>Max. traverse speed</b><br>permanent absolute positions reading | 4 m/s   |
| <b>Shock resistance acc. to EN 60068-2-27</b>                      | 5000 m/s <sup>2</sup> , 1 ms                              |
| <b>Vibration resistance acc. to EN 60068-2-6</b>                   | 300 m/s <sup>2</sup> , 10 ... 2000 Hz                     |
| <b>Distance sensor head / magnetic band</b>                        | 0.1 ... 1.5 mm incl. masking tape<br>(recommended 0.5 mm) |
| <b>Measuring length</b>  | max. 20 m   |
| <b>Type of connection (standard)</b>                               | cable, 1.5 m PUR, open cable ends                         |

| Electrical characteristics         |   |
|------------------------------------|---|
| <b>Power supply</b>                | 10 ... 30 V DC ±10%                                   |
| <b>Residual ripple</b>             | < 10 %  |
| <b>Current consumption</b>         | max. 150 mA   |
| <b>Reverse polarity protection</b> | yes   |
| <b>Short circuit proof</b>         | yes   |
| <b>CE compliant acc. to</b>        | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Accuracy                               |  |
|--|--|
| <b>Measuring principle</b>             | absolute   |
| <b>System accuracy at 20°C [+68°F]</b> | max. ± (150 + 20 x L) µm<br>L = measuring length in meters |
| <b>Repeat accuracy</b>                 | ±1 increment   |
| <b>Resolution</b>                      | 0.01 mm  |
| <b>LED, red</b>                        | lights up when distance too large                          |

| SSI interface                     |  |
|-----------------------------------|--|
| <b>Output driver</b>              | RS485 transceiver type   |
| <b>Permissible load / channel</b> | max. ±20 mA  |
| <b>Signal level</b>               | HIGH typ. 3.8 V<br>LOW at I <sub>Load</sub> = 20 mA typ. 1.3 V |
| <b>Clock rate</b>                 | 25 bit<br>(24 + 1 failurebit for distance)                     |
| <b>Code</b>                       | binary / gray (default) switchable                             |
| <b>SSI clock rate</b>             | 80 kHz ... 0.4 MHz   |
| <b>Monoflop time</b>              | ≤ 40 µs  |
| <b>Data refresh rate</b>          | ≤ 250 µs   |

| CANopen interface   |   |
|---------------------|---|
| <b>Interface</b>    | CAN High-Speed acc. to ISO 11898,<br>Basic and Full CAN,<br>CAN specification 2.0 B   |
| <b>Protocol</b>     | CANopen   |
| <b>Baud rate</b>    | 250 kbit/s;<br>125 ... 1000 kbit/s configurable   |
| <b>Termination</b>  | yes/no via rotary switch  |
| <b>Node address</b> | 1 ... 15 configurable (default 1)   |
| <b>LSS protocol</b> | CIA LSS protocol DS305<br>global command support for node<br>address and baud rate<br>selective commands via attributes<br>of the identity object |

# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system<br/>sensor head, magnetic band</b> | <b>Limes LA50 / BA5</b> | <b>Measuring length max. 20 m<br/>Resolution min. 10 µm</b> |
|--|-------------------------|---|

| Magnetic band Limes BA5          |   |
|----------------------------------|---|
| <b>Pole gap</b>                  | basic pole pitch 5 mm   |
| <b>Dimensions</b>                | width 20 mm   |
|                                  | thickness 1.8 mm incl. masking tape   |
| <b>Relative linear expansion</b> | $\Delta L = L \alpha \times \Delta \delta$<br><br>$L$ = measuring length in meters<br>$\alpha$ = $16 \times 10^{-6}$ 1/K temperature coefficient<br>$\Delta \delta$ = relative temperature change based on 20°C [+68°F] in °K |

|  |   |
|--|---|
| <b>Working temperature</b>             | -20°C ... +70°C [-4°F ... +158°F]   |
| <b>Storage temperature</b>             | -20°C ... +80°C [-4°F ... +176°F]   |
| <b>Mounting</b>                        | adhesive joint  |
| <b>Additional length</b>               | 100 mm<br>in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than the required measuring length |
| <b>Min. bending radius for storage</b> | ≥ 150 mm  |
| <b>Material metal tape</b>             | precision steel strip 1.4404 acc. to EN 10088-3   |

## Terminal assignment

| Output circuit | Type of connection | Cable        |     |    |    |    |    |    |    |    |                      |   |
|----------------|--------------------|--------------|-----|----|----|----|----|----|----|----|----------------------|---|
| 1<br>(SSI)     | 1                  | Signal:      | 0 V | +V | D+ | D- | C+ | C- | -  | -  | -                    | ⊥ |
|                |                    | Cable color: | WH  | BN | YE | OR | GN | PK | GY | BK | shield <sup>1)</sup> |   |

| Output circuit | Type of connection | Cable        |     |    |       |       |    |    |    |    |                      |   |
|----------------|--------------------|--------------|-----|----|-------|-------|----|----|----|----|----------------------|---|
| 3<br>(CANopen) | 1                  | Signal:      | 0 V | +V | CAN_H | CAN_L | -  | -  | -  | -  | -                    | ⊥ |
|                |                    | Cable color: | WH  | BN | YE    | OR    | GN | PK | GY | BK | shield <sup>1)</sup> |   |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0V)
- C+, C-: Clock signal
- D+, D-: Data signal

1) Connect shielding only machine side

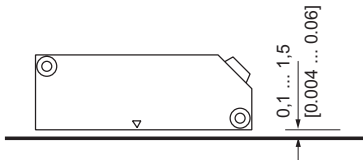
# Linear measuring technology

|  |                         |   |
|--|-------------------------|---|
| <b>Absolute magnetic measurement system</b><br><b>Sensor head, magnetic band</b> | <b>Limes LA50 / BA5</b> | <b>Measuring length max. 20 m</b><br><b>Resolution min. 10 µm</b> |
|--|-------------------------|---|

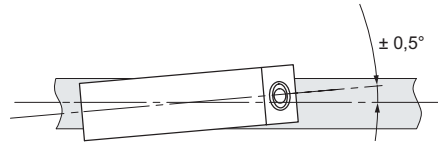
## Permissible mounting tolerances

Dimensions in mm [inch]

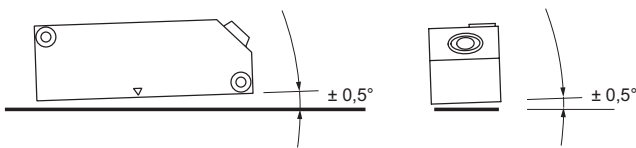
Distance sensor head / magnetic band (incl. masking tape)



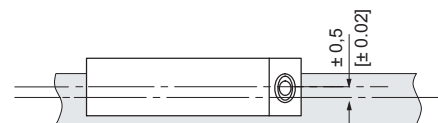
Torsion



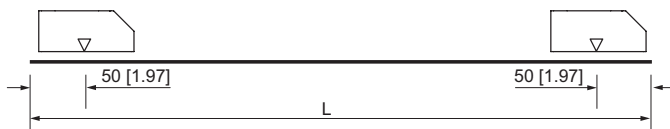
Tilting



Offset



Measuring range



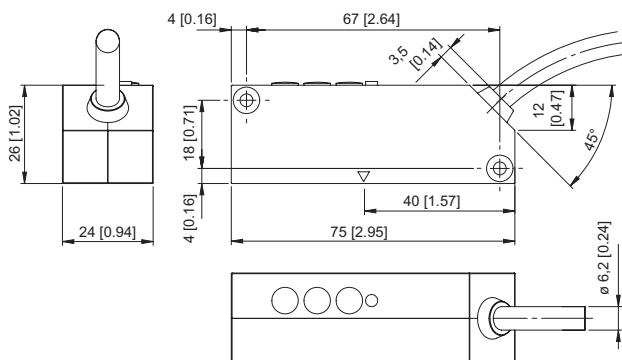
Observe mounting direction



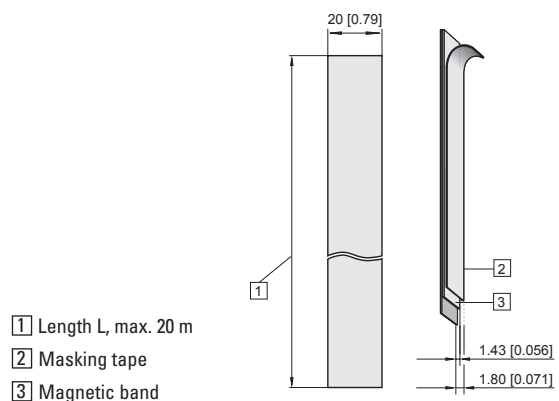
## Dimensions

Dimensions in mm [inch]

**Sensor head Limes LA50**



**Magnetic band Limes BA5**



# Linear measuring technology

**Draw wire mechanics with analog sensor**

**Draw wire encoder A30**

**Measuring length max. 0.6 m  
Traverse speed max. 0.8 m/s**



The draw wire mechanics A30 with analog output stands out with its miniaturized design. It is available with potentiometer, voltage or current output.



Analog output

## Miniaturized and simple

- Measuring length up to 600 mm.
- For applications with a low traversing speed.
- Easy to install.

**Order code** **D5.350X . AXX . 0000**  
draw wire encoder

Type **a** **b** **c**

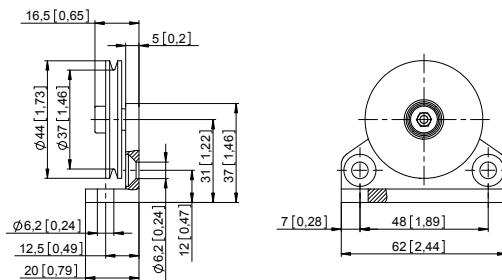
**a** Measuring range  
A = 300 mm <sup>1)</sup>  
B = 600 mm

**b** Output circuit  
11 = analog output 4 ... 20 mA  
22 = analog output 0 ... 10 V DC  
power supply 15 ... 28 V DC  
33 = potentiometer output 10 kΩ

**c** Type of connection  
4 = radial cable, 0.5 m [1.64']

## Guide pulley for draw wire encoder

Order no.



Order code for the set:  
- Guide pulley (anodized aluminum)  
- 2 x countersunk screws  
for lateral fixing  
- 2 x hexagonal screws  
for fixing on a flat surface

**8.0000.7000.0045**

1) Not suitable for potentiometer output.

# Linear measuring technology

|   |                              |  |
|---|------------------------------|--|
| <b>Draw wire mechanics with analog sensor</b> | <b>Draw wire encoder A30</b> | <b>Measuring length max. 0.6 m</b><br><b>Traverse speed max. 0.8 m/s</b> |
|---|------------------------------|--|

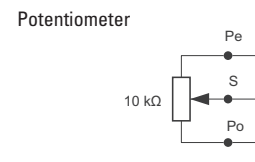
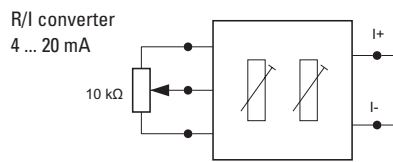
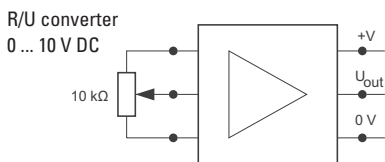
## Technical data

| Mechanical characteristics (draw wire mechanics) |  |
|--|--|
| <b>Speed max.</b>                                | 0.8 m/s  |
| <b>Working temperature</b>                       | -10°C ... +80°C [+14°F ... +176°F]   |
| <b>Protection acc. to EN 60529</b>               | IP50   |
| <b>Weight</b>                                    | approx. 60 g [2.12 oz]   |
| <b>Extension force <math>F_{min}</math></b>      | 3 N  |
| <b>Repeat accuracy</b>                           | ±0.15 mm   |
| <b>Linearity</b>                                 | ±0.35 %  |
| <b>Material</b>                                  | housing plastic<br>wire stainless-steel $\varnothing$ 0.4 mm<br>plastic-coated |

| Electrical characteristics  |   |                   |                                |
|-----------------------------|---|-------------------|--------------------------------|
| <b>Analog output</b>        | 0 ... 10 V DC   | 4 ... 20 mA       | potentiometer<br>10 k $\Omega$ |
| <b>Power supply</b>         | 15 ... 28 V DC  | –                 | –                              |
| <b>Operating range</b>      | –   | 15 ... 28 V DC    | max. 48 V DC                   |
| <b>Max. load current</b>    | 15 mA   | –                 | –                              |
| <b>Load</b>                 | –   | max. 500 $\Omega$ | –                              |
| <b>Temperature range</b>    | -10°C ... +80°C [+14°F ... +176°F]                    |                   |                                |
| <b>CE compliant acc. to</b> | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                   |                                |

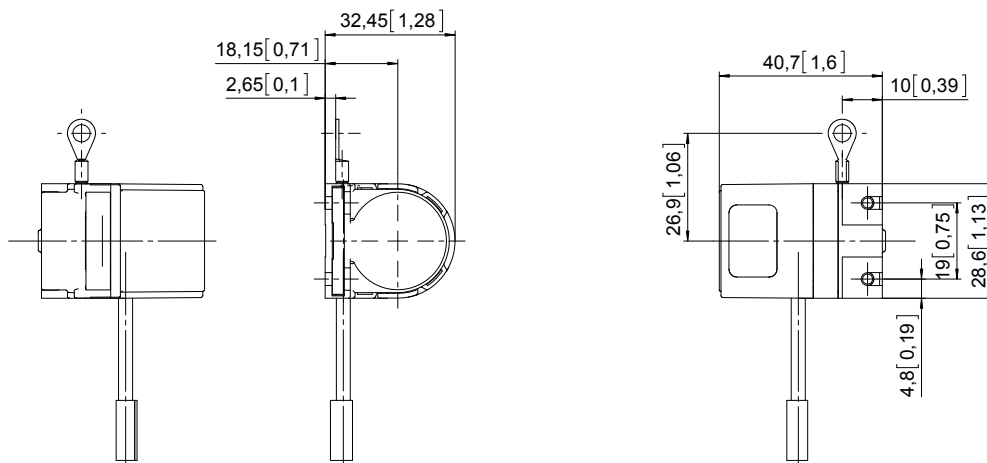
### Terminal assignment

| Color         | BN        | WH  | GN        |
|---------------|-----------|-----|-----------|
| 0 ... 10 V DC | + 24 V DC | 0 V | $U_{out}$ |
| 4 ... 20 mA   | +I        | -I  | n.c.      |
| Potentiometer | Po        | Pe  | S         |



### Dimensions

Dimensions in mm [inch]



# Linear measuring technology

**Draw wire mechanics with analog sensor**

**Draw wire encoder A40, 1 m  
Draw wire encoder A41, 2 m**

**Measuring length max. 2 m  
Traverse speed max. 1 m/s**



The draw wire encoders A40 and A41 with analog output is characterized by its compact design. They are available with a potentiometer, voltage or current output.



Analog output

### Compact and simple

- Measuring length up to 2000 mm.
- For applications with a low traversing speed.
- Easy to install.

**Order code draw wire encoder**

**D5.350X.AXX.X.0000**  
Type    a    b    c

**a Measuring range**

- 1 = 1000 mm
- 2 = 2000 mm

**b Output circuit**

- 11 = analog output 4 ... 20 mA
- 22 = analog output 0 ... 10 V DC power supply 15 ... 28 V DC
- 33 = potentiometer output 10 kΩ

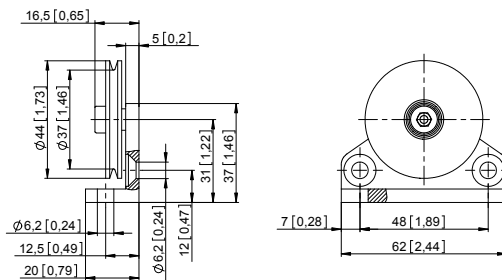
**c Type of connection**

- 1 = cable 2 m [6.56'] for measuring range 1000 mm: axial for measuring range 2000 mm: radial
- 2 = radial M12 connector, 4-pin (only available for measuring range 2000 mm)

### Accessories for draw wire encoder

Order no.

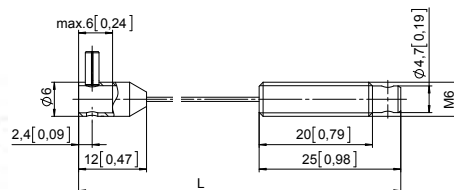
#### Guide pulley



- Order code for the set:
- Guide pulley (anodized aluminum)
  - 2 x countersunk screws for lateral fixing
  - 2 x hexagonal screws for fixing on a flat surface

**8.0000.7000.0045**

#### Extension cable



- Steel wire 2 m [6.56']
- Steel wire 5 m [16.40']
- Steel wire 10 m [32.81']
- Paraleine 2 m [6.56']

**8.0000.7000.0033**  
**8.0000.7000.0034**  
**8.0000.7000.0035**  
**8.0000.7000.0032**

# Linear measuring technology

|   |  |  |
|---|--|--|
| <b>Draw wire mechanics with analog sensor</b> | <b>Draw wire encoder A40, 1 m</b><br><b>Draw wire encoder A41, 2 m</b> | <b>Measuring length max. 2 m</b><br><b>Traverse speed max. 1 m/s</b> |
|---|--|--|

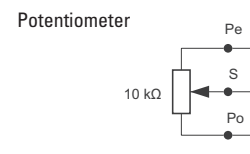
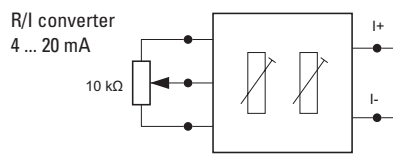
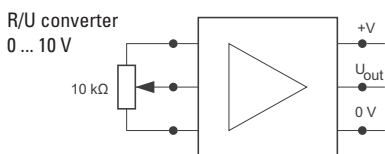
## Technical data

| Mechanical characteristics (draw wire mechanics) |                                  |  |
|--|----------------------------------|--|
| <b>Measuring range</b>                           | <b>1000 mm (A40)</b>             | <b>2000 mm (A41)</b>                           |
| <b>Speed max.</b>                                | 0.8 m/s                          | 1 m/s  |
| <b>Working temperature</b>                       | 0°C ... 50°C [+32°F ... +122°F]  | -10°C ... +80°C [+14°F ... +176°F]             |
| <b>Protection (sensor) acc. to EN 60529</b>      | IP50                             | IP65   |
| <b>Weight</b>                                    | approx. 200 g [7.06 oz]          | approx. 320 g [11.29 oz]                       |
| <b>Extension force <math>F_{min}</math></b>      | 2 N                              |  |
| <b>Repeat accuracy</b>                           | ±0.15 mm                         |  |
| <b>Linearity</b>                                 | ±0.35 %                          |  |
| <b>Material</b>                                  | housing: plastic / zinc die-cast | wire: stainless-steel ø 0.45 mm plastic-coated |

| Electrical characteristics  |   |                                 |                                 |
|-----------------------------|---|---------------------------------|---------------------------------|
| <b>Analog output</b>        | 0 ... 10 V  | 4 ... 20 mA                     | potentiometer 10 kΩ             |
| <b>Power supply</b>         | 15 ... 28 V DC  | –                               | –                               |
| <b>Operating range</b>      | –   | 15 ... 28 V DC                  | max. 48 V DC                    |
| <b>Temperature range</b>    | 0°C ... 50°C [+32°F ... +122°F]                       | 0°C ... 50°C [+32°F ... +122°F] | 0°C ... 50°C [+32°F ... +122°F] |
| <b>Load</b>                 | max. 500 Ω  | max. 500 Ω                      | –                               |
| <b>CE compliant acc. to</b> | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                                 |                                 |

### Terminal assignment

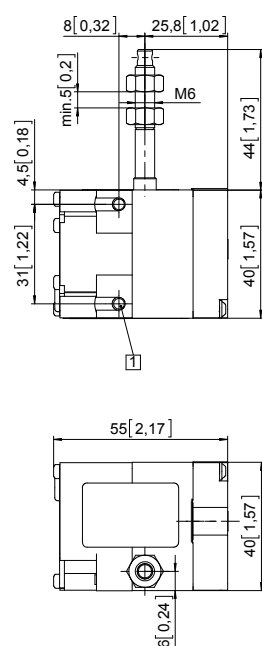
| Color         | BN        | WH  | GN        |      |
|---------------|-----------|-----|-----------|------|
| Pin M12       | 1         | 2   | 3         | 4    |
| 0 ... 10 V    | + 24 V DC | 0 V | $U_{out}$ | n.c. |
| 0 ... 20 mA   | I+        | I-  | n.c.      | n.c. |
| Potentiometer | Po        | Pe  | S         | n.c. |



### Dimensions

Dimensions in mm [inch]

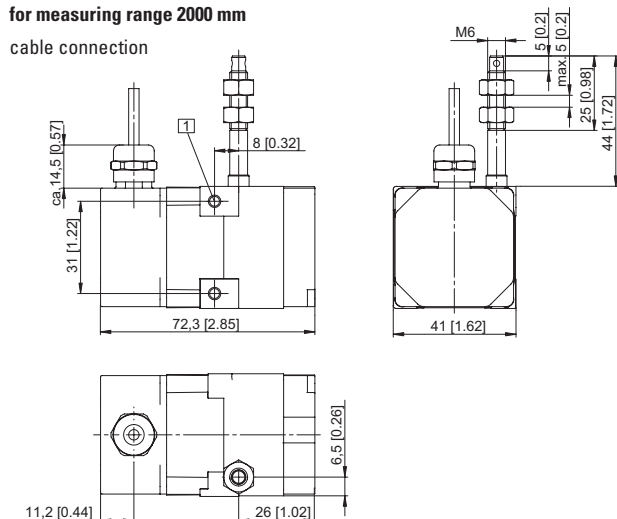
#### for measuring range 1000 mm



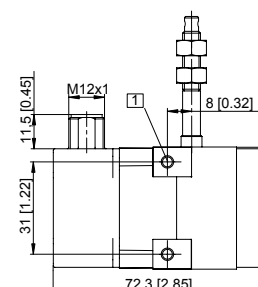
1 2 x M4, max. screw-in depth 8 mm [0.32"]

#### for measuring range 2000 mm

cable connection



M12 connector



# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

**Draw wire encoder A50**

**Measuring length max. 1.25 m  
Traverse speed max. 10 m/s**



The draw wire mechanics A50 boast both a compact design and high dynamics.

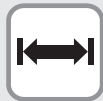
The draw wire mechanics may be equipped with encoders with an analog, incremental or absolute output. The maximum measuring length is 1.25 m.



Analog output



Max. acceleration



Long service life



Wide temperature range



High protection level



Reverse polarity protection

## Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

## Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 300 m/s<sup>2</sup>.
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Scalable analog output with limit switch function.

## Order code with encoder (incremental, absolute)

**D8.6A1 . XXXX . XXXX . XXXX**  
Type                      **a**                      **b** **c** **d**                      **e**

Standard variants are represented **bold underlined>**

**a** *Measuring range*  
0025 = 250 mm  
0050 = 500 mm  
0125 = 1250 mm

**b** *Encoder used*  
36 = Sendix 3610, incremental  
**M3 = Sendix M3663, absolute, SSI**  
F3 = Sendix F3663, absolute, SSI  
**M8 = Sendix M3668, absolute, CANopen**  
F8 = Sendix F3668, absolute, CANopen

**c** *Output circuit*  
depends on the encoder used

**d** *Type of connection*  
depends on the encoder used

**e** *Resolution / Protocol / Options*  
depends on the encoder used

### Optional on request

- Other measuring ranges
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

### Standard resolutions for draw wire with incremental encoder Sendix 3610

|                           |     |      |      |
|---------------------------|-----|------|------|
| Drum circumference [mm]   | 125 | 125  | 125  |
| Pulses / revolution [ppr] | 125 | 1250 | 2500 |
| Pulses / mm               | 1   | 10   | 20   |
| Resolution [mm]           | 1   | 0.1  | 0.05 |

### Standard resolutions for draw wire with absolute encoder Sendix F3663/M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus)

|                           |      |
|---------------------------|------|
| Drum circumference [mm]   | 125  |
| Pulses / revolution [ppr] | 4096 |
| Pulses / mm               | 32.8 |
| Resolution [mm]           | 0.03 |



|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder A50</b> | <b>Measuring length max. 1.25 m<br/>Traverse speed max. 10 m/s</b> |
|--|------------------------------|--|

**Recommended standard variants (with incremental, absolute encoder)**

| Order no. draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection   | Resolution / Protocol              | Option |
|-----------------------------|----------------------------------|--------------------------------|----------------|----------------------|------------------------------------|--------|
| D8.6A1.xxxx.3642.1250       | 3610 (8.3610.2342.1250)          | Push-pull with inverted signal | 8 ... 30 V DC  | radial cable, 2 m    | 1250 ppr                           | -      |
| D8.6A1.xxxx.M324.G222       | Sendix M3663 (8.M3663.4124.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector | 4096 ppr / SSI-Gray-Code           | -      |
| D8.6A1.xxxx.M824.2122       | Sendix M3668 (8.M3668.4124.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector | CANopen encoder profile DS406 V4.0 | -      |

**Other variants (with absolute encoder)**

| Order no. draw wire encoder | Mounted encoder                  | Interface | Power supply   | Type of connection    | Resolution / Protocol              | Option |
|-----------------------------|----------------------------------|-----------|----------------|-----------------------|------------------------------------|--------|
| D8.6A1.xxxx.F321.G222       | Sendix F3663 (8.F3663.4121.G222) | SSI       | 10 ... 30 V DC | tangential cable, 1 m | 4096 ppr / SSI-Gray-Code           | -      |
| D8.6A1.xxxx.F821.2122       | Sendix F3668 (8.F3668.4121.2122) | CANopen   | 10 ... 30 V DC | tangential cable, 1 m | CANopen encoder profile DS406 V3.2 | -      |

**Order code with encoder (analog, scalable with limit switch function)**

D8.6A1

. XXXX

. M1XX

. XXXX

Type      **a**      **b** **c** **d**      **e**

Standard variants are represented **bold underlined**

|   |   |  |   |
|---|---|--|---|
| <b>a</b> <i>Measuring range</i><br>0025 = 250 mm<br>0050 = 500 mm<br>0125 = 1250 mm | <b>b</b> <i>Encoder used</i><br><u><b>M1 = Sendix M3661, absolute</b></u> | <b>c</b> <i>Output circuit</i><br>depends on the encoder used                  | <i>Optional on request</i><br>- Other measuring ranges<br>- Eyelet or M4 wire fastening instead of wire clip<br>- Modified cable and/or connector orientation<br>- Modified cable outlet direction<br>- Sensor protection level IP67<br>- Improved linearity (0.02 %) |
|   |   | <b>d</b> <i>Type of connection</i><br>depends on the encoder used              |   |
|   |   | <b>e</b> <i>Resolution / Protocol / Options</i><br>depends on the encoder used |   |

**Recommended standard variants (with analog encoder, scalable with limit switch function)**

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|--------------------|-----------------------|--|
| D8.6A1.xxxx.M134.3312       | Sendix M3661 (8.M3661.4134.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | M12-Stecker radial | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>1)</sup>    |
| D8.6A1.xxxx.M144.4312       | Sendix M3661 (8.M3661.4144.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | M12-Stecker radial | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>1)</sup>    |
| D8.6A1.xxxx.M134.3412       | Sendix M3661 (8.M3661.4134.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | M12-Stecker radial | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>1)</sup> |
| D8.6A1.xxxx.M144.4412       | Sendix M3661 (8.M3661.4144.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | M12-Stecker radial | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>1)</sup> |

**Order code with analog sensor (scaled to measuring range)**

D8.3A1

. XXXX

. XXXX

. 0000

Type      **a**      **b** **c**

|   |   |   |
|---|---|---|
| <b>a</b> <i>Measuring range</i><br>0025 = 250 mm<br>0050 = 500 mm<br>0125 = 1250 mm | <b>b</b> <i>Analog sensor output / power supply</i><br>A11 = 4 ... 20 mA / 12 ... 30 V DC<br>A22 = 0 ... 10 V / 12 ... 30 V DC<br>A33 = potentiometer 1 kΩ / max. 30 V DC | <i>Optional on request</i><br>- Other measuring ranges<br>- Eyelet or M4 wire fastening instead of wire clip<br>- Modified cable and/or connector orientation<br>- Modified cable outlet direction<br>- Sensor protection level IP67<br>- Improved linearity (0.02 %)<br>- Increased temperature range -40°C ... +85°C and -20°C ... +120°C |
|   |   | <b>c</b> <i>Type of connection</i><br>1 = axial cable, 2 m PVC<br>3 = axial M12 connector, 4-pin  |

1) Delivery condition: scaled to measuring range.  
 Description for scaling and limit switch function see data sheet M3661.

# Linear measuring technology

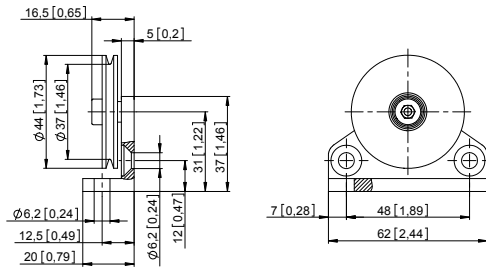
**Draw wire mechanics with encoder or analog sensor**

**Draw wire encoder A50**

**Measuring length max. 1.25 m  
Traverse speed max. 10 m/s**

**Guide pulley for draw wire encoder**

Order no.



Order code for the set:  
 - Guide pulley (anodized aluminum)  
 - 2 x countersunk screws for lateral fixing  
 - 2 x hexagonal screws for fixing on a flat surface

**8.0000.7000.0045**

**Connection technology for analog sensor**

Order no.

**Cordset, pre-assembled**

M12 female connector with coupling nut, 5-pin  
2 m [6.56'] PVC cable

**05.00.6081.2211.002M**

**Connector, self-assembly (straight)**

M12 female connector with coupling nut, 5-pin

**8.0000.5116.0000**

**Technical data**

**Mechanical characteristics (draw wire mechanics)**

|   |                    |  |                       |                       |
|---|--------------------|--|-----------------------|-----------------------|
| <b>Measuring range</b>                    |                    | 250 mm   | 500 mm                | 1250 mm               |
| <b>Extension force</b>                    | $F_{min}$          | 6.8 N  | 3.4 N                 | 4.1 N                 |
|   | $F_{max}$          | 7.9 N  | 4.0 N                 | 5.4 N                 |
| <b>Max. speed</b>                         |                    | 8 m/s  | 8 m/s                 | 10 m/s                |
| <b>Max. acceleration</b>                  |                    | 200 m/s <sup>2</sup>   | 200 m/s <sup>2</sup>  | 300 m/s <sup>2</sup>  |
| <b>Linearity</b> (of the measuring range) | with analog sensor | ±0.15 %  | ±0.1 %                | ±0.1 %                |
|   | with encoder       | ±0.05 %  | ±0.05 %               | ±0.05 %               |
|   |                    | ±0.02 % <sup>1)</sup>  | ±0.02 % <sup>1)</sup> | ±0.02 % <sup>1)</sup> |
| <b>Weight</b>                             |                    | approx. 330 g [11.64 oz]<br>(depending on the sensor / encoder used) |                       |                       |
| <b>Material</b>                           | housing            | titanium-anodized aluminum   |                       |                       |
|   | wire               | stainless steel ø 0.5 mm<br>(other wire types on request)            |                       |                       |
| <b>Protection</b> acc. to EN 60529        |                    | IP65 (sensor)  |                       |                       |

**Electrical characteristics (digital output)**

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

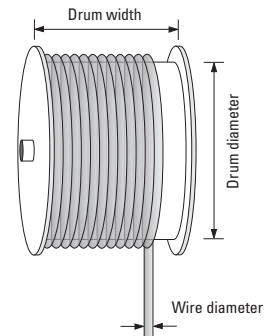
**Operating principle**

**Construction**

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

**Note**

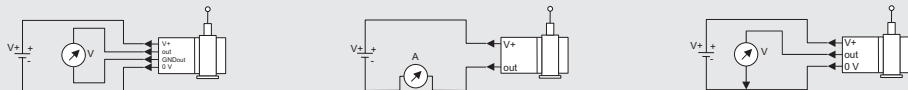
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



**Electrical characteristics (analog sensor, scaled to measuring range)**

| Version                            | A22  | A11  | A33  |
|------------------------------------|--|--|--|
| <b>Analog output</b>               | 0 ... 10 V                                       | 4 ... 20 mA                                      | potentiometer                                    |
| <b>Output</b>                      | 0 ... 10 V / galv. isolated, 4 conductors        | 4 ... 20 mA / 2 conductors                       | 1 kΩ   |
| <b>Power supply</b>                | 12 ... 30 V DC                                   | 12 ... 30 V DC                                   | max. 30 V DC                                     |
| <b>Recommended slider current</b>  | –  | –  | < 1 μA   |
| <b>Max. current consumption</b>    | 22.5 mA (no load)                                | 50 mA  | –  |
| <b>Reverse polarity protection</b> | yes  | yes  | –  |
| <b>Working temperature</b>         | -20°C ... +60°C [-4°F ... +140°F]                | -20°C ... +60°C [-4°F ... +140°F]                | -20°C ... +85°C [-4°F ... +140°F]                |
|                                    | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup> | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup> | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup> |
|                                    | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> |

**Connection diagrams**



**CE compliant** acc. to

EMC guideline 2014/30/EU  
RoHS guideline 2011/65/EU

<sup>1)</sup> Optional on request.

# Linear measuring technology

|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder A50</b> | <b>Measuring length max. 1.25 m<br/>Traverse speed max. 10 m/s</b> |
|--|------------------------------|--|

## Technology in detail

**Various wire types and wire fastenings**

Wire types:  
 - 0.5 mm (V2A) <sup>1)</sup>  
 - 0.51 mm (V4A)  
 - 0.6 mm (Coramid)

Wire fastenings:  
 Clip <sup>1)</sup>      M4 thread      Eyelet

**Individual wire outlet and Cable / connector orientation**

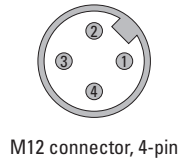
**Extension wire**

**Application-specific installation possibilities**

**Terminal assignment potentiometer**

| Pin         | 1  | 2      | 3   | 4     |
|-------------|----|--------|-----|-------|
| Cable color | BN | WH     | BU  | BK    |
| 1 kΩ        | +V | Slider | 0 V | n. c. |

**Top view of mating side, male contact base**



1) Standard.

# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

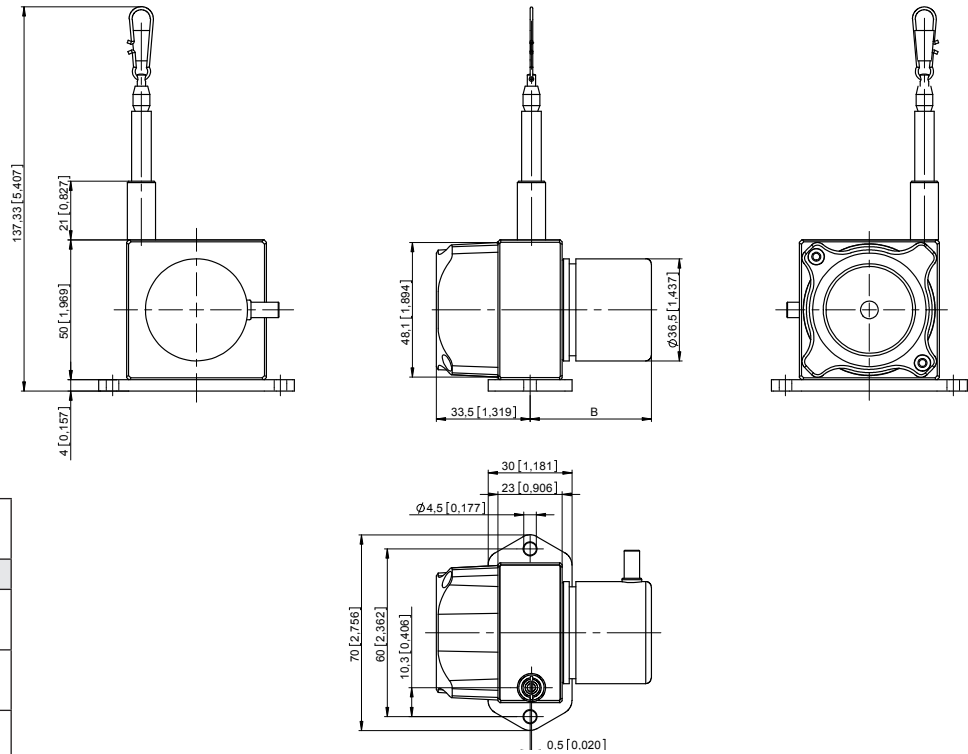
**Draw wire encoder A50**

**Measuring length max. 1.25 m  
Traverse speed max. 10 m/s**

## Dimensions

Dimensions in mm [inch]

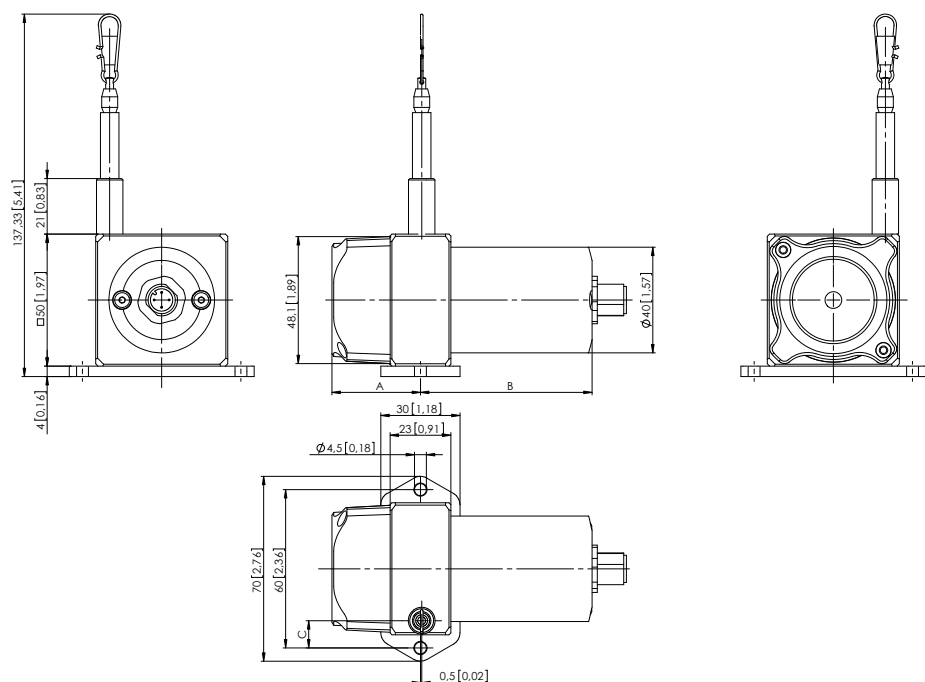
### Draw wire mechanics with encoder



Dimension B depends on the encoder used

| Encoder  | B               |
|--|-----------------|
| Sendix incremental 3610<br>D8.6A1.xxxx.36xx.xxxx | 43.00<br>[1.69] |
| Sendix absolute M366x<br>D8.6A1.xxxx.Mxxx.xxxx   | 62.45<br>[2.46] |
| Sendix absolute F366x<br>D8.6A1.xxxx.Fxxx.xxxx   | 51.20<br>[2.02] |

### Draw wire mechanics with analog sensor (scaled on measuring range)



| Sensor type   | Measuring length | A           | B         | C           |
|---------------|------------------|-------------|-----------|-------------|
| Potentiometer | 250 mm           | 26.5 [1.04] | 65 [2.56] | 21.3 [0.84] |
|               | 500 mm           | 26.5 [1.04] | 65 [2.56] | 21.3 [0.84] |
|               | 1250 mm          | 33.5 [1.32] | 65 [2.56] | 10.3 [0.41] |

# Linear measuring technology

|   |                              |  |
|---|------------------------------|--|
| <b>Draw wire mechanics<br/>with incremental encoder</b> | <b>Draw wire encoder A40</b> | <b>Measuring length max. 2 m<br/>Traverse speed max. 0.8 m/s</b> |
|---|------------------------------|--|



The draw wire system A40 with incremental encoder excels with its compact construction.



**Compact and simple**

- Measuring length up to 2000 mm.
- For applications with low traverse speeds.
- Easy mounting.

| Order code<br>draw wire encoder | <b>D5.2</b><br>Type | <b>XXX</b><br>a                                     | <b>. 24</b> | <b>XX</b><br>b | <b>. 1000</b> |                    |                   |
|---------------------------------|---------------------|---|-------------|----------------|---------------|--------------------|-------------------|
| <b>a</b> Steel wire, length     |                     | <b>b</b> Output circuit / power supply              |             |                |               | <i>Stock types</i> |                   |
| 501 = 1000 mm                   |                     | 21 = Push-pull with inverted signal / 5 ... 24 V DC |             |                |               | D5.2102.2421.1000  | D5.2501.2421.1000 |
| 102 = 2000 mm                   |                     | 41 = Push-pull with inverted signal / 8 ... 30 V DC |             |                |               | D5.2102.2441.1000  | D5.2501.2441.1000 |

## Accessories for draw wire encoder Order no.

**Guide pulley**

Order code for the set: **8.0000.7000.0045**

- Guide pulley (anodized aluminum)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

**Extension cable**

|                          |                         |
|--------------------------|-------------------------|
| Steel wire 2 m [6.56']   | <b>8.0000.7000.0033</b> |
| Steel wire 5 m [16.40']  | <b>8.0000.7000.0034</b> |
| Steel wire 10 m [32.81'] | <b>8.0000.7000.0035</b> |
| Paraleine 2 m [6.56']    | <b>8.0000.7000.0032</b> |

# Linear measuring technology

**Draw wire mechanics  
with incremental encoder**

**Draw wire encoder A40**

**Measuring length max. 2 m  
Traverse speed max. 0.8 m/s**

## Technical data

### Mechanical characteristics (draw wire mechanics)

|                                 |  |
|---------------------------------|--|
| <b>Measuring range</b>          | up to 2000 mm  |
| <b>Absolute accuracy</b>        | ±0.1 %<br>for the whole measuring range                      |
| <b>Repetition accuracy</b>      | ±0.15 mm<br>per direction of travel                          |
| <b>Resolution (incremental)</b> | 0.1 mm standard encoder<br>with 1000 ppr                     |
| <b>Traversing speed</b>         | max. 800 mm/s  |
| <b>Required force</b>           | approx. 10 N (on wire)                                       |
| <b>Material</b>                 | housing reinforced plastic<br>wire stainless steel ø 0.45 mm |
| <b>Weight</b>                   | approx. 210 g [7.41 oz]                                      |

### Electrical characteristics (encoder)

|   |   |                               |
|---|---|-------------------------------|
| <b>Output circuits</b>                    | Push-pull   | Push-pull                     |
| <b>Power supply</b>                       | 5 ... 24 V DC   | 8 ... 30 V DC                 |
| <b>Current consumption (no load)</b>      | max. 50 mA  | max. 50 mA                    |
| <b>Permissible load / channel</b>         | max. +/- 50 mA  | max. +/- 50 mA                |
| <b>Pulse rate</b>                         | max. 160 kHz  | max. 160 kHz                  |
| <b>Switching level</b>                    | HIGH<br>LOW   | min. +V - 2.5 V<br>max. 0.5 V |
| <b>Rising edge time <math>t_r</math></b>  | max. 1 µs   | max. 1 µs                     |
| <b>Falling edge time <math>t_f</math></b> | max. 1 µs   | max. 1 µs                     |
| <b>Short-circuit protected outputs</b>    | yes   | yes                           |
| <b>CE compliant acc. to</b>               | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                               |

### Mechanical characteristics (encoder)

|  |                                       |
|--|---------------------------------------|
| <b>Protection acc. to EN 60529</b>               | IP54                                  |
| <b>Working temperature</b>                       | -20°C ... +85°C [-4°F ... +185°F]     |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms          |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz |

### Description of the incremental encoder (connected on load side)

- Compensation for temperature and ageing
- Short-circuit protected outputs
- Reverse polarity protected power supply input
- Push-pull output

## Terminal assignment of the encoder

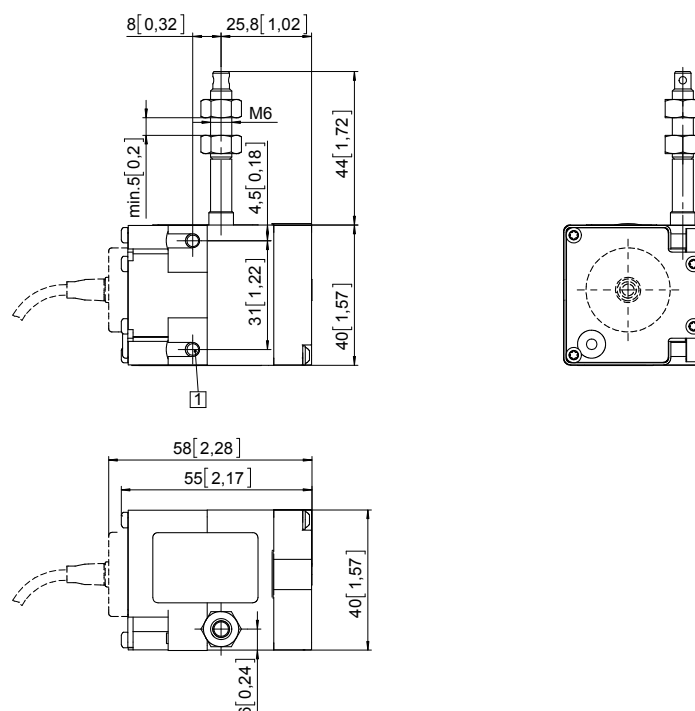
|             |     |    |    |           |    |           |    |           |
|-------------|-----|----|----|-----------|----|-----------|----|-----------|
| Signal      | 0 V | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | 0  | $\bar{0}$ |
| Cable color | WH  | BN | GN | YE        | GY | PK        | BU | RD        |

Isolate unused outputs before initial start-up.

## Dimensions

Dimensions in mm [inch]

1 2 x M4, max. screw-in depth 8 mm [0.32"]



# Linear measuring technology

|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with absolute encoder</b> | <b>Draw wire encoder A41</b> | <b>Measuring length max. 2 m</b><br><b>Traverse speed max. 1 m/s</b> |
|--|------------------------------|--|



The draw wire mechanics A41 with absolute encoder excels with its compact construction.

These draw wire mechanics can be equipped with multiturn encoders of the F366x series. The maximum measuring length is 2 meters.



Analog output



**Compact and simple**

- Measuring length up to 2000 mm.
- Scalable analog output with limit switch function.
- For applications with low traverse speeds.
- Easy mounting.
- Robust design.

**Order code with encoder (absolute)**

|       |    |   |    |    |   |      |
|-------|----|---|----|----|---|------|
| D5.55 | 02 | . | XX | XX | . | XXXX |
| Type  | a  |   | b  | c  | d | e    |

Standard variants are represented **bold underlined**

- |   |   |   |  |
|---|---|---|--|
| <p><b>a</b> <i>Measuring range</i><br/>02 = 2000 mm</p> | <p><b>b</b> <i>Encoder used</i><br/><b>M3</b> = <b>Sendix M3663, absolute, SSI</b><br/>F3 = Sendix F3663, absolute, SSI<br/><b>M8</b> = <b>Sendix M3668, absolute, CANopen</b><br/>F8 = Sendix F3668, absolute, CANopen</p> | <p><b>c</b> <i>Output circuit</i><br/>depends on the encoder used</p>     | <p><b>e</b> <i>Resolution / Protocol / Options</i><br/>depends on the encoder used</p> |
|   |   | <p><b>d</b> <i>Type of connection</i><br/>depends on the encoder used</p> |  |

| Standard resolutions for draw wire with absolute encoder Sendix F3663/ M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus) |      |
|---|------|
| Drum circumference [mm]   | 100  |
| Pulses / revolution [ppr]   | 4096 |
| Pulses / mm   | 41   |
| Resolution [mm]   | 0.02 |

**Recommended standard variants (with absolute encoder)**

| Order no. draw wire encoder | Mounted encoder                  | Interface | Power supply   | Type of connection    | Resolution / Protocol              | Option |
|-----------------------------|----------------------------------|-----------|----------------|-----------------------|------------------------------------|--------|
| D5.5502.M324.G222           | Sendix M3663 (8.M3663.4124.G222) | SSI       | 10 ... 30 V DC | radial M12 connector  | 4096 ppr / SSI-Gray-Code           | -      |
| D5.5502.M824.2122           | Sendix M3668 (8.M3668.4124.2122) | CANopen   | 10 ... 30 V DC | radial M12 connector  | CANopen encoder profile DS406 V4.0 | -      |
| D5.5502.F321.G222           | Sendix F3663 (8.F3663.4121.G222) | SSI       | 10 ... 30 V DC | tangential cable, 1 m | 4096 ppr / SSI-Gray-Code           | -      |
| D5.5502.F821.2122           | Sendix F3668 (8.F3668.4121.2122) | CANopen   | 10 ... 30 V DC | tangential cable, 1 m | CANopen encoder profile DS406 V3.2 | -      |

# Linear measuring technology

**Draw wire mechanics with absolute encoder**

**Draw wire encoder A41**

**Measuring length max. 2 m  
Traverse speed max. 1 m/s**

**Order code with encoder (analog, scalable with limit switch function)**

**D5.55** **02** . **M1** **XX** . **XXXX**  
Type    **a**    **b**    **c**    **d**    **e**

Standard variants are represented **bold underlined**

**a** Measuring range  
02 = 2000 mm

**b** Encoder used  
**M1 = Sendix M3661, absolute, analog**

**c** Output circuit  
depends on the encoder used

**e** Resolution / Protocol / Options  
depends on the encoder used

**d** Type of connection  
depends on the encoder used

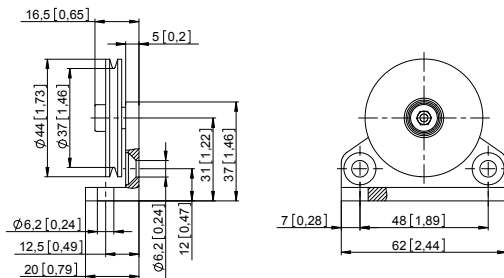
**Recommended standard variants (with encoder analog, scalable with limit switch function)**

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D5.5502.M134.3312           | Sendix M3661 (8.M3661.4134.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>1)</sup>    |
| D5.5502.M144.4312           | Sendix M3661 (8.M3661.4144.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>1)</sup>    |
| D5.5502.M134.3412           | Sendix M3661 (8.M3661.4134.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>1)</sup> |
| D5.5502.M144.4412           | Sendix M3661 (8.M3661.4144.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>1)</sup> |

## Guide pulley for draw wire encoder

Order no.

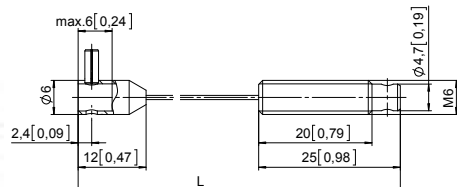
**Guide pulley**



Order code for the set:  
- Guide pulley (anodized aluminum)  
- 2 x countersunk screws for lateral fixing  
- 2 x hexagonal screws for fixing on a flat surface

**8.0000.7000.0045**

**Extension cable**



Steel wire 2 m [6.56']  
Steel wire 5 m [16.40']  
Steel wire 10 m [32.81']  
Paraleine 2 m [6.56']

**8.0000.7000.0033**  
**8.0000.7000.0034**  
**8.0000.7000.0035**  
**8.0000.7000.0032**

## Technical data

### Mechanical characteristics (draw wire mechanics)

|                     |   |
|---------------------|---|
| Measuring range     | up to 2000 mm   |
| Traversing speed    | max. 1000 mm/s  |
| Working temperature | -10°C ... +80°C [+14°F ... +176°F]                                  |
| Weight              | approx. 200 g [7.06 oz]   |
| Required force      | ≥ 2 N (on wire)   |
| Linearity           | ±0.35 %<br>for the whole measuring range                            |
| Repetition accuracy | ±0.15 mm per direction of travel                                    |
| Material            | housing zinc die-cast<br>wire stainless steel $\varnothing$ 0.45 mm |

### Electrical characteristics (encoder)

The electrical characteristics can be found in the data sheets of the encoders.

<sup>1)</sup> Delivery condition: unscaled.  
Description for scaling and limit switch function see data sheet M3661.



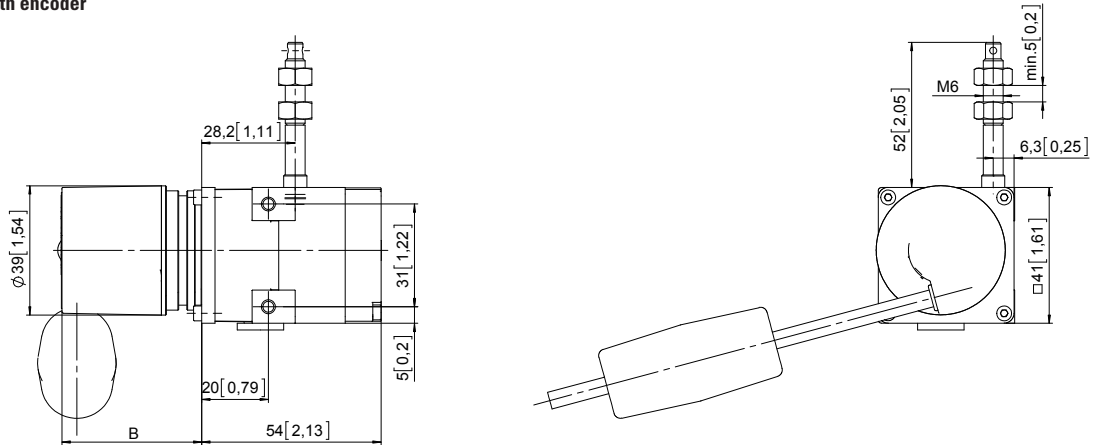
# Linear measuring technology

|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with absolute encoder</b> | <b>Draw wire encoder A41</b> | <b>Measuring length max. 2 m</b><br><b>Traverse speed max. 1 m/s</b> |
|--|------------------------------|--|

## Dimensions

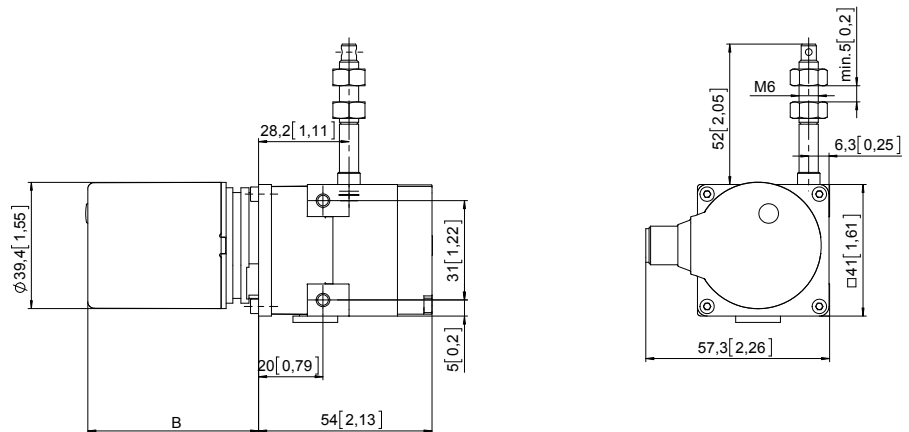
Dimensions in mm [inch]

### Draw wire mechanics with encoder (tangential cable)



| Dimension B depends on the encoder used      |                 |
|--|-----------------|
| Encoder                                      | B               |
| Sendix absolute (M366x)<br>D5.5502.Mxxx.xxxx | 50.25<br>[1.98] |
| Sendix absolute (F366x)<br>D5.5502.Fxxx.xxxx | 39.70<br>[1.56] |

### Draw wire mechanics with encoder (M12 connector)



| Dimension B depends on the encoder used               |                 |
|---|-----------------|
| Encoder   | B               |
| Sendix absolute (F3663, SSI)<br>D5.5502.Fxxx.xxxx     | 42.20<br>[1.66] |
| Sendix absolute (F3668, CANopen)<br>D5.5502.Fxxx.xxxx | 42.20<br>[1.66] |
| Sendix absolute (M3661, analog)<br>D5.5502.Mxxx.xxxx  | 53.25<br>[2.10] |

Linear measuring technology

# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

**Draw wire encoder B75**

**Measuring length max. 3 m  
Traverse speed max. 0.8 m/s**



The draw wire mechanics B75 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



## Compact and versatile

- Compact housing.
- Variable mounting possibilities.
- Low-wear wire exit.
- Scalable analog interface with limit switch function.
- Various field bus interfaces.

## Order code with encoder (incremental, absolute)

**D8.15** **03** . **XX****XX** . **XXXX**  
Type      **a**      **b** **c** **d**      **e**

Standard variants are represented **bold underlined>**

- a** *Measuring range*  
03 = 3000 mm
- b** *Encoder used*  
**M3 = Sendix M5863, absolute**  
F3 = Sendix F5863, absolute  
**M3 = Sendix M5868, absolute**  
63 = Sendix 5863, absolute  
F8 = Sendix F5868, absolute  
68 = Sendix 5868, absolute
- c** *Output circuit*  
depends on the encoder used
- d** *Type of connection*  
depends on the encoder used
- e** *Resolution / Protocol / Options*  
depends on the encoder used  
  
*Optional on request*  
- Other measuring ranges

| Standard resolutions for draw wire with incremental encoder Sendix 5000 |     |      |      |
|---|-----|------|------|
| Drum circumference [mm]   | 200 | 200  | 200  |
| Pulses / revolution [ppr]   | 200 | 2000 | 4000 |
| Pulses / mm   | 1   | 10   | 20   |
| Resolution [mm]   | 1   | 0.1  | 0.05 |

| Standard resolutions for draw wire with absolute encoder M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus) |      |
|---|------|
| Drum circumference [mm]   | 200  |
| Pulses / revolution [ppr]   | 4096 |
| Pulses / mm   | 20.5 |
| Resolution [mm]   | 0.05 |

## Recommended standard variants (with incremental, absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection   | Resolution / Protocol              | Option |
|-----------------------------|----------------------------------|--------------------------------|----------------|----------------------|------------------------------------|--------|
| D8.1503.2Z54.2000           | Sendix 5000 (8.5000.B154.2000)   | Push-pull with inverted signal | 10 ... 30 V DC | radial M12 connector | 2000 ppr                           | -      |
| D8.1503.M324.G222           | Sendix M5863 (8.M5863.4124.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector | 4096 ppr / SSI-Gray-Code           | -      |
| D8.1503.M824.2122           | Sendix M5868 (8.M5868.4124.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector | CANopen encoder profile DS406 V4.0 | -      |

## Other variants (with absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface   | Power supply   | Type of connection       | Resolution / Protocol                  | Option                  |
|-----------------------------|----------------------------------|-------------|----------------|--------------------------|--|-------------------------|
| D8.1503.F324.G223           | Sendix F5863 (8.F5863.2124.G223) | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.1503.6324.G223           | Sendix 5863 (8.5863.2124.G223)   | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.1503.F82E.2123           | Sendix F5868 (8.F5868.212E.2123) | CANopen     | 10 ... 30 V DC | 1 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.1503.6822.2123           | Sendix 5868 (8.5868.2122.2123)   | CANopen     | 10 ... 30 V DC | 2 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.1503.6832.3113           | Sendix 5868 (8.5868.2132.3113)   | PROFIBUS    | 10 ... 30 V DC | 3 x radial M12 connector | Profibus-DP V0 encoder profile Class 2 | SET button              |
| D8.1503.68B2.B212           | Sendix 5868 (8.5868.21B2.B212)   | EtherCAT    | 10 ... 30 V DC | 3 x radial M12 connector | EtherCAT with CoE 3.2.10               | -                       |
| D8.1503.68C2.C212           | Sendix 5868 (8.5868.21C2.C212)   | PROFINET IO | 10 ... 30 V DC | 3 x radial M12 connector | PROFINET encoder profile version 4.1   | -                       |
| D8.1503.F8AN.A222           | Sendix F5868 (8.F5868.21AN.A222) | EtherNet/IP | 10 ... 30 V DC | 3 x axial M12 connector  | EtherNet/IP                            | -                       |

# Linear measuring technology


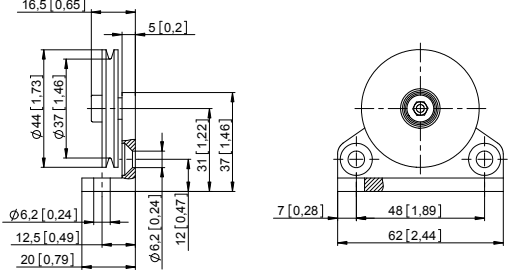
|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B75</b> | <b>Measuring length max. 3 m</b><br><b>Traverse speed max. 0.8 m/s</b> |
|--|------------------------------|--|


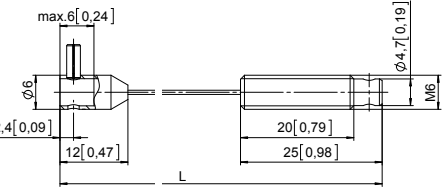
|  |  |  |
|--|--|--|
| <b>Order code with encoder (analog, scalable with limit switch function)</b> | <b>D8.15</b> <b>03</b> . <b>M1XX</b> . <b>XXXX</b><br><small>Type      a      b      c      d      e</small> | Standard variants are represented <b>bold underlined</b>   |
| <b>a</b> <i>Measuring range</i><br>03 = 3000 mm                              | <b>b</b> <i>Encoder used</i><br><b>M1 = Sendix M5861, absolute</b>   | <b>c</b> <i>Output circuit</i><br>depends on the encoder used  |
| <b>d</b> <i>Type of connection</i><br>depends on the encoder used            |  | <b>e</b> <i>Resolution / Protocol / Options</i><br>depends on the encoder used<br><br><i>Optional on request</i><br>- Other measuring ranges |

**Recommended standard variants (with encoder analog, scalable with limit switch function)**

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D8.1503.M134.3312           | Sendix M5861 (8.M5861.4134.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>1)</sup>    |
| D8.1503.M144.4312           | Sendix M5861 (8.M5861.4144.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>1)</sup>    |
| D8.1503.M134.3412           | Sendix M5861 (8.M5861.4134.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>1)</sup> |
| D8.1503.M144.4412           | Sendix M5861 (8.M5861.4144.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>1)</sup> |

|  |   |   |
|--|---|---|
| <b>Order code with analog sensor (scaled to measuring range)</b> | <b>D8.35</b> <b>03</b> . <b>XXX</b> <b>2</b> . <b>0000</b><br><small>Type      a      b      c</small>  | Optional on request - Other measuring ranges  |
| <b>a</b> <i>Measuring range</i><br>03 = 3000 mm                  | <b>b</b> <i>Analog sensor output / power supply</i><br>A11 = 4 ... 20 mA / 12 ... 30 V DC<br>A22 = 0 ... 10 V DC / 12 ... 30 V DC<br>A33 = potentiometer 10 kΩ / max. 30 V DC | <b>c</b> <i>Type of connection</i><br>2 = radial M12 connector, 4-pin (wire outlet direction) |

| Accessories for draw wire encoder   | Order no.               |
|---|-------------------------|
| <b>Guide pulley</b><br>  <p>Order code for the set:<br/>         - Guide pulley (anodized aluminum)<br/>         - 2 x countersunk screws for lateral fixing<br/>         - 2 x hexagonal screws for fixing on a flat surface</p> | <b>8.0000.7000.0045</b> |

|   |  |  |
|---|--|--|
| <b>Extension cable</b><br>  | Steel wire 2 m [6.56']<br>Steel wire 5 m [16.40']<br>Steel wire 10 m [32.81']<br>Paraleine 2 m [6.56'] | <b>8.0000.7000.0033</b><br><b>8.0000.7000.0034</b><br><b>8.0000.7000.0035</b><br><b>8.0000.7000.0032</b> |
|---|--|--|

| Connection technology for analog sensor   | Order no.                   |
|---|-----------------------------|
| <b>Cordset, pre-assembled</b><br>M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable | <b>05.00.6081.2211.002M</b> |
| <b>Connector, self-assembly (straight)</b><br>M12 female connector with coupling nut, 5-pin             | <b>8.0000.5116.0000</b>     |

1) Delivery condition: unscaled.  
 Description for scaling and limit switch function see data sheet M5861.

Linear measuring technology

# Linear measuring technology

|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B75</b> | <b>Measuring length max. 3 m<br/>Traverse speed max. 0.8 m/s</b> |
|--|------------------------------|--|

## Technical data

| Mechanical characteristics (draw wire mechanics) |  |
|--|--|
| <b>Measuring range</b>                           | 3000 mm  |
| <b>Traversing speed</b>                          | max. 0.8 m/s   |
| <b>Working temperature</b>                       | -40°C ... +80°C [-40°F ... +176°F]   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Weight</b>                                    | approx. 500 g [17.67 oz]   |
| <b>Required force <math>F_{min}</math></b>       | 3 N  |
| <b>Linearity</b>                                 | ±0.35 %  |
| <b>Repetition accuracy</b>                       | ±0.15 mm   |
| <b>Material</b>                                  | housing: plastic / zinc die-cast<br>wire: stainless steel $\varnothing$ 0.9 mm, plastic-coated |

| Electrical characteristics  |   |                   |                             |
|-----------------------------|---|-------------------|-----------------------------|
| <b>Analog output</b>        | 0 ... 10 V DC   | 4 ... 20 mA       | potentiometer 10 k $\Omega$ |
| <b>Power supply</b>         | 15 ... 28 V DC  | –                 | –                           |
| <b>Operating range</b>      | –   | 15 ... 28 V DC    | max. 48 V DC                |
| <b>Load</b>                 | max. 500 $\Omega$                                     | max. 500 $\Omega$ | –                           |
| <b>Temperature range</b>    | -40°C ... +80°C [-40°F ... +176°F]                    |                   |                             |
| <b>CE compliant acc. to</b> | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                   |                             |

### Terminal assignment (analog output)

| Color                       | BN       | WH  | GN        |      |
|-----------------------------|----------|-----|-----------|------|
| Pin M12                     | 1        | 2   | 3         | 4    |
| 0 ... 10 V DC               | +24 V DC | 0 V | $U_{out}$ | n.c. |
| 4 ... 20 mA                 | +I       | -I  | n.c.      | n.c. |
| Potentiometer 10 k $\Omega$ | Po       | Pe  | S         | n.c. |

| Electrical characteristics (digital output)  |
|--|
| The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders. |

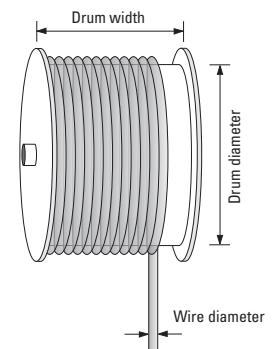
### Operating principle

#### Construction

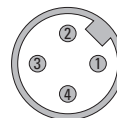
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

#### Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



### Top view of mating side, male contact base



M12 connector, 4-pin

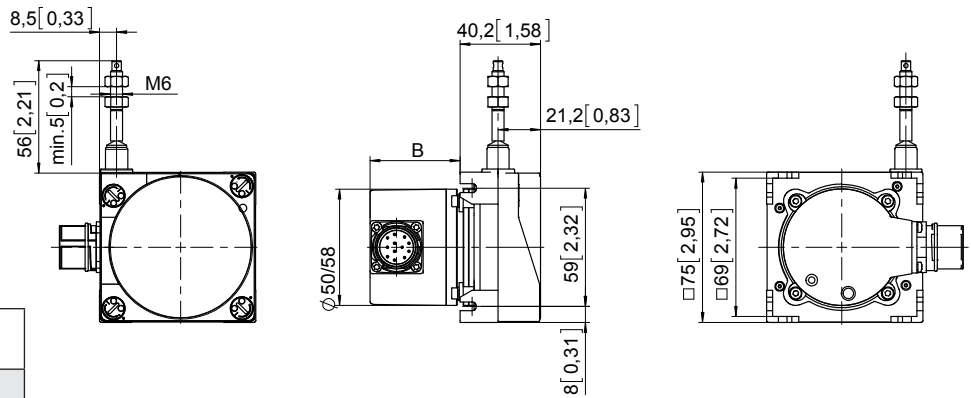
# Linear measuring technology

|  |                              |  |
|--|------------------------------|--|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B75</b> | <b>Measuring length max. 3 m<br/>Traverse speed max. 0.8 m/s</b> |
|--|------------------------------|--|

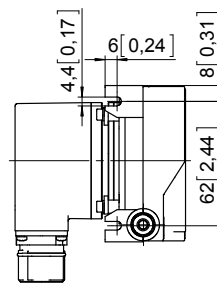
## Dimensions

Dimensions in mm [inch]

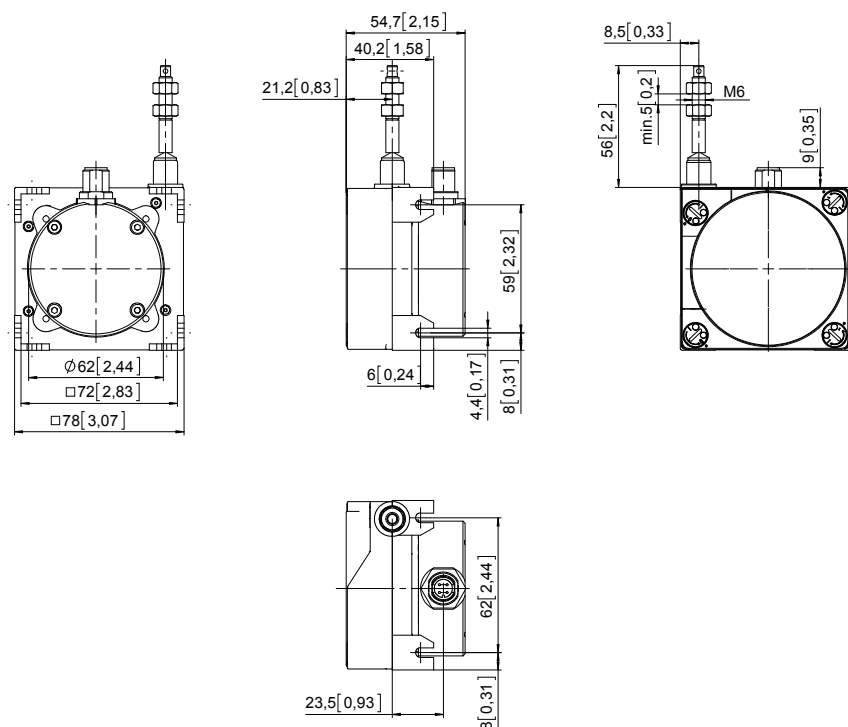
### Draw wire mechanics with encoder



| Dimension B depends on the encoder used                        |                 |
|--|-----------------|
| Encoder  | B               |
| Sendix incremental (5000)<br>D8.1503.xxxx.2Zxx.xxxx            | 43.00<br>[1.69] |
| Sendix absolute (F5863)<br>D8.1503.xxxx.F3xx.xxxx              | 55.50<br>[2.19] |
| Sendix absolute (5863)<br>D8.1503.xxxx.63xx.xxxx               | 55.50<br>[2.19] |
| Sendix absolute (F5868, CANopen)<br>D8.1503.xxxx.F8xx.21xx     | 65.50<br>[2.58] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.1503.xxxx.F8xx.A2xx | 65.50<br>[2.58] |
| Sendix absolute (5868)<br>D8.1503.xxxx.68xx.xxxx               | 83.20<br>[3.28] |
| Sendix absolute (M586x)<br>D8.1503.xxxx.Mxxx.xxxx              | 55.80<br>[2.20] |



### Draw wire mechanics with analog sensor (scalable on measuring range)



# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

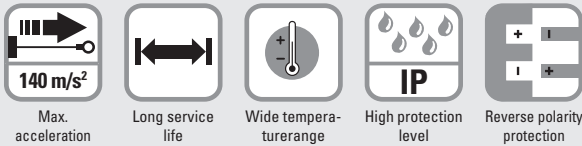
**Draw wire encoder B80**

**Measuring length max. 3 m  
Traverse speed max. 10 m/s**



The draw wire mechanics B80 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



## Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

## Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s<sup>2</sup>.
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (Interchangeable installation).

## Order code with encoder (incremental, absolute)

**D8.XB1.XXXX.XXX.XXXX**

Standard variants are represented **bold underlined**

**a** *Mechanics*  
2 = interchangeable installation <sup>1)</sup>  
**4 = fixed installation** <sup>2)</sup>

**b** *Measuring range*  
0100 = 1000 mm  
0200 = 2000 mm  
0300 = 3000 mm

**c** *Encoder used*  
**00 = Sendix 5000**, incremental  
**M3 = Sendix M5863**, absolute  
F3 = Sendix F5863, absolute  
63 = Sendix 5863, absolute  
**M8 = Sendix M5868**, absolute  
F8 = Sendix F5868 absolute  
68 = Sendix 5868, absolute

**d** *Output circuit*  
depends on the encoder used

**e** *Type of connection*  
depends on the encoder used

**f** *Resolution / Protocol / Options*  
depends on the encoder used

### Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

### Standard resolutions for draw wire with incremental encoder Sendix 5000

|                           |     |      |      |
|---------------------------|-----|------|------|
| Drum circumference [mm]   | 200 | 200  | 200  |
| Pulses / revolution [ppr] | 200 | 2000 | 4000 |
| Pulses / mm               | 1   | 10   | 20   |
| Resolution [mm]           | 1   | 0.1  | 0.05 |

### Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)

|                           |      |
|---------------------------|------|
| Drum circumference [mm]   | 200  |
| Pulses / revolution [ppr] | 4096 |
| Pulses / mm               | 20.5 |
| Resolution [mm]           | 0.05 |

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.  
2) The encoder can only be replaced at the factory.

|  |                              |   |
|--|------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B80</b> | <b>Measuring length max. 3 m<br/>Traverse speed max. 10 m/s</b> |
|--|------------------------------|---|

**Recommended standard variants (with incremental, absolute encoder)**

| Order no. draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection   | Resolution / Protocol              | Option |
|-----------------------------|----------------------------------|--------------------------------|----------------|----------------------|------------------------------------|--------|
| D8.xB1.xxxx.0054.2000       | Sendix 5000 (8.5000.8354.2000)   | Push-pull with inverted signal | 10 ... 30 V DC | radial M12 connector | 2000 ppr                           | -      |
| D8.xB1.xxxx.M324.G222       | Sendix M5863 (8.M5863.3524.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector | 4096 ppr / SSI-Gray-Code           | -      |
| D8.xB1.xxxx.M824.2122       | Sendix M5868 (8.M5868.3524.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector | CANopen encoder profile DS406 V4.0 | -      |

**Other variants (with absolute encoder)**

| Order no. draw wire encoder | Mounted encoder                  | Interface   | Power supply   | Type of connection       | Resolution / Protocol                  | Option                  |
|-----------------------------|----------------------------------|-------------|----------------|--------------------------|--|-------------------------|
| D8.xB1.xxxx.F324.G223       | Sendix F5863 (8.F5863.1224.G223) | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xB1.xxxx.6324.G223       | Sendix 5863 (8.5863.1224.G223)   | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xB1.xxxx.F82E.2123       | Sendix F5868 (8.F5868.122E.2123) | CANopen     | 10 ... 30 V DC | 1 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xB1.xxxx.6822.2123       | Sendix 5868 (8.5868.1222.2123)   | CANopen     | 10 ... 30 V DC | 2 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xB1.xxxx.6832.3113       | Sendix 5868 (8.5868.1232.3113)   | PROFIBUS    | 10 ... 30 V DC | 3 x radial M12 connector | Profibus-DP V0 encoder profile Class 2 | SET button              |
| D8.xB1.xxxx.68B2.B212       | Sendix 5868 (8.5868.12B2.B212)   | EtherCAT    | 10 ... 30 V DC | 3 x radial M12 connector | EtherCAT with CoE 3.2.10               | -                       |
| D8.xB1.xxxx.68C2.C212       | Sendix 5868 (8.5868.12C2.C212)   | PROFINET IO | 10 ... 30 V DC | 3 x radial M12 connector | PROFINET encoder profile version 4.1   | -                       |
| D8.xB1.xxxx.F8AN.A222       | Sendix F5868 (8.F5868.12AN.A222) | EtherNet/IP | 10 ... 30 V DC | 3 x axial M12 connector  | EtherNet/IP                            | -                       |

**Order code with encoder (analog, scalable with limit switch function)**

D8.XB1.XXXX.M1XX.XXXX
Standard variants are represented **bold underlined**

|  |  |  |
|--|--|--|
| <p><b>a</b> <i>Mechanics</i><br/>2 = interchangeable installation <sup>1)</sup><br/><u>4 = fixed installation</u> <sup>2)</sup></p> <p><b>b</b> <i>Measuring range</i><br/>0100 = 1000 mm<br/>0200 = 2000 mm<br/>0300 = 3000 mm</p> <p><b>c</b> <i>Encoder used</i><br/><u>M1 = Sendix M5861, absolute</u></p> | <p><b>d</b> <i>Output circuit</i><br/>depends on the encoder used</p> <p><b>e</b> <i>Type of connection</i><br/>depends on the encoder used</p> <p><b>f</b> <i>Resolution / Protocol / Options</i><br/>depends on the encoder used</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Other measuring ranges</li> <li>- Cable diameter 1 mm</li> <li>- Eyelet or M4 wire fastening instead of wire clip</li> <li>- Modified cable and/or connector orientation</li> <li>- Modified cable outlet direction</li> <li>- Sensor protection level IP67</li> <li>- Improved linearity (0.02 %)</li> </ul> |
|--|--|--|

**Recommended standard variants (with encoder analog, scalable with limit switch function)**

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D8.xB1.xxxx.M134.3312       | Sendix M5861 (8.M5861.3534.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>3)</sup>    |
| D8.xB1.xxxx.M144.4312       | Sendix M5861 (8.M5861.3544.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>3)</sup>    |
| D8.xB1.xxxx.M134.3412       | Sendix M5861 (8.M5861.3534.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>3)</sup> |
| D8.xB1.xxxx.M144.4412       | Sendix M5861 (8.M5861.3544.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>3)</sup> |

**Order code with analog sensor (scaled to measuring range)**

D8.3B1.XXXX.XXX.X.0000
Type      a      b      c

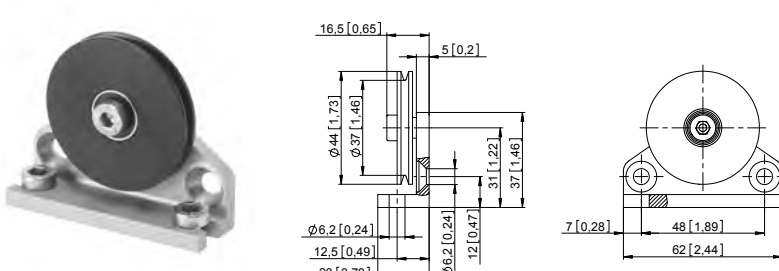
|   |   |  |
|---|---|--|
| <p><b>a</b> <i>Measuring range</i><br/>0100 = 1000 mm<br/>0200 = 2000 mm<br/>0300 = 3000 mm</p> | <p><b>b</b> <i>Analog sensor output / power supply</i><br/>A11 = 4 ... 20 mA / 12 ... 30 V DC<br/>A22 = 0 ... 10 V / 12 ... 30 V DC<br/>A33 = potentiometer 1 kΩ / max. 30 V DC</p> <p><b>c</b> <i>Type of connection</i><br/>1 = axial cable, 2 m PVC<br/>3 = axial M12 connector, 4-pin</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> <li>- Other measuring ranges</li> <li>- Cable diameter 1 mm</li> <li>- Eyelet or M4 wire fastening instead of wire clip</li> <li>- Modified cable and/or connector orientation</li> <li>- Modified cable outlet direction</li> <li>- Sensor protection level IP67</li> <li>- Improved linearity (0.02 %)</li> <li>- Increased temperature range -40°C ... +85°C and -20°C ... +120°C</li> </ul> |
|---|---|--|

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.  
 2) The encoder can only be replaced at the factory.  
 3) Delivery condition: scaled to measuring range. Description for scaling and limit switch function see data sheet M5861.

Linear measuring technology

# Linear measuring technology

|  |                              |   |
|--|------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B80</b> | <b>Measuring length max. 3 m<br/>Traverse speed max. 10 m/s</b> |
|--|------------------------------|---|

|   |   |   |   |
|---|---|---|---|
| <b>Guide pulley for draw wire encoder</b> |  | <p>Order code for the set:</p> <ul style="list-style-type: none"> <li>- Guide pulley (anodized aluminum)</li> <li>- 2 x countersunk screws for lateral fixing</li> <li>- 2 x hexagonal screws for fixing on a flat surface</li> </ul> | <p>Order no.</p> <p><b>8.0000.7000.0045</b></p> |
|---|---|---|---|

|  |  |                             |
|--|--|-----------------------------|
| <b>Connection technology for analog sensor</b> |  | Order no.                   |
| <b>Cordset, pre-assembled</b>                  | M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable | <b>05.00.6081.2211.002M</b> |
| <b>Connector, self-assembly (straight)</b>     | M12 female connector with coupling nut, 5-pin                          | <b>8.0000.5116.0000</b>     |

## Technical data

| Mechanical characteristics (draw wire mechanics) |                    |   |                       |                       |
|--|--------------------|---|-----------------------|-----------------------|
| <b>Measuring range</b>                           |                    | 1000 mm   | 2000 mm               | 3000 mm               |
| <b>Extension force</b>                           | $F_{min}$          | 6.9 N   | 6.4 N                 | 6.9 N                 |
|  | $F_{max}$          | 8.3 N   | 7.8 N                 | 9.8 N                 |
| <b>Max. speed</b>                                |                    | 10 m/s  | 10 m/s                | 10 m/s                |
| <b>Max. acceleration</b>                         |                    | 140 m/s <sup>2</sup>  | 140 m/s <sup>2</sup>  | 140 m/s <sup>2</sup>  |
| <b>Linearity (of the measuring range)</b>        | with analog sensor | ±0.15 %   | ±0.1 %                | ±0.1 %                |
|  | with encoder       | ±0.05 %   | ±0.05 %               | ±0.05 %               |
|  |                    | ±0.02 % <sup>1)</sup>   | ±0.02 % <sup>1)</sup> | ±0.02 % <sup>1)</sup> |
| <b>Weight</b>                                    |                    | approx. 750 g [26.45 oz] (dep. on the sensor/encoder used)  |                       |                       |
| <b>Material</b>                                  | housing            | titanium-anodized aluminum  |                       |                       |
|  | wire               | stainless steel $\varnothing$ 0.5 mm<br>$\varnothing$ 1 mm can be supplied as a special up to measuring range 1500 mm (other wire types on request) |                       |                       |
| <b>Protection acc. to EN 60529</b>               |                    | IP65 (sensor)   |                       |                       |

| Electrical characteristics (digital output)  |
|--|
| The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders. |

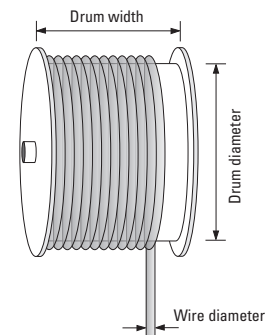
### Operating principle

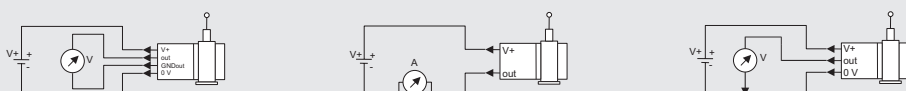
#### Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

#### Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



| Electrical characteristics (analog sensor, scaled to measuring range) |  |  |  |
|---|--|--|--|
| <b>Version</b>  | <b>A22</b>   | <b>A11</b>                                       | <b>A33</b>                                       |
| <b>Analog output</b>  | 0 ... 10 V   | 4 ... 20 mA                                      | potentiometer                                    |
| <b>Output</b>   | 0 ... 10 V / galv. isolated, 4 conductors  | 4 ... 20 mA / 2 conductors                       | 1 k $\Omega$                                     |
| <b>Power supply</b>   | 12 ... 30 V DC   | 12 ... 30 V DC                                   | max. 30 V DC                                     |
| <b>Recommended slider current</b>                                     | –  | –  | < 1 $\mu$ A                                      |
| <b>Max. current consumption</b>                                       | 22.5 mA (no load)  | 50 mA  | –  |
| <b>Reverse polarity protection</b>                                    | yes  | yes  | –  |
| <b>Working temperature</b>  | -20°C ... +60°C [-4°F ... +140°F]  | -20°C ... +60°C [-4°F ... +140°F]                | -20°C ... +85°C [-4°F ... +140°F]                |
|   | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup>                                     | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup> | -40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup> |
|   | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup>                                     | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> |
| <b>Connection diagrams</b>  |  |  |  |

|                             |   |
|-----------------------------|---|
| <b>CE compliant acc. to</b> | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |
|-----------------------------|---|

<sup>1)</sup> Optional on request.



# Linear measuring technology

**Draw wire mechanics  
with encoder or analog sensor**

**Draw wire encoder B80**

**Measuring length max. 3 m  
Traverse speed max. 10 m/s**

## Technology in detail

### Various wire types and wire fastenings

Wire types:

- 0.5 mm (V2A) <sup>1)</sup>
- 0.51 mm (V4A)
- 1.0 mm plastic-coated  
(V4A = 0.81 mm,  
plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

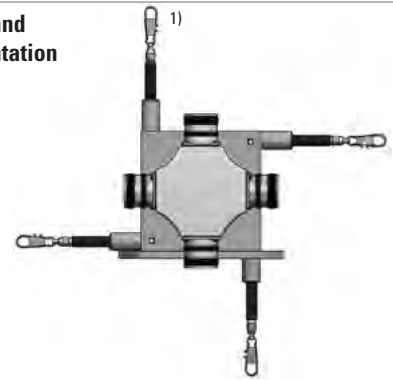
Clip <sup>1)</sup>

M4 thread

Eyelet



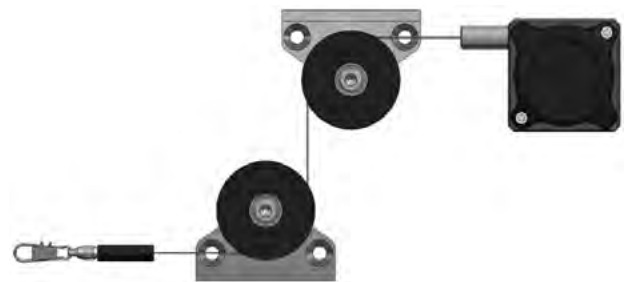
### Individual wire outlet and cable / connector orientation



### Extension wire



### Application-specific installation possibilities



1) Standard.

# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

**Draw wire encoder B80**

**Measuring length max. 3 m  
Traverse speed max. 10 m/s**

## Dimensions

Dimensions in mm [inch]

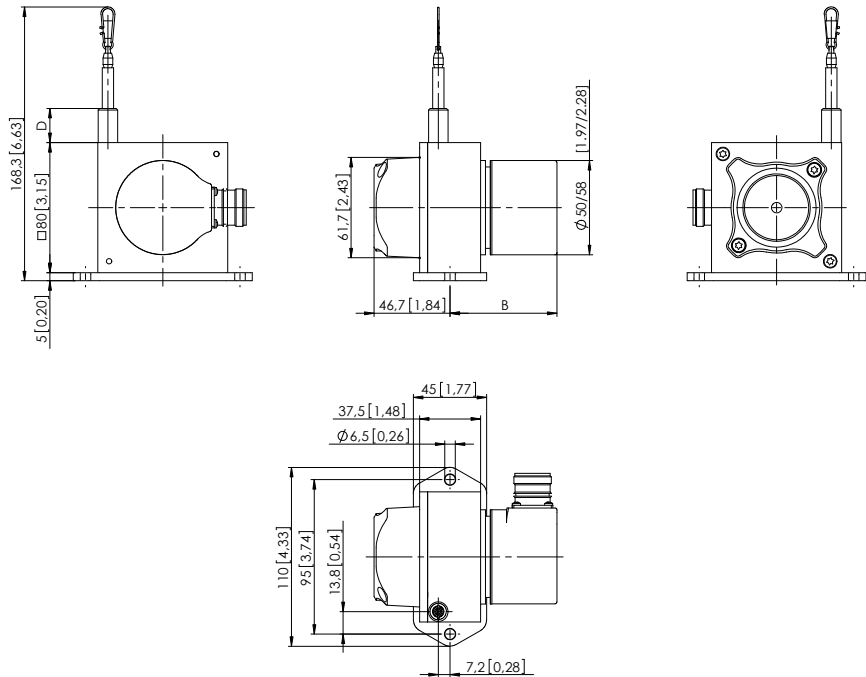
### Draw wire mechanics with encoder Fixed installation

Dimension D depends on the measuring range of the draw wire

| Measuring range | D         |
|-----------------|-----------|
| 1000 mm         | 21 [0.83] |
| 2000 mm         | 21 [0.83] |
| 3000 mm         | 35 [1.38] |

Dimension B depends on the encoder used

| Encoder   | B            |
|---|--------------|
| Sendix incremental (5000)<br>D8.4B1.xxxx.00xx.xxxx            | 55.75 [2.19] |
| Sendix absolute (F5863)<br>D8.4B1.xxxx.F3xx.xxxx              | 68.25 [2.69] |
| Sendix absolute (5863)<br>D8.4B1.xxxx.63xx.xxxx               | 68.25 [2.69] |
| Sendix absolute (F5868, CANopen)<br>D8.4B1.xxxx.F8xx.21xx     | 88.25 [3.47] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.4B1.xxxx.F8xx.A2xx | 76.75 [3.02] |
| Sendix absolute (5868)<br>D8.4B1.xxxx.68xx.xxxx               | 95.35 [3.75] |
| Sendix absolute (M586x)<br>D8.4B1.xxxx.Mxxx.xxxx              | 68.45 [2.69] |



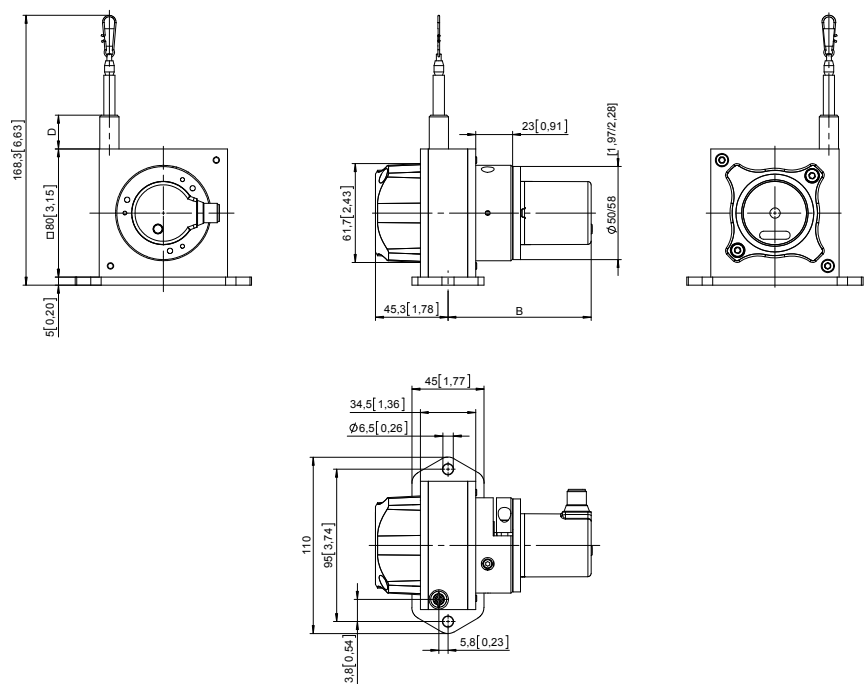
### Draw wire mechanics with encoder Interchangeable installation, clamping flange

Dimension D depends on the measuring range of the draw wire

| Measuring range | D         |
|-----------------|-----------|
| 1000 mm         | 21 [0.83] |
| 2000 mm         | 21 [0.83] |
| 3000 mm         | 35 [1.38] |

Dimension B depends on the encoder used

| Encoder   | B             |
|---|---------------|
| Sendix incremental (5000)<br>D8.2B1.xxxx.00xx.xxxx            | 78.75 [3.10]  |
| Sendix absolute (F5863)<br>D8.2B1.xxxx.F3xx.xxxx              | 91.25 [3.59]  |
| Sendix absolute (5863)<br>D8.2B1.xxxx.63xx.xxxx               | 91.25 [3.59]  |
| Sendix absolute (F5868, CANopen)<br>D8.2B1.xxxx.F8xx.21xx     | 111.25 [4.40] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.2B1.xxxx.F8xx.A2xx | 99.75 [3.93]  |
| Sendix absolute (5868)<br>D8.2B1.xxxx.68xx.xxxx               | 118.35 [4.66] |
| Sendix absolute (M586x)<br>D8.2B1.xxxx.Mxxx.xxxx              | 91.45 [3.60]  |



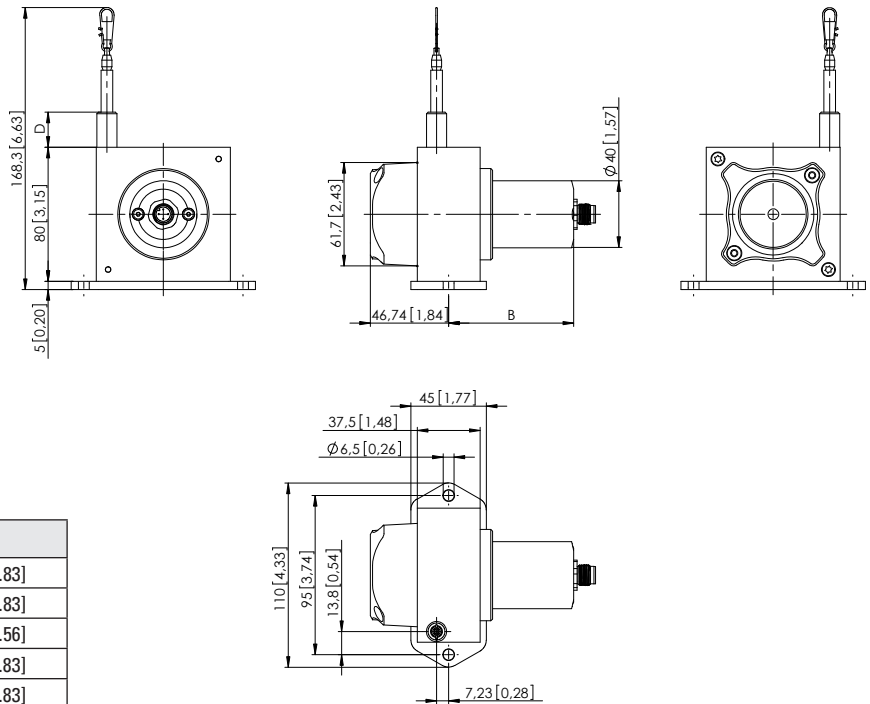
# Linear measuring technology

|  |                              |   |
|--|------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder B80</b> | <b>Measuring length max. 3 m<br/>Traverse speed max. 10 m/s</b> |
|--|------------------------------|---|

## Dimensions

Dimensions in mm [inch]

### Draw wire mechanics with analog sensor (scaled on measuring range)

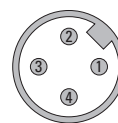


| Sensor type   | Measuring length | B            | D           |
|---------------|------------------|--------------|-------------|
| Potentiometer | 1000 mm          | 74 [2.91]    | 21 [0.83]   |
|               | 2000 mm          | 74 [2.91]    | 21 [0.83]   |
|               | 3000 mm          | 102.5 [4.04] | 65 [2.56]   |
| 4 ... 20 mA   | 1000 mm          | 87.5 [3.44]  | 21 [0.83]   |
|               | 2000 mm          | 87.5 [3.44]  | 21 [0.83]   |
|               | 3000 mm          | 102.3 [4.03] | 78.5 [3.09] |

## Terminal assignment (analog sensor A11, A22, A33)

| Pin         | 1  | 2      | 3      | 4        |
|-------------|----|--------|--------|----------|
| Cable color | BN | WH     | BU     | BK       |
| 0 ... 10 V  | +V | Signal | 0 V    | 0 V Sig. |
| 4 ... 20 mA | +V | n. c.  | Signal | n. c.    |
| 1 kΩ        | +V | Slider | 0 V    | n. c.    |

### Top view of mating side, male contact base



M12 connector, 4-pin

# Linear measuring technology

**Draw wire mechanics with encoder**

**Draw wire encoder C105**

**Measuring length max. 6 m  
Traverse speed max. 3 m/s**



The draw wire encoder C105 can be combined with all encoders having a size 58 synchro flange and 6 mm shaft.

Kübler's encoders portfolio offers the suitable Sendix encoder for every application.



## Flexible and simple

- Possibility for user to exchange encoder.
- Measuring lengths 2800 mm or 6000 mm.
- Simple installation.
- Scalable analog output with limit switch function.

## Order code with encoder (incremental, absolute)

**D8.1** **XXX** . **XX****XX** . **XXXX**  
Type **a** **b** **c** **d** **e**

Standard variants are represented **bold underlined>**

### **a** Measuring range

106 = 6000 mm  
2A1 = 2800 mm

### **b** Encoder used

**2Z** = **Sendix 5000, incremental**  
**M3** = **Sendix M5863, absolute**  
F3 = Sendix F5863, absolute  
63 = Sendix 5863, absolute  
**M8** = **Sendix M5868, absolute**  
F8 = Sendix F5868 absolute  
68 = Sendix 5868, absolute

### **c** Output circuit

depends on the encoder used

### **d** Type of connection

depends on the encoder used

### **e** Resolution / Protocol / Options

depends on the encoder used

### Standard resolutions for draw wire with incremental encoder

| Drum circumference [mm]   | 200 | 200  | 200  |
|---------------------------|-----|------|------|
| Pulses / revolution [ppr] | 200 | 2000 | 4000 |
| Pulses / mm               | 1   | 10   | 20   |
| Resolution [mm]           | 1   | 0.1  | 0.05 |

### Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)

| Drum circumference [mm]   | 200  |
|---------------------------|------|
| Pulses / revolution [ppr] | 4096 |
| Pulses / mm               | 20.5 |
| Resolution [mm]           | 0.05 |

## Recommended standard variants (with incremental, absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection       | Resolution / Protocol            | Option |
|-----------------------------|----------------------------------|--------------------------------|----------------|--------------------------|----------------------------------|--------|
| D8.1xxx.2Z54.2000           | Sendix 5000 (8.5000.B154.2000)   | Push-pull with inverted signal | 10 ... 30 V DC | 1 x radial M12 connector | 2000 ppr                         | -      |
| D8.1xxx.M324.G222           | Sendix M5863 (8.M5863.4124.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector     | 4096 ppr / SSI-Gray-Code         | -      |
| D8.1xxx.M824.2122           | Sendix M5868 (8.M5868.4124.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector     | CANopen encoderprofil DS406 V4.0 | -      |

## Other variants (with absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface   | Power supply   | Type of connection       | Resolution / Protocol                  | Option                  |
|-----------------------------|----------------------------------|-------------|----------------|--------------------------|--|-------------------------|
| D8.1xxx.F324.G223           | Sendix F5863 (8.F5863.2124.G223) | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.1xxx.6324.G223           | Sendix 5863 (8.5863.2124.G223)   | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.1xxx.F82E.2123           | Sendix F5868 (8.F5868.212E.2123) | CANopen     | 10 ... 30 V DC | 1 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.1xxx.6822.2123           | Sendix 5868 (8.5868.2122.2123)   | CANopen     | 10 ... 30 V DC | 2 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.1xxx.6832.3113           | Sendix 5868 (8.5868.2132.3113)   | PROFIBUS    | 10 ... 30 V DC | 3 x radial M12 connector | Profibus-DP V0 encoder profile Class 2 | SET button              |
| D8.1xxx.68B2.B212           | Sendix 5868 (8.5868.21B2.B212)   | EtherCAT    | 10 ... 30 V DC | 3 x radial M12 connector | EtherCAT with CoE 3.2.10               | -                       |
| D8.1xxx.68C2.C212           | Sendix 5868 (8.5868.21C2.C212)   | PROFINET IO | 10 ... 30 V DC | 3 x radial M12 connector | PROFINET encoder profile version 4.1   | -                       |
| D8.1xxx.F8AN.A222           | Sendix F5868 (8.F5868.21AN.A222) | EtherNet/IP | 10 ... 30 V DC | 3 x axial M12 connector  | EtherNet/IP                            | -                       |

# Linear measuring technology

|   |                               |  |
|---|-------------------------------|--|
| <b>Draw wire mechanics with encoder</b> | <b>Draw wire encoder C105</b> | <b>Measuring length max. 6 m</b><br><b>Traverse speed max. 3 m/s</b> |
|---|-------------------------------|--|

|  |   |      |          |          |          |          |   |      |      |          |  |          |          |          |          |   |
|--|---|------|----------|----------|----------|----------|---|------|------|----------|--|----------|----------|----------|----------|---|
| <b>Order code with encoder (analog, scalable with limit switch function)</b> | <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">D8.1</td> <td style="padding: 2px 5px;">XXX</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">M1</td> <td style="padding: 2px 5px;">XX</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">XXXX</td> </tr> <tr> <td style="font-size: 8px;">Type</td> <td style="font-size: 8px;"><b>a</b></td> <td></td> <td style="font-size: 8px;"><b>b</b></td> <td style="font-size: 8px;"><b>c</b></td> <td style="font-size: 8px;"><b>d</b></td> <td style="font-size: 8px;"><b>e</b></td> </tr> </table> | D8.1 | XXX      | .        | M1       | XX       | . | XXXX | Type | <b>a</b> |  | <b>b</b> | <b>c</b> | <b>d</b> | <b>e</b> | Standard variants are represented <b>bold</b> <u>underlined</u> |
| D8.1   | XXX   | .    | M1       | XX       | .        | XXXX     |   |      |      |          |  |          |          |          |          |   |
| Type   | <b>a</b>  |      | <b>b</b> | <b>c</b> | <b>d</b> | <b>e</b> |   |      |      |          |  |          |          |          |          |   |

- |  |  |  |
|--|--|--|
| <p><b>a</b> <i>Measuring range</i><br/>106 = 6000 mm<br/>2A1 = 2800 mm</p> | <p><b>b</b> <i>Encoder used</i><br/><b>M1 = Sendix M5861, absolute</b></p> | <p><b>c</b> <i>Output circuit</i><br/>depends on the encoder used</p> <p><b>d</b> <i>Type of connection</i><br/>depends on the encoder used</p> <p><b>e</b> <i>Resolution / Protocol / Options</i><br/>depends on the encoder used</p> |
|--|--|--|

**Recommended standard variants (with encoder analog, scalable with limit switch function)**

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D8.1xxx.M134.3312           | Sendix M5861 (8.M5861.4134.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>1)</sup>    |
| D8.1xxx.M144.4312           | Sendix M5861 (8.M5861.4144.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>1)</sup>    |
| D8.1xxx.M134.3412           | Sendix M5861 (8.M5861.4134.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>1)</sup> |
| D8.1xxx.M144.4412           | Sendix M5861 (8.M5861.4144.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>1)</sup> |

**Accessories for draw wire encoder** Order no.

|                               |  |   |  |
|-------------------------------|--|---|--|
| <p><b>Guide pulley</b></p>    |  | <p>Order code for the set:<br/>- Guide pulley (anodized aluminum)<br/>- 2 x countersunk screws for lateral fixing<br/>- 2 x hexagonal screws for fixing on a flat surface</p> | <p><b>8.0000.7000.0045</b></p>   |
| <p><b>Extension cable</b></p> |  | <p>Steel wire 2 m [6.56']<br/>Steel wire 5 m [16.40']<br/>Steel wire 10 m [32.81']<br/>Paraleine 2 m [6.56']</p>  | <p><b>8.0000.7000.0033</b><br/><b>8.0000.7000.0034</b><br/><b>8.0000.7000.0035</b><br/><b>8.0000.7000.0032</b></p> |

**Technical data**

| Mechanical characteristics             |   |
|--|---|
| <b>Measuring range</b>                 | 2800 mm / 6000 mm   |
| <b>Traversing speed</b>                | max. 3000 mm/s  |
| <b>Extension force F<sub>min</sub></b> | 8 N   |
| <b>Repeat accuracy</b>                 | ±0.15 mm  |
| <b>Working temperature</b>             | -20°C ... +80°C [-4°F ... +176°F]   |
| <b>Weight</b>                          | approx. 700 g [24.69 oz]  |
| <b>Drum circumference</b>              | 200 mm  |
| <b>Wire</b>                            | 2800 mm paraleine – with ø 1.05 mm<br>6000 mm steel wire – with ø 0.54 mm |

**For the electrical characteristics as well as for the terminal assignment, please refer to the data sheet of the encoder used.**

1) Delivery condition: unscaled.  
Description for scaling and limit switch function see data sheet M5861.

## Draw wire mechanics with encoder

## Draw wire encoder C105

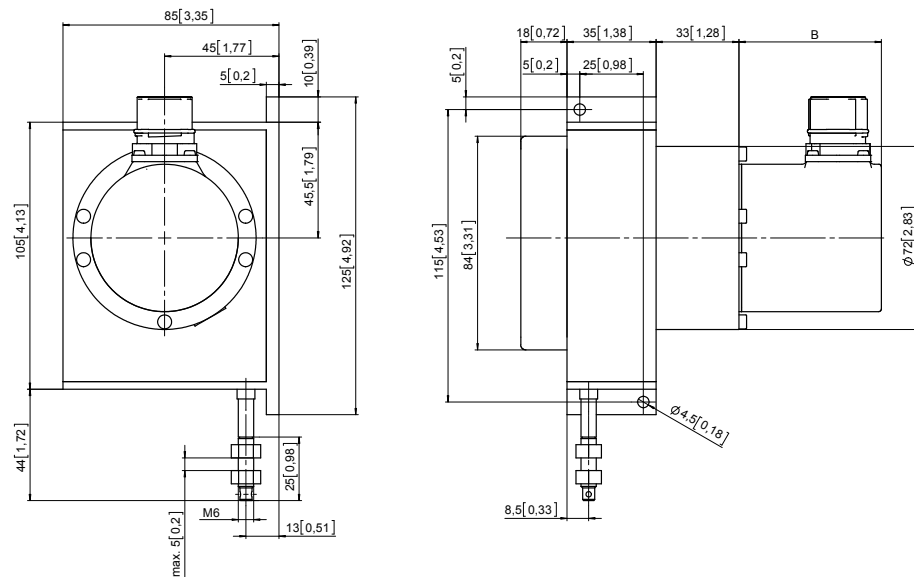
Measuring length max. 6 m  
Traverse speed max. 3 m/s

### Dimensions

Dimensions in mm [inch]

#### Draw wire mechanics with encoder

| Dimension B depends on the encoder used                   |                |
|---|----------------|
| Encoder   | B              |
| Sendix incremental (5000)<br>D8.1xxx.2Zxx.xxxx            | 37.0<br>[1.46] |
| Sendix absolute (F5863)<br>D8.1xxx.F3xx.xxxx              | 49.5<br>[1.95] |
| Sendix absolute (5863)<br>D8.1xxx.63xx.xxxx               | 49.5<br>[1.95] |
| Sendix absolute (F5868, CANopen)<br>D8.1xxx.F8xx.21xx     | 70.0<br>[2.76] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.1xxx.F8xx.A2xx | 59.5<br>[2.34] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.1xxx.68xx.A2xx | 77.2<br>[3.04] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.1xxx.Mxxx.xxxx | 49.8<br>[1.96] |



# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder C120</b> | <b>Measuring length max. 6 m</b><br><b>Traverse speed max. 10 m/s</b> |
|--|-------------------------------|---|



These draw wire mechanics C120 can be used up to a measuring length of 6 meters.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



|   |                   |                        |                             |                             |
|---|-------------------|------------------------|-----------------------------|-----------------------------|
|   |                   |                        |                             |                             |
| Max. acceleration<br>140 m/s <sup>2</sup> | Long service life | Wide temperature range | High protection level<br>IP | Reverse polarity protection |

## Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

## Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s<sup>2</sup>.
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

## Order code with encoder (incremental, absolute)

**D8.XC1.0600.XX.XX.XXXX**

Standard variants are represented **bold underlined**

### a Mechanics

- 2 = interchangeable installation <sup>1)</sup>
- 4 = fixed installation <sup>2)</sup>**

### b Measuring range

0600 = 6000 mm

### c Encoder used

- 00 = Sendix 5000, incremental**
- M3 = Sendix M5863, absolute**
- F3 = Sendix F5863, absolute
- 63 = Sendix 5863, absolute
- M8 = Sendix M5868, absolute**
- F8 = Sendix F5868 absolute
- 68 = Sendix 5868, absolute

### d Output circuit

depends on the encoder used

### e Type of connection

depends on the encoder used

### f Resolution / Protocol / Options

depends on the encoder used

### Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

### Standard resolutions for draw wire with incremental encoder Sendix 5000

|                           |        |        |        |
|---------------------------|--------|--------|--------|
| Drum circumference [mm]   | 317.68 | 317.68 | 317.68 |
| Pulses / revolution [ppr] | 1000   | 2000   | 4000   |
| Pulses / mm               | 3.1    | 6.3    | 12.6   |
| Resolution [mm]           | 0.32   | 0.16   | 0.08   |

### Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)

|                           |        |
|---------------------------|--------|
| Drum circumference [mm]   | 317.68 |
| Pulses / revolution [ppr] | 4096   |
| Pulses / mm               | 12.9   |
| Resolution [mm]           | 0.08   |

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.  
2) The encoder can only be replaced at the factory.

# Linear measuring technology

**Draw wire mechanics  
with encoder or analog sensor**

**Draw wire encoder C120**

**Measuring length max. 6 m  
Traverse speed max. 10 m/s**

## Recommended standard variants (with incremental, absolute encoder)

| Order no.<br>draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection       | Resolution / Protocol            | Option |
|--------------------------------|----------------------------------|--------------------------------|----------------|--------------------------|----------------------------------|--------|
| D8.xC1.0600.0054.2000          | Sendix 5000 (8.5000.8354.2000)   | Push-pull with inverted signal | 10 ... 30 V DC | 1 x radial M12 connector | 2000 ppr                         | -      |
| D8.xC1.0600.M324.G222          | Sendix M5863 (8.M5863.3524.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector     | 4096 ppr / SSI-Gray-Code         | -      |
| D8.xC1.0600.M824.2122          | Sendix M5868 (8.M5868.3524.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector     | CANopen encoderprofil DS406 V4.0 | -      |

## Other variants (with absolute encoder)

| Order no.<br>draw wire encoder | Mounted encoder                  | Interface   | Power supply   | Type of connection       | Resolution / Protocol                  | Option                  |
|--------------------------------|----------------------------------|-------------|----------------|--------------------------|--|-------------------------|
| D8.xC1.0600.F324.G223          | Sendix F5863 (8.F5863.1224.G223) | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xC1.0600.6324.G223          | Sendix 5863 (8.5863.1224.G223)   | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xC1.0600.F82E.2123          | Sendix F5868 (8.F5868.122E.2123) | CANopen     | 10 ... 30 V DC | 1 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xC1.0600.6822.2123          | Sendix 5868 (8.5868.1222.2123)   | CANopen     | 10 ... 30 V DC | 2 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xC1.0600.6832.3113          | Sendix 5868 (8.5868.1232.3113)   | PROFIBUS    | 10 ... 30 V DC | 3 x radial M12 connector | Profibus-DP V0 encoder profile Class 2 | SET button              |
| D8.xC1.0600.68B2.B212          | Sendix 5868 (8.5868.12B2.B212)   | EtherCAT    | 10 ... 30 V DC | 3 x radial M12 connector | EtherCAT with CoE 3.2.10               | -                       |
| D8.xC1.0600.68C2.C212          | Sendix 5868 (8.5868.12C2.C212)   | PROFINET IO | 10 ... 30 V DC | 3 x radial M12 connector | PROFINET encoder profile version 4.1   | -                       |
| D8.xC1.0600.F8AN.A222          | Sendix F5868 (8.F5868.12AN.A222) | EtherNet/IP | 10 ... 30 V DC | 3 x axial M12 connector  | EtherNet/IP                            | -                       |

## Order code with encoder (analog, scalable with limit switch function)

**D8.XC1 . 0600 . M1XX . XXXX**

Standard variants are represented **bold underlined**

### **a** Mechanics

2 = interchangeable installation <sup>1)</sup>  
4 = **fixed installation** <sup>2)</sup>

### **b** Measuring range

0600 = 6000 mm

### **c** Encoder used

**M1 = Sendix M5861, absolute**

### **d** Output circuit

depends on the encoder used

### **e** Type of connection

depends on the encoder used

### **f** Resolution / Protocol / Options

depends on the encoder used

### Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

## Recommended standard variants (with encoder analog, scalable with limit switch function)

| Order no.<br>draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|--------------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D8.xC1.0600.M134.3312          | Sendix M5861 (8.M5861.3534.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>3)</sup>    |
| D8.xC1.0600.M144.4312          | Sendix M5861 (8.M5861.3544.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>3)</sup>    |
| D8.xC1.0600.M134.3412          | Sendix M5861 (8.M5861.3534.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>3)</sup> |
| D8.xC1.0600.M144.4412          | Sendix M5861 (8.M5861.3544.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>3)</sup> |

## Order code with analog sensor (scaled to measuring range)

**D8.3C1 . 0600 . XXX X . 0000**

### **a** Measuring range

0100 = 1000 mm  
0200 = 2000 mm  
0300 = 3000 mm

### **b** Analog sensor output / power supply

A11 = 4 ... 20 mA / 12 ... 30 V DC  
A22 = 0 ... 10 V / 12 ... 30 V DC  
A33 = potentiometer 1 kΩ / max. 30 V DC

### **c** Type of connection

1 = axial cable, 2 m PVC  
3 = axial M12 connector, 4-pin

### Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C


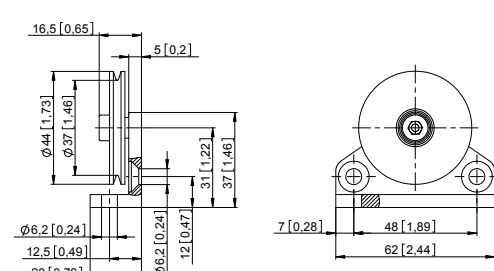
1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.  
2) The encoder can only be replaced at the factory.

3) Delivery condition: scaled to measuring range.  
Description for scaling and limit switch function see data sheet M5861.



# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder C120</b> | <b>Measuring length max. 6 m<br/>Traverse speed max. 10 m/s</b> |
|--|-------------------------------|---|

|   |   |
|---|---|
| <b>Guide pulley for draw wire encoder</b>   | Order no.   |
|   | Order code for the set:<br>- Guide pulley (anodized aluminum)<br>- 2 x countersunk screws for lateral fixing<br>- 2 x hexagonal screws for fixing on a flat surface |
|   | <b>8.0000.7000.0045</b>   |

|  |  |
|--|--|
| <b>Connection technology for analog sensor</b> | Order no.  |
| <b>Cordset, pre-assembled</b>                  | M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable |
|  | <b>05.00.6081.2211.002M</b>  |
| <b>Connector, self-assembly (straight)</b>     | M12 female connector with coupling nut, 5-pin                          |
|  | <b>8.0000.5116.0000</b>  |

## Technical data

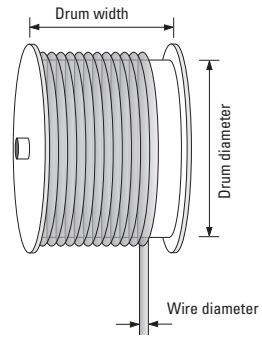
| Mechanical characteristics (draw wire mechanics) |  |
|--|--|
| <b>Measuring range</b>                           | 6000 mm  |
| <b>Extension force</b>                           | $F_{min}$ 8.8 N<br>$F_{max}$ 12.3 N  |
| <b>Max. speed.</b>                               | 10 m/s   |
| <b>Max. acceleration</b>                         | 140 m/s <sup>2</sup>   |
| <b>Linearity (of the measuring range)</b>        | with analog sensor ±0.10 %<br>with encoder ±0.05 %<br>±0.02 % <sup>1)</sup>  |
| <b>Weight</b>                                    | approx. 1600 g [56.44 oz]<br>(depending on the sensor/encoder used)  |
| <b>Material</b>                                  | housing titanium-anodized aluminum<br>wire stainless steel ø 0.5 mm<br>ø 1 mm can be supplied as a special up to measuring range 3000 mm (other wire types on request) |
| <b>Protection acc. to EN 60529</b>               | IP65 (sensor)  |

| Electrical characteristics (digital output)   |
|---|
| The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders |

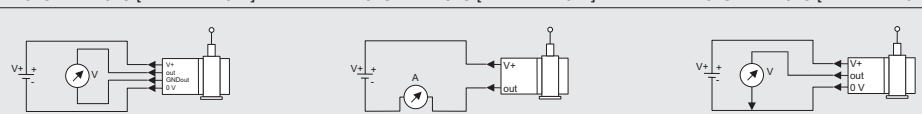
### Operating principle

**Construction**  
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

**Note**  
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Linear measuring technology

| Electrical characteristics (analog sensor, scaled to measuring range) |   |   |   |
|---|---|---|---|
| Version   | A22   | A11   | A33   |
| <b>Analog output</b>  | 0 ... 10 V  | 4 ... 20 mA   | potentiometer   |
| <b>Output</b>   | 0 ... 10 V / galv. isolated, 4 conductors   | 4 ... 20 mA / 2 conductors  | 1 kΩ  |
| <b>Power supply</b>   | 12 ... 30 V DC  | 12 ... 30 V DC  | max. 30 V DC  |
| <b>Recommended slider current</b>                                     | –   | –   | < 1 μA  |
| <b>Max. current consumption</b>                                       | 22.5 mA (no load)   | 50 mA   | –   |
| <b>Reverse polarity protection</b>                                    | yes   | yes   | –   |
| <b>Working temperature</b>  | -20°C ... +60°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +60°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +85°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> |
| <b>Connection diagrams</b>  |   |   |   |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |   |   |

1) On request.


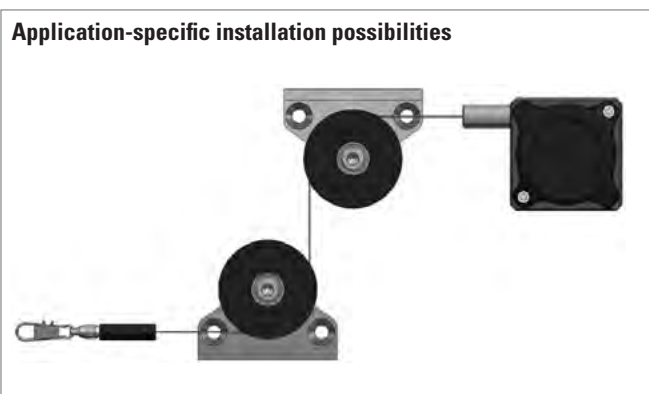
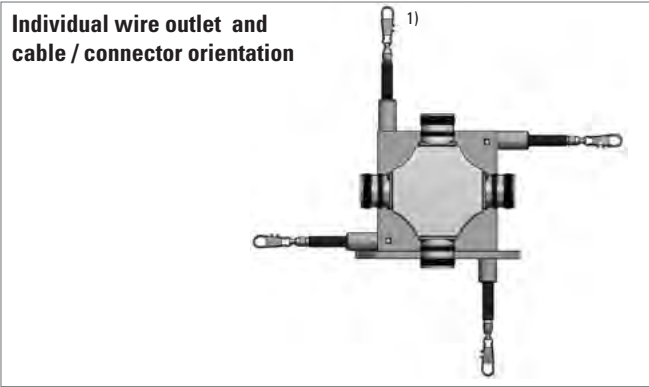
# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder C120</b> | <b>Measuring length max. 6 m<br/>Traverse speed max. 10 m/s</b> |
|--|-------------------------------|---|

## Technology in detail

**Various wire types and wire fastenings**

|  |   |                    |           |        |
|--|---|--------------------|-----------|--------|
| <p>Wire types:</p> <ul style="list-style-type: none"> <li>- 0.5 mm (V2A) <sup>1)</sup></li> <li>- 0.51 mm (V4A)</li> <li>- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)</li> <li>- 0.6 mm (Coramid)</li> </ul> | <p>Wire fastenings:</p> <table border="0"> <tr> <td style="padding-right: 10px;">Clip <sup>1)</sup></td> <td style="padding-right: 10px;">M4 thread</td> <td>Eyelet</td> </tr> </table> | Clip <sup>1)</sup> | M4 thread | Eyelet |
| Clip <sup>1)</sup>   | M4 thread   | Eyelet             |           |        |

1) Standard.

# Linear measuring technology

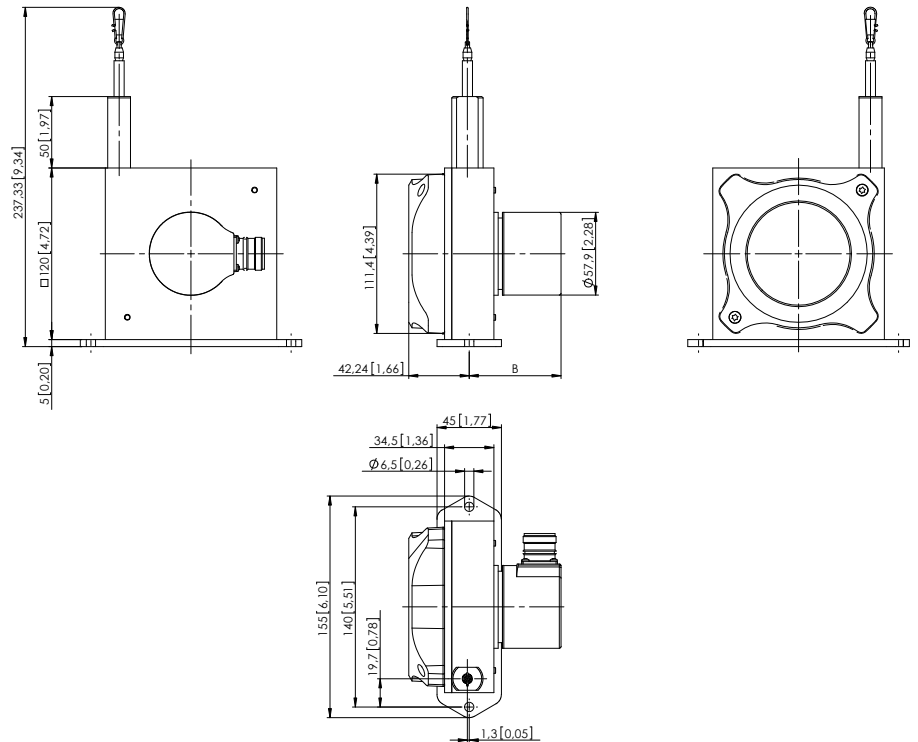
|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder C120</b> | <b>Measuring length max. 6 m<br/>Traverse speed max. 10 m/s</b> |
|--|-------------------------------|---|

## Dimensions

Dimensions in mm [inch]

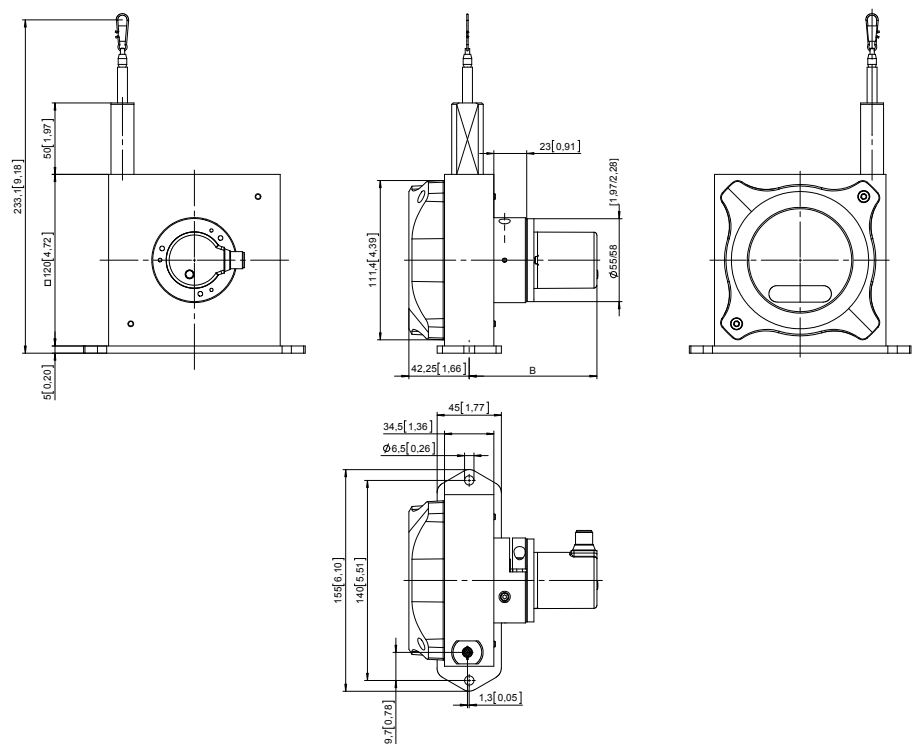
### Draw wire mechanics with encoder Fixed installation

| Dimension B depends on the encoder used                       |                 |
|---|-----------------|
| Encoder   | B               |
| Sendix incremental (5000)<br>D8.4C1.0600.00xx.xxxx            | 54.25<br>[2.14] |
| Sendix absolute (F5863)<br>D8.4C1.0600.F3xx.xxxx              | 66.75<br>[2.63] |
| Sendix absolute (5863)<br>D8.4C1.0600.63xx.xxxx               | 66.75<br>[2.63] |
| Sendix absolute (F5868, CANopen)<br>D8.4C1.0600.F8xx.21xx     | 88.25<br>[3.47] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.4C1.0600.F8xx.A2xx | 76.75<br>[3.02] |
| Sendix absolute (5868)<br>D8.4C1.0600.68xx.xxxx               | 67.35<br>[2.65] |
| Sendix absolute (M586x)<br>D8.4C1.0600.Mxxx.xxxx              | 67.05<br>[2.64] |



### Draw wire mechanics with encoder Interchangeable installation, clamping flange

| Dimension B depends on the encoder used                       |                  |
|---|------------------|
| Encoder   | B                |
| Sendix incremental (5000)<br>D8.2C1.0600.00xx.xxxx            | 77.25<br>[3.04]  |
| Sendix absolute (F5863)<br>D8.2C1.0600.F3xx.xxxx              | 89.75<br>[3.53]  |
| Sendix absolute (5863)<br>D8.2C1.0600.63xx.xxxx               | 89.75<br>[3.53]  |
| Sendix absolute (F5868, CANopen)<br>D8.2C1.0600.F8xx.21xx     | 111.25<br>[4.38] |
| Sendix absolute (F5868, EtherNet/IP)<br>D8.2C1.0600.F8xx.A2xx | 99.75<br>[1.69]  |
| Sendix absolute (5868)<br>D8.2C1.0600.68xx.xxxx               | 90.35<br>[3.93]  |
| Sendix absolute (M586x)<br>D8.2C1.0600.Mxxx.xxxx              | 90.05<br>[3.54]  |



# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

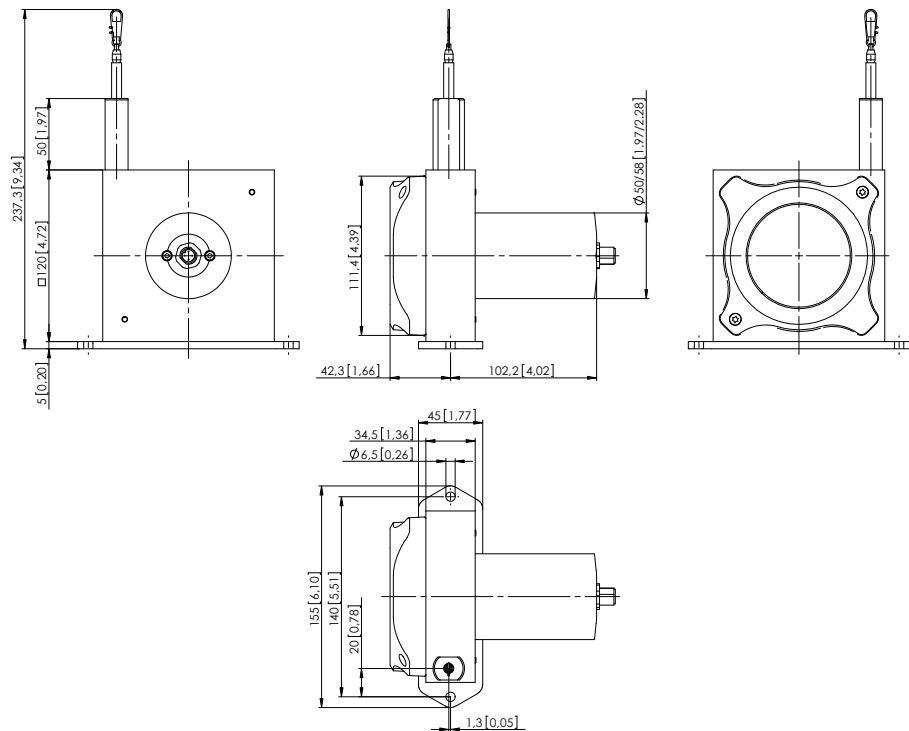
**Draw wire encoder C120**

**Measuring length max. 6 m  
Traverse speed max. 10 m/s**

## Dimensions

Dimensions in mm [inch]

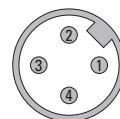
**Draw wire mechanics with analog sensor  
(scaled on measuring range)**



## Terminal assignment (analog sensor A11, A22, A33)

| Pin          | 1  | 2      | 3      | 4        |
|--------------|----|--------|--------|----------|
| Cable color  | BN | WH     | BU     | BK       |
| 0 ... 10 V   | +V | Signal | 0 V    | 0 V Sig. |
| 4 ... 20 mA  | +V | n. c.  | Signal | n. c.    |
| 1 k $\Omega$ | +V | Slider | 0 V    | n. c.    |

Top view of mating side, male contact base



M12 connector, 4-pin

# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder D135</b> | <b>Measuring length max. 42.5 m</b><br><b>Traverse speed max. 5 m/s</b> |
|--|-------------------------------|---|



These draw wire mechanics D135 can be used up to a measuring length of 42.5 meters. This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

With its compact construction, the D135 suits perfectly all measuring tasks from 8 up to 42.5 meters.



|   |                   |                               |                             |                             |
|---|-------------------|-------------------------------|-----------------------------|-----------------------------|
|   |                   |                               |                             |                             |
| Max. acceleration<br>140 m/s <sup>2</sup> | Long service life | Temperature<br>-20°C .. +90°C | High protection level<br>IP | Reverse polarity protection |

## Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

## Versatile

- High traverse speed and high acceleration.
- Flexible mounting thanks to fastening tabs or fastening grooves.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

## Order code with encoder (incremental, absolute)

**D8.4D1 . XXXX . XX XX . XXXX**  
Type                      a                      b                      c                      d                      e

Standard variants are represented **bold underlined**

- a** *Measuring range*  
0800 = 8 000 mm  
1000 = 10 000 mm  
1200 = 12 000 mm  
1500 = 15 000 mm  
2000 = 20 000 mm  
2500 = 25 000 mm  
3000 = 30 000 mm  
3500 = 35 000 mm  
4000 = 40 000 mm  
4250 = 42 500 mm

- b** *Encoder used*  
**00 = Sendix 5000, incremental**  
**M3 = Sendix M5863, absolute**  
F3 = Sendix F5863, absolute  
63 = Sendix 5863, absolute  
**M8 = Sendix M5868, absolute**  
F8 = Sendix F5868 absolute  
68 = Sendix 5868, absolute

- c** *Output circuit*  
depends on the encoder used
- d** *Type of connection*  
depends on the encoder used
- e** *Resolution / Protocol / Options*  
depends on the encoder used

- Optional on request*
- Other measuring ranges
  - Cable diameter 1 mm
  - Eyelet or M4 wire fastening instead of wire clip
  - Modified cable and/or connector orientation
  - Modified cable outlet direction
  - Sensor protection level IP67
  - Improved linearity (0.02 %)

### Standard resolutions for draw wire with incremental encoder Sendix 5000

|                           |        |        |        |
|---------------------------|--------|--------|--------|
| Drum circumference [mm]   | 333.33 | 333.33 | 333.33 |
| Pulses / revolution [ppr] | 1000   | 2000   | 4000   |
| Pulses / mm               | 3      | 6      | 12     |
| Resolution [mm]           | 0.33   | 0.17   | 0.08   |

### Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)

|                           |        |
|---------------------------|--------|
| Drum circumference [mm]   | 333.33 |
| Pulses / revolution [ppr] | 4096   |
| Pulses / mm               | 12.3   |
| Resolution [mm]           | 0.08   |

## Draw wire mechanics with encoder or analog sensor

### Draw wire encoder D135

Measuring length max. 42.5 m  
Traverse speed max. 5 m/s

#### Recommended standard variants (with incremental, absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface                      | Power supply   | Type of connection       | Resolution / Protocol            | Option |
|-----------------------------|----------------------------------|--------------------------------|----------------|--------------------------|----------------------------------|--------|
| D8.xD1.xxxx.0054.2000       | Sendix 5000 (8.5000.8354.2000)   | Push-pull with inverted signal | 10 ... 30 V DC | 1 x radial M12 connector | 2000 ppr                         | -      |
| D8.xD1.xxxx.M324.G222       | Sendix M5863 (8.M5863.3524.G222) | SSI                            | 10 ... 30 V DC | radial M12 connector     | 4096 ppr / SSI-Gray-Code         | -      |
| D8.xD1.xxxx.M824.2122       | Sendix M5868 (8.M5868.3524.2122) | CANopen                        | 10 ... 30 V DC | radial M12 connector     | CANopen encoderprofil DS406 V4.0 | -      |

#### Other variants (with absolute encoder)

| Order no. draw wire encoder | Mounted encoder                  | Interface   | Power supply   | Type of connection       | Resolution / Protocol                  | Option                  |
|-----------------------------|----------------------------------|-------------|----------------|--------------------------|--|-------------------------|
| D8.xD1.xxxx.F324.G223       | Sendix F5863 (8.F5863.1224.G223) | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xD1.xxxx.6324.G223       | Sendix 5863 (8.5863.1224.G223)   | SSI         | 10 ... 30 V DC | 1 x radial M12 connector | 4096 ppr / SSI-Gray-Code               | SET button + status LED |
| D8.xD1.xxxx.F82E.2123       | Sendix F5868 (8.F5868.122E.2123) | CANopen     | 10 ... 30 V DC | 1 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xD1.xxxx.6822.2123       | Sendix 5868 (8.5868.1222.2123)   | CANopen     | 10 ... 30 V DC | 2 x radial M12 connector | CANopen encoder profile DS406 V3.2     | SET button              |
| D8.xD1.xxxx.6832.3113       | Sendix 5868 (8.5868.1232.3113)   | PROFIBUS    | 10 ... 30 V DC | 3 x radial M12 connector | Profibus-DP V0 encoder profile Class 2 | SET button              |
| D8.xD1.xxxx.68B2.B212       | Sendix 5868 (8.5868.12B2.B212)   | EtherCAT    | 10 ... 30 V DC | 3 x radial M12 connector | EtherCAT with CoE 3.2.10               | -                       |
| D8.xD1.xxxx.68C2.C212       | Sendix 5868 (8.5868.12C2.C212)   | PROFINET IO | 10 ... 30 V DC | 3 x radial M12 connector | PROFINET encoder profile version 4.1   | -                       |
| D8.xD1.xxxx.F8AN.A222       | Sendix F5868 (8.F5868.12AN.A222) | EtherNet/IP | 10 ... 30 V DC | 3 x axial M12 connector  | EtherNet/IP                            | -                       |

#### Order code with encoder (analog, scalable with limit switch function)

**D8.4D1 . XXXX . M1XX . XXXX**  
Type                      a                      b c d                      e

Standard variants are represented **bold underlined**

**a** *Measuring range*  
0800 = 8 000 mm  
1000 = 10 000 mm  
1200 = 12 000 mm  
1500 = 15 000 mm  
2000 = 20 000 mm  
2500 = 25 000 mm  
3000 = 30 000 mm  
3500 = 35 000 mm  
4000 = 40 000 mm  
4250 = 42 500 mm

**b** *Encoder used*  
**M1 = Sendix M5861, absolute**

**c** *Output circuit*  
depends on the encoder used

**d** *Type of connection*  
depends on the encoder used

**e** *Resolution / Protocol / Options*  
depends on the encoder used

*Optional on request*  
- Other measuring ranges  
- Cable diameter 1 mm  
- Eyelet or M4 wire fastening instead of wire clip  
- Modified cable and/or connector orientation  
- Modified cable outlet direction  
- Sensor protection level IP67  
- Improved linearity (0.02 %)

#### Recommended standard variants (with encoder analog, scalable with limit switch function)

| Order no. draw wire encoder | Mounted encoder                  | Interface           | Power supply   | Type of connection   | Resolution / Protocol | Option   |
|-----------------------------|----------------------------------|---------------------|----------------|----------------------|-----------------------|--|
| D8.xD1.xxxx.M134.3312       | Sendix M5861 (8.M5861.3534.3312) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable with limit switch function <sup>1)</sup>    |
| D8.xD1.xxxx.M144.4312       | Sendix M5861 (8.M5861.3544.4312) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable with limit switch function <sup>1)</sup>    |
| D8.xD1.xxxx.M134.3412       | Sendix M5861 (8.M5861.3534.3412) | Analog, 4 ... 20 mA | 10 ... 30 V DC | radial M12 connector | 12 Bit / 4 ... 20 mA  | scalable without limit switch function <sup>1)</sup> |
| D8.xD1.xxxx.M144.4412       | Sendix M5861 (8.M5861.3544.4412) | Analog, 0 ... 10 V  | 15 ... 30 V DC | radial M12 connector | 12 Bit / 0 ... 10 V   | scalable without limit switch function <sup>1)</sup> |

#### Order code with analog sensor (scaled to measuring range)

**D8.3D1 . XXXX . XXX X . 0000**  
Type                      a                      b c                      0000

**a** *Measuring range*  
0800 = 8 000 mm  
1000 = 10 000 mm  
1500 = 15 000 mm  
2000 = 20 000 mm  
2500 = 25 000 mm  
3000 = 30 000 mm  
3500 = 35 000 mm  
4000 = 40 000 mm

**b** *Analog sensor output / power supply*  
A11 = 4 ... 20 mA / 12 ... 30 V DC  
A22 = 0 ... 10 V / 12 ... 30 V DC  
A33 = potentiometer 1 kΩ / max. 30 V DC


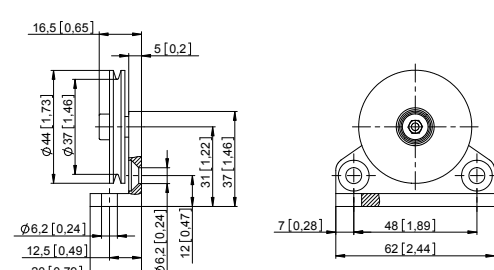
**c** *Type of connection*  
1 = axial cable, 2 m [6.56'] PVC  
3 = axial M12 connector, 4-pin

*Optional on request*  
- Other measuring ranges  
- Cable diameter 1 mm  
- Eyelet or M4 wire fastening instead of wire clip  
- Modified cable and/or connector orientation  
- Modified cable outlet direction  
- Sensor protection level IP67  
- Improved linearity (0.02 %)  
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) Delivery condition: scaled to measuring range.  
Description for scaling and limit switch function see data sheet M5861.

# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder D135</b> | <b>Measuring length max. 42.5 m<br/>Traverse speed max. 5 m/s</b> |
|--|-------------------------------|---|

|   |   |
|---|---|
| <b>Guide pulley for draw wire encoder</b>   | Order no.   |
|   | Order code for the set:<br>- Guide pulley (anodized aluminum)<br>- 2 x countersunk screws for lateral fixing<br>- 2 x hexagonal screws for fixing on a flat surface |
|   | <b>8.0000.7000.0045</b>   |

|  |  |
|--|--|
| <b>Connection technology for analog sensor</b> | Order no.  |
| <b>Cordset, pre-assembled</b>                  | M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable |
|  | <b>05.00.6081.2211.002M</b>  |
| <b>Connector, self-assembly (straight)</b>     | M12 female connector with coupling nut, 5-pin                          |
|  | <b>8.0000.5116.0000</b>  |

## Technical data

| Mechanical characteristics (draw wire mechanics) |                    |   |                                  |                     |                      |                                  |
|--|--------------------|---|----------------------------------|---------------------|----------------------|----------------------------------|
| Measuring range                                  |                    | 8000 mm   | 10000 mm<br>12000 mm<br>15000 mm | 20000 mm            | 25000 mm<br>30000 mm | 35000 mm<br>40000 mm<br>42500 mm |
| <b>Extension force</b>                           | $F_{min}$          | 7.2 N   | 8.7 N                            | 7.0 N               | 7.3 N                | 7.0 N                            |
|  | $F_{max}$          | 16.0 N  | 16.9 N                           | 12.4 N              | 15.7 N               | 14.1 N                           |
| <b>Max. speed</b>                                |                    | 10 m/s  | 6 m/s                            | 5 m/s               | 5 m/s                | 5 m/s                            |
| <b>Max. acceleration</b>                         |                    | 140 m/s <sup>2</sup>  | 80 m/s <sup>2</sup>              | 60 m/s <sup>2</sup> | 60 m/s <sup>2</sup>  | 60 m/s <sup>2</sup>              |
| <b>Linearity</b>                                 | with analog output | ±0.1 % (of the measuring range)   |                                  |                     |                      |                                  |
|  | with encoder       | ±0.05 % (of the measuring range)  |                                  |                     |                      |                                  |
|  |                    | ±0.02 % (of the measuring range) <sup>1)</sup>  |                                  |                     |                      |                                  |
| <b>Weight</b>                                    |                    | depending on the measuring and the sensor/encoder used  |                                  |                     |                      |                                  |
| <b>Material</b>                                  | housing            | titanium-anodized aluminum  |                                  |                     |                      |                                  |
|  | wire               | stainless steel Ø 0.5 mm (Ø 1 mm can be supplied as a special up to measuring range 20000 mm) |                                  |                     |                      |                                  |
| <b>Protection acc. to EN 60529</b>               |                    | IP65 (sensor)   |                                  |                     |                      |                                  |

| Electrical characteristics (digital output)  |
|--|
| The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders. |

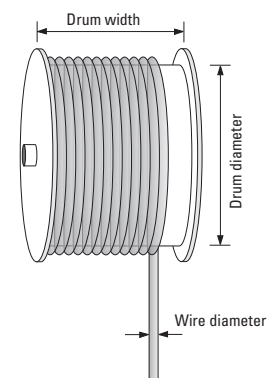
### Operating principle

#### Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

#### Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



1) On request.

# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder D135</b> | <b>Measuring length max. 42.5 m<br/>Traverse speed max. 5 m/s</b> |
|--|-------------------------------|---|

| Electrical characteristics (analog sensor, scaled to measuring range) |   |   |   |
|---|---|---|---|
| Version   | A22   | A11   | A33   |
| <b>Analog output</b>  | 0 ... 10 V  | 4 ... 20 mA   | potentiometer   |
| <b>Output</b>   | 0 ... 10 V / galv. isolated, 4 conductors   | 4 ... 20 mA / 2 conductors  | 1 kΩ  |
| <b>Power supply</b>   | 12 ... 30 V DC  | 12 ... 30 V DC  | max. 30 V DC  |
| <b>Recommended slider current</b>                                     | –   | –   | < 1 μA  |
| <b>Max. current consumption</b>                                       | 22.5 mA (no load)   | 50 mA   | –   |
| <b>Reverse polarity protection</b>                                    | yes   | yes   | –   |
| <b>Working temperature</b>  | -20°C ... +60°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +60°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> | -20°C ... +85°C [-4°F ... +140°F]<br>-40°C ... +85°C [-40°F ... +185°F] <sup>1)</sup><br>-20°C ... +120°C [-4°F ... +248°F] <sup>1)</sup> |
| <b>Connection diagrams</b>  |   |   |   |
| <b>CE compliant acc. to</b>   | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU   |   |   |

## Technology in detail

**Various wire types and wire fastenings**

Wire types:

- 0.5 mm (V2A) <sup>1)</sup>
- 0.51 mm (V4A)
- 1.0 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

- Clip <sup>1)</sup>
- M4 thread
- Eyelet

**Individual wire outlet and cable / connector orientation**

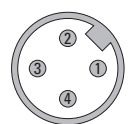
**Extension wire**

**Application-specific installation possibilities**

**Terminal assignment (analog sensor A11, A22, A33)**

| Pin         | 1  | 2      | 3      | 4        |
|-------------|----|--------|--------|----------|
| Cable color | BN | WH     | BU     | BK       |
| 0 ... 10 V  | +V | Signal | 0 V    | 0 V Sig. |
| 4 ... 20 mA | +V | n. c.  | Signal | n. c.    |
| 1 kΩ        | +V | Slider | 0 V    | n. c.    |

Top view of mating side, male contact base



M12 connector, 4-pin

<sup>1)</sup> Standard.



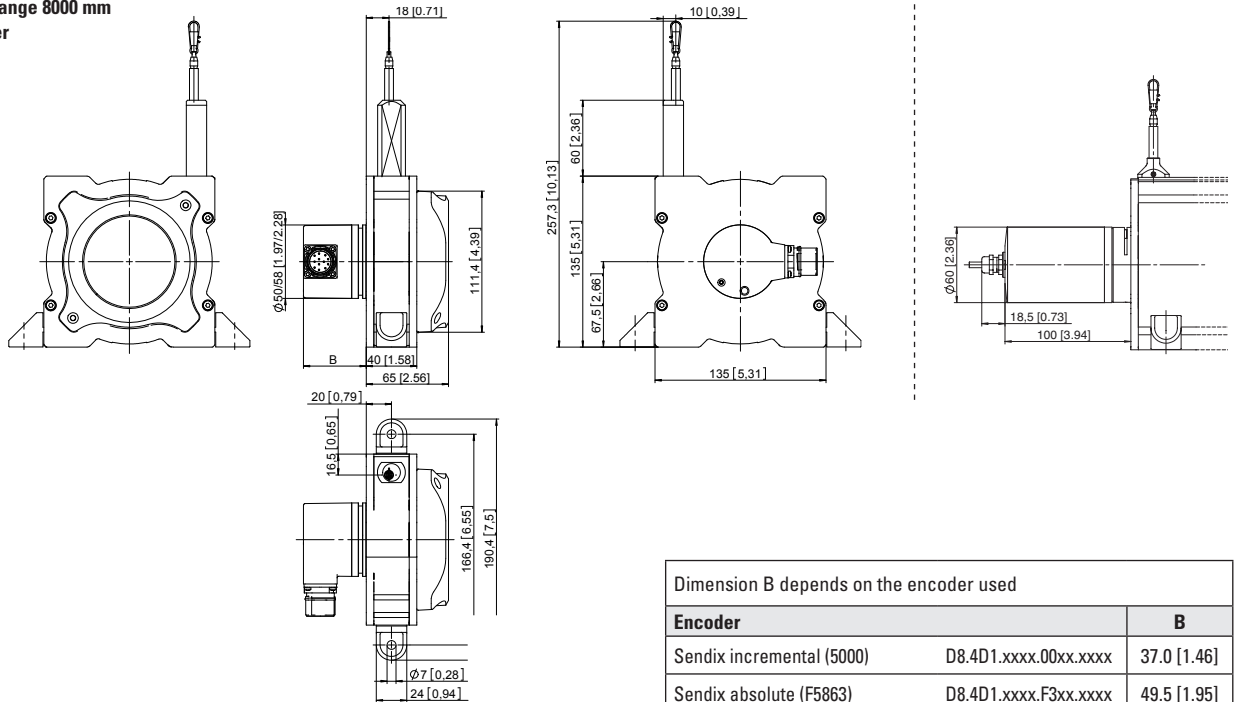
# Linear measuring technology

|  |                               |   |
|--|-------------------------------|---|
| <b>Draw wire mechanics with encoder or analog sensor</b> | <b>Draw wire encoder D135</b> | <b>Measuring length max. 42.5 m</b><br><b>Traverse speed max. 5 m/s</b> |
|--|-------------------------------|---|

## Dimensions

Dimensions in mm [inch]

**Draw wire mechanics, measuring range 8000 mm with encoder**



Dimension B depends on the encoder used

| Encoder                              |                       | B           |
|--------------------------------------|-----------------------|-------------|
| Sendix incremental (5000)            | D8.4D1.xxxx.00xx.xxxx | 37.0 [1.46] |
| Sendix absolute (F5863)              | D8.4D1.xxxx.F3xx.xxxx | 49.5 [1.95] |
| Sendix absolute (5863)               | D8.4D1.xxxx.63xx.xxxx | 49.5 [1.95] |
| Sendix absolute (F5868, CANopen)     | D8.4D1.xxxx.F8xx.21xx | 70.0 [2.76] |
| Sendix absolute (F5868, EtherNet/IP) | D8.4D1.xxxx.F8xx.A2xx | 59.5 [2.34] |
| Sendix absolute (5868)               | D8.4D1.xxxx.68xx.xxxx | 77.2 [3.04] |
| Sendix absolute (M586x)              | D8.4D1.xxxx.Mxxx.xxxx | 49.8 [1.96] |

Linear measuring technology

# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**

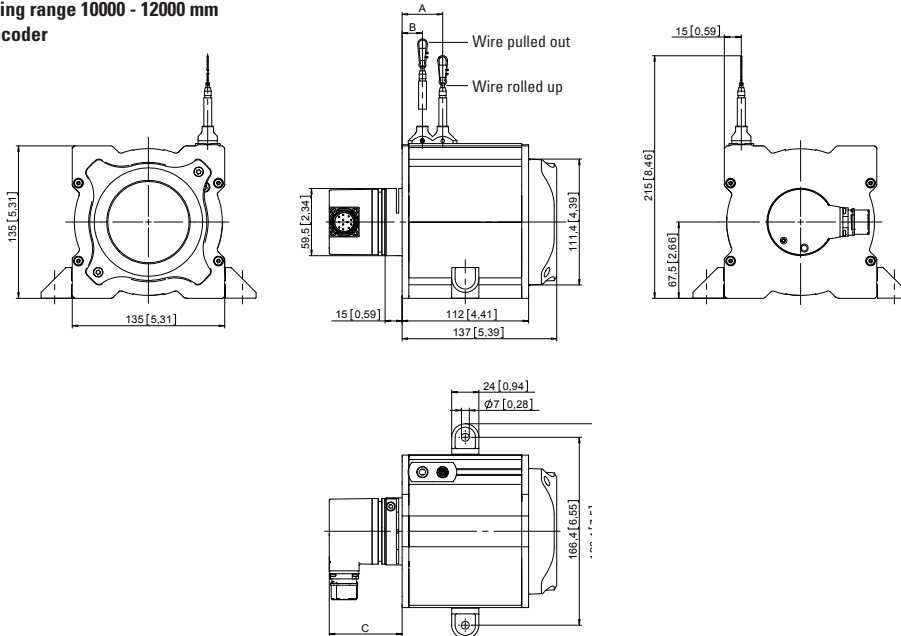
**Draw wire encoder D135**

**Measuring length max. 42.5 m  
Traverse speed max. 5 m/s**

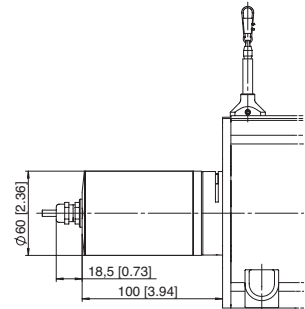
## Dimensions

Dimensions in mm [inch]

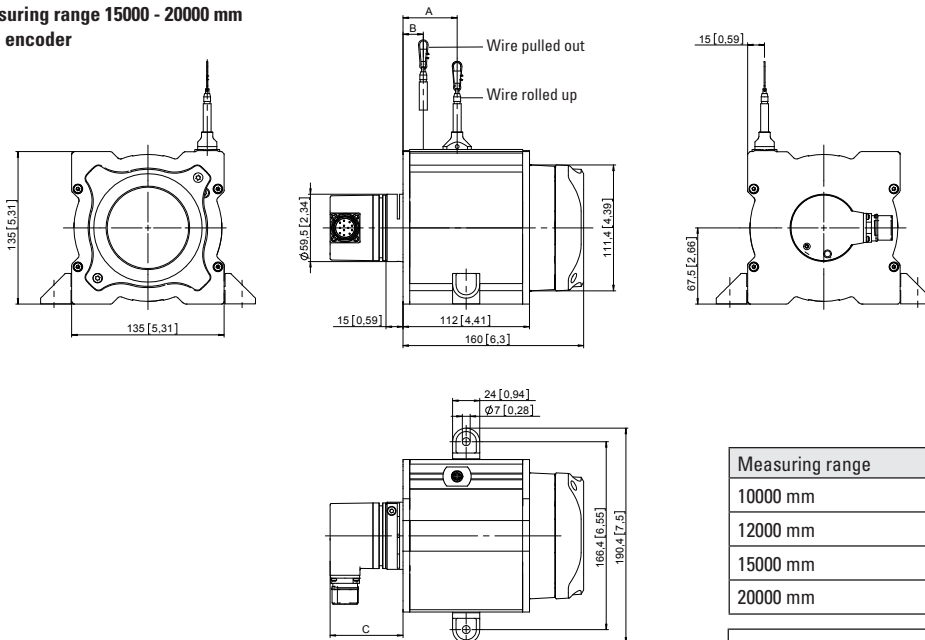
**Draw wire mechanics, measuring range 10000 - 12000 mm with encoder**



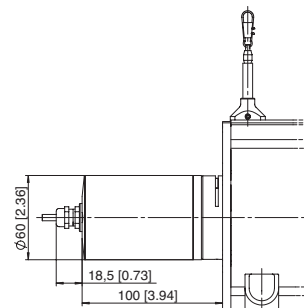
**with analog output**



**Draw wire mechanics, measuring range 15000 - 20000 mm with encoder**



**with analog output**



| Measuring range | A - Wire rolled up | B - Wire pulled out |
|-----------------|--------------------|---------------------|
| 10000 mm        | 33 [1.30]          | 18 [0.71]           |
| 12000 mm        | 36 [1.42]          | 18 [0.71]           |
| 15000 mm        | 41 [1.61]          | 18 [0.71]           |
| 20000 mm        | 48 [1.89]          | 18 [0.71]           |

| Dimension C depends on the encoder used |                       |              |
|---|-----------------------|--------------|
| Encoder                                 |                       | C            |
| Sendix incremental (5000)               | D8.4D1.xxxx.00xx.xxxx | 60.0 [2.36]  |
| Sendix absolute (F5863)                 | D8.4D1.xxxx.F3xx.xxxx | 72.5 [2.85]  |
| Sendix absolute (5863)                  | D8.4D1.xxxx.63xx.xxxx | 72.5 [2.85]  |
| Sendix absolute (F5868, CANopen)        | D8.4D1.xxxx.F8xx.21xx | 93.0 [3.66]  |
| Sendix absolute (F5868, EtherNet/IP)    | D8.4D1.xxxx.F8xx.A2xx | 82.5 [3.25]  |
| Sendix absolute (5868)                  | D8.4D1.xxxx.68xx.xxxx | 100.2 [3.94] |
| Sendix absolute (M586x)                 | D8.4D1.xxxx.Mxxx.xxxx | 72.8 [2.87]  |

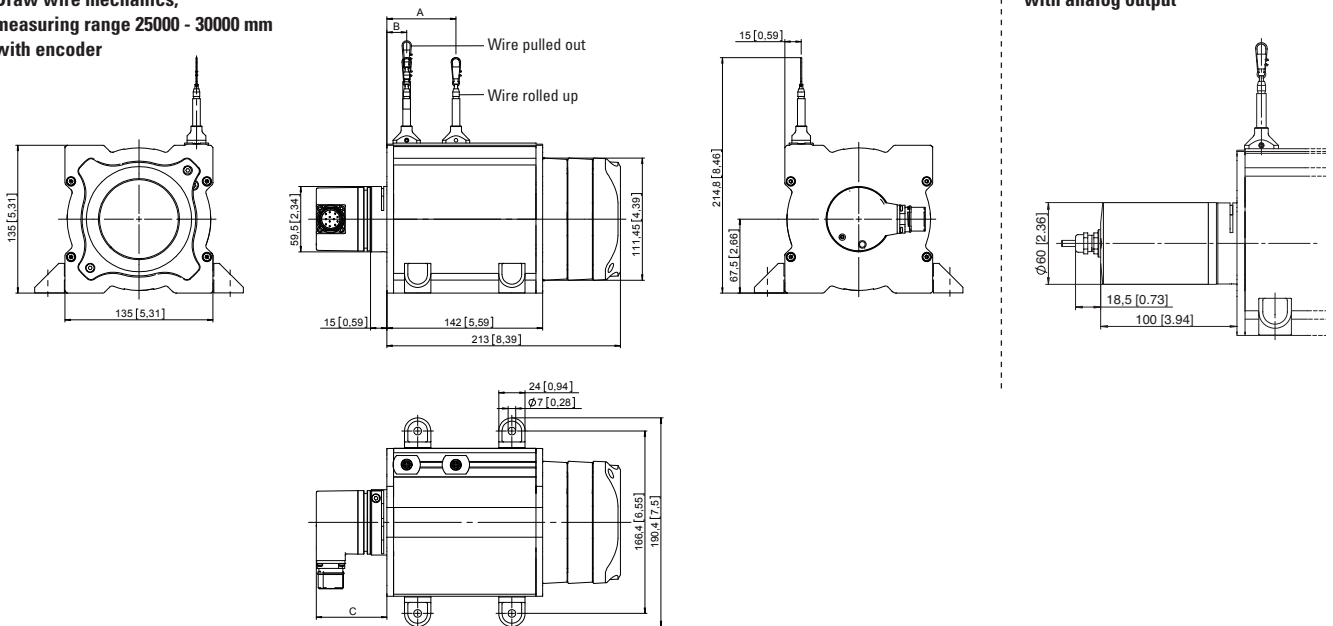
# Linear measuring technology

**Draw wire mechanics with encoder or analog sensor**      **Draw wire encoder D135**      **Measuring length max. 42.5 m**  
**Traverse speed max. 5 m/s**

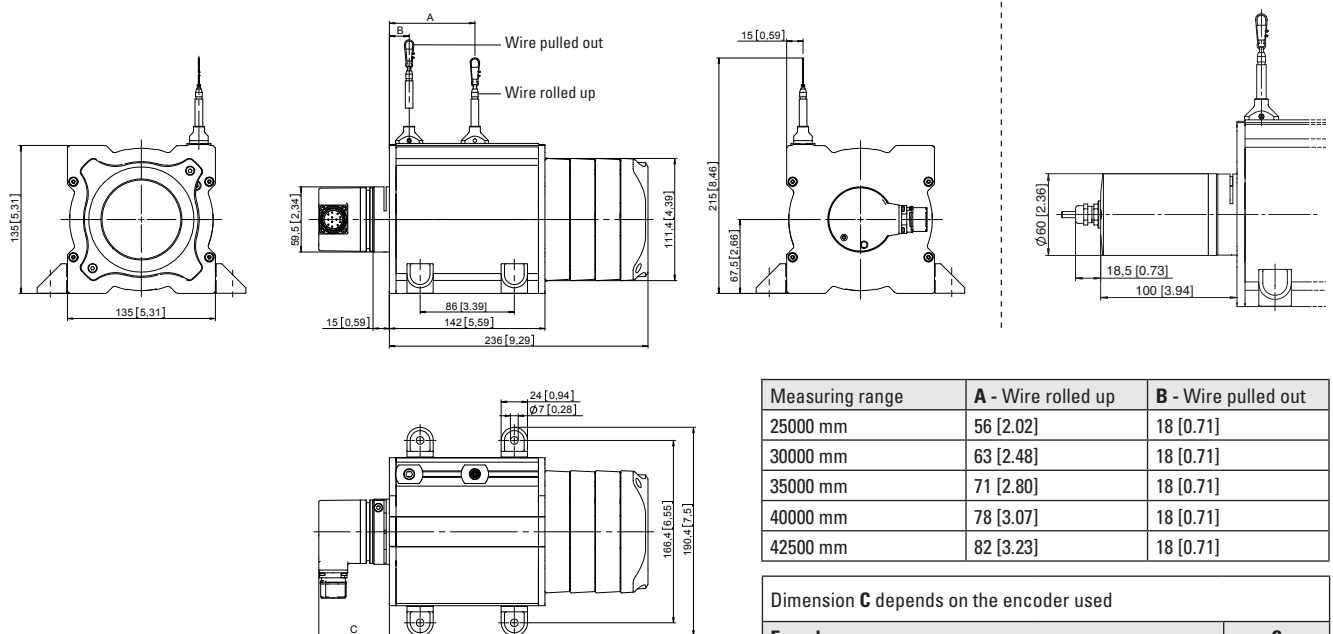
## Dimensions

Dimensions in mm [inch]

**Draw wire mechanics, measuring range 25000 - 30000 mm with encoder**



**Draw wire mechanics measuring range 35000 - 42500 mm with encoder**



| Measuring range | A - Wire rolled up | B - Wire pulled out |
|-----------------|--------------------|---------------------|
| 25000 mm        | 56 [2.02]          | 18 [0.71]           |
| 30000 mm        | 63 [2.48]          | 18 [0.71]           |
| 35000 mm        | 71 [2.80]          | 18 [0.71]           |
| 40000 mm        | 78 [3.07]          | 18 [0.71]           |
| 42500 mm        | 82 [3.23]          | 18 [0.71]           |

| Dimension C depends on the encoder used |                       |              |
|---|-----------------------|--------------|
| Encoder                                 |                       | C            |
| Sendix incremental (5000)               | D8.4D1.xxxx.00xx.xxxx | 60.0 [2.36]  |
| Sendix absolute (F5863)                 | D8.4D1.xxxx.F3xx.xxxx | 72.5 [2.85]  |
| Sendix absolute (5863)                  | D8.4D1.xxxx.63xx.xxxx | 72.5 [2.85]  |
| Sendix absolute (F5868, CANopen)        | D8.4D1.xxxx.F8xx.21xx | 93.0 [3.66]  |
| Sendix absolute (F5868, EtherNet/IP)    | D8.4D1.xxxx.F8xx.A2xx | 82.5 [3.25]  |
| Sendix absolute (5868)                  | D8.4D1.xxxx.68xx.xxxx | 100.2 [3.94] |
| Sendix absolute (M586x)                 | D8.4D1.xxxx.Mxxx.xxxx | 72.8 [2.87]  |

Linear measuring technology

# Linear measuring technology

|  |   |                         |
|--|---|-------------------------|
| <b>Lift measuring system for shaft-copying</b> | <b>Encoder mounting fixture, guided-belt, LM3</b> | <b>max. height 53 m</b> |
|--|---|-------------------------|



System for shaft-copying, with complete mechanical kit in proven toothed belt technology.

A smooth-running toothed belt and a vibration-resistant encoder mounting fixture ensure quiet operation. The belt pulley benefits from separate bearing supports in the mounting fixture, so protecting the installed encoder from mechanical overloading. With the guided-belt system, the encoder mounting fixture and the measuring wheels are located on the lift car.

Ideal for use in passenger lifts, freight lifts, automatic storage systems.

### Complete system

- Fast and easy installation with accessories from one single source.
- Reduced load on encoder bearings due to separate belt pulley-bearings.
- Non-slip.
- Tensioning rollers with belt guide.

### Minimal noise generation

- Smooth-running toothed-belt ensures extremely quiet operation.
- Vibration-free operation.

|                   |                 |
|-------------------|-----------------|
| <b>Order code</b> | <b>8.LM3.01</b> |
|-------------------|-----------------|

Encoder mounting fixture with measuring wheels for fixing on the lift car

Consists of:

- Encoder mounting fixture
- Mounted measuring wheel
- Belt guide
- Belt fixing and tensioning set
- Screws and other small components

Suitable encoders:

- Incremental encoder: 8.5000.83XX.XXXX

calculation of pulse rate ppr =

$$\frac{300 \text{ mm}}{\text{resolution, e.g. } 0.5 \text{ mm}} = 600$$

- Absolute encoders:

SSI: 8.5863.12XX.XXXX  
CANopen / CANopenLift: 8.5868.12XX.XXXX




# Linear measuring technology

|  |   |                         |
|--|---|-------------------------|
| <b>Elevator measuring system for shaft-copying</b> | <b>Encoder mounting fixture, guided-belt, LM3</b> | <b>max. height 53 m</b> |
|--|---|-------------------------|

|   |           |
|---|-----------|
| <b>Accessories for encoder mounting fixture LM3</b> | Order no. |
|---|-----------|

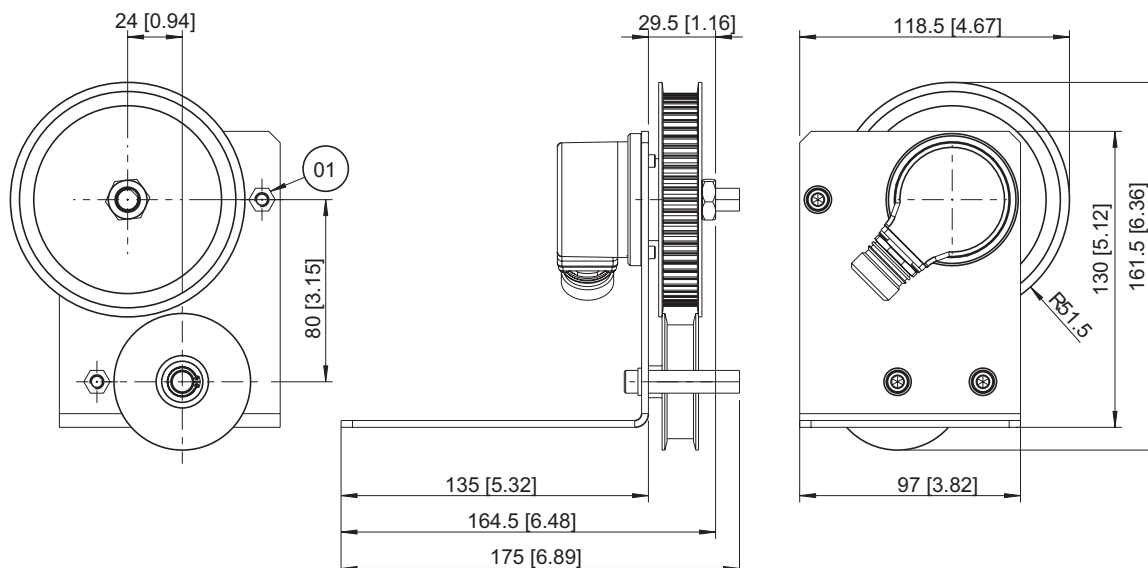
|                   |   |                  |
|-------------------|---|------------------|
| <b>Fixing kit</b> |  <p>Complete kit consists of:</p> <ul style="list-style-type: none"> <li>- C-rails, 700 mm</li> <li>- Bracket</li> <li>- Screws</li> <li>- Other small components</li> </ul> | <b>8.BLM2.01</b> |
|-------------------|---|------------------|

|                     |  |  |
|---------------------|--|--|
| <b>Toothed belt</b> |  <ul style="list-style-type: none"> <li>- Width 10 mm</li> <li>- Polyurethane, with single parallel steel cords</li> <li>- Low belt-stretch</li> <li>- High resistance to abrasive wear</li> <li>- Resistant to the effects of UV radiation</li> <li>- Maintenance-free</li> <li>- Resistant to ageing</li> <li>- Temperature range -10°C ... +80°C [+14°F ... +176°F]</li> </ul> <p>Calculation of the required length of toothed belt =<br/>Elevator height + approx. 5 m<br/>(depending on the distance between top and bottom fixing)</p> | <b>05.ZAR1.XXX</b><br><br><small>XXX = Length in meters<br/>Standard delivery lengths:<br/>20 m, 25 m, 30 m, 35 m, 40 m,<br/>45 m, 50 m, 55 m, 60 m, 70 m,<br/>80 m, 90 m, 100 m, 120 m,<br/>250 m, 300 m<br/>Other lengths on request</small> |
|---------------------|--|--|

| Technical data                                |  |
|---|--|
| <b>Resolution in the shaft</b>                | depends on the resolution of the encoder<br>(e.g. incremental encoder with 3000 ppr = 0.1 mm; absolute encoder 12 x 12 bit < 0.1 mm) |
| <b>Elevator car speed</b>                     | max. 1.6 m/s   |
| <b>Max. height of lift</b>                    | 53 m   |
| <b>Effective circumference of belt pulley</b> | 300 mm   |

## Dimensions

Dimensions in mm [inch]



# Linear measuring technology

|   |  |                    |
|---|--|--------------------|
| <b>Length measuring kit<br/>mini measurement system</b> | <b>Measuring wheel system, incl. encoder</b> | <b>Incremental</b> |
|---|--|--------------------|



Very compact mini measurement system with incremental interface.

### Easy to install

- The measuring wheel, the sensor and the fastening are pre-assembled and thus easy to install:  
fix – connect – ready-to-go.

### Compact construction

- Dimensions of the whole unit 74 x 50 x 52 mm.
- Measuring wheel circumference 100 mm.

**Order code**      **05.2400.0040.1000.50 XX**

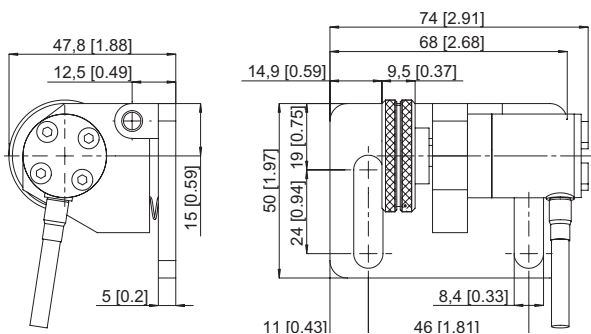
*Resolution*                      0.1 mm  
*Cable outlet*                      radial cable, 2 m [6.56'] PVC

**a** *Measuring wheel*  
45 = knurled aluminum  
49 = rubber, Shore hardness 60

| Technical data                     |                                |
|------------------------------------|--------------------------------|
| <b>Maximum speed</b>               | 2000 min <sup>-1</sup>         |
| <b>Protection acc. to EN 60529</b> | IP64                           |
| <b>Output circuit</b>              | Push-pull with inverted signal |
| <b>Power supply</b>                | 8 ... 30 V DC                  |
| <b>Current</b>                     | ≤ 20 mA                        |
| <b>Load channel max.</b>           | 20 mA                          |
| <b>Output frequency max.</b>       | ≥ 100 kHz                      |

### Dimensions

Dimensions in mm [inch]



# Linear measuring technology

|  |   |                               |
|--|---|-------------------------------|
| <b>Length measuring kit with rack and pinion</b> | <b>Rack system incl. encoder / preset counter</b> | <b>Incremental / absolute</b> |
|--|---|-------------------------------|



**Measuring system with mobile encoder holder, mounted on springs, (with rack and pinion) for an optimum contact pressure and protection of the encoder shaft.**

**Components suited optimally to each other. One rotation of the pinion corresponds to a movement of 50 mm.**

The holding device for the encoder (8.0010.7000.0004) is a movable support for encoders, to the shaft of which, for instance, a measuring wheel or pinion can be attached. Due to the fact that it is movable, optimum contact pressure is ensured and overload on the bearings of the encoder prevented.

When used in conjunction with a pulse generating unit, the rack and pinion combination (8.0010.7000.0001 and ...02) serves as a simple length and displacement measuring system. One rotation of the pinion on the rack corresponds to a displacement of 50 mm. Moreover the racks are designed in such a way that they can be butt-mounted without pitch error.

The absolute accuracy is 0.5 mm per meter. The resolution / repetition accuracy is 0.1 mm. Holding device, rack and pinion are available as a set for the purpose of displacement measurement (8.0010.7000.0005).

The installation aid (8.0010.7000.0003) is required to maintain exact pitch when butt-mounting racks.

Typical areas of application are:

- Wood working industry
- Textile industry
- Handling and automation technology
- Mechanical engineering / special machines

| Single components                               |   | Order no.  |
|---|---|--|
| <b>Flexible holding device for encoders</b>     | <b>Guide rods</b> stainless steel<br><b>Flange</b> Al   | <b>8.0010.7000.0004</b>                            |
| <b>Pinion for displacement measuring device</b> | <b>Material</b> free-cutting steel<br><b>Surface</b> burnished<br><b>Module pitch</b> approx. 1<br><b>No of teeth</b> 16<br><br>with bore diameter $\varnothing$ 6 mm [0.24"]<br>with bore diameter $\varnothing$ 10 mm [0.39"] | <b>8.0010.7000.0002</b><br><b>8.0010.7000.0006</b> |
| <b>Rack</b>                                     | <b>Material</b> S235JR<br><b>Surface</b> uncoated<br><b>Module pitch</b> approx. 1  | <b>8.0010.7000.0001</b>                            |
| <b>Installation aid</b>                         | <b>Material</b> S235JR<br><b>Surface</b> uncoated<br><b>Module pitch</b> approx. 1  | <b>8.0010.7000.0003</b>                            |
| <b>Encoder</b>                                  | Sendix 5000, for rack and pinion, 0.1 mm resolution   | <b>8.5000.8354.0500</b>                            |
| <b>Standard cordset</b>                         | with 2 m [6.56'] PVC cable, M12   | <b>05.00.6041.8211.002M</b>                        |
| <b>Preset counter</b>                           | 716 LED preset counter, 100 ... 240 V AC, 1 preset<br>923 LCD preset counter 100 ... 240 V AC, 1 preset   | <b>6.716.010.000</b><br><b>6.923.0100.000</b>      |

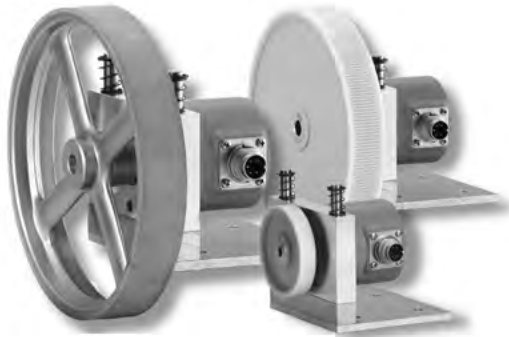
Linear measuring technology

# Linear measuring technology

**Length measuring kits with measuring wheel**

**Measuring wheelsystem incl. encoder / preset counter**

**Incremental / absolute**



The (metric) measuring kit is a complete solution for the quick and simple implementation of length measurements on products in movement.

## Flexible

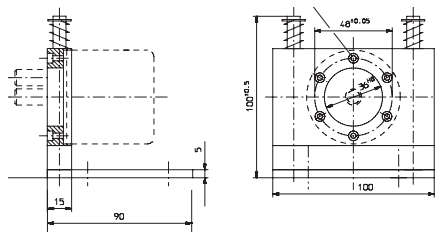
- Various measuring wheels for various applications:
  - Hytrel for the textile industry.
  - Vulkollan for the wood, paper, metal and plastics industry.
- Resolution 1 mm.

## Easy operation

- The encoder support ensures an optimal load on the encoder shaft.
- No additional power supply is required for the encoder, since it can be powered directly by the preset counter.

## Single components

### Flexible holding device for encoders



### Guide rods Flange

stainless steel  
Al

Order no.

**8.0010.7000.0004**

### Spring encoder arm

**8.0010.7000.0010**

### Measuring wheels

0.2 m measuring wheel, plastic corrugated  
0.5 m measuring wheel, plastic smooth  
0.5 m measuring wheel, plastic corrugated

**8.0000.3297.0010**

**8.0000.3547.0010**

**8.0000.3597.0010**

### Encoder

Sendix 5000 for 0.2 m measuring wheel, 1 mm resolution  
Sendix 5000 for 0.5 m measuring wheel, 1 mm resolution

**8.5000.8354.0200**

**8.5000.8354.0500**

### Standard cordset

with 2 m [6.56'] PVC cable, M12

**05.00.6041.8211.002M**

### Preset counter

716 LED preset counter, 100 ... 240 V AC, 1 preset

**6.716.010.000**



# Linear measuring technology

**Length measuring kits  
flexible fastening**

**Spring encoder arm**



### Robust and reliable

- Max. 40 N, adjustable spring pressure available in any position.
- Pressure for each notch appr. 20 N (first notch between 0 and appr. 20 N).
- Wide temperature range -40°C ... +120°C.

### Versatile

- Can be installed in any mounting position 8 setting positions in 45° steps.
- Base plate – variable in 4 directions.

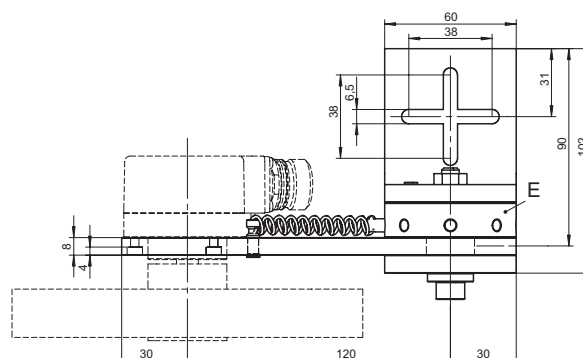
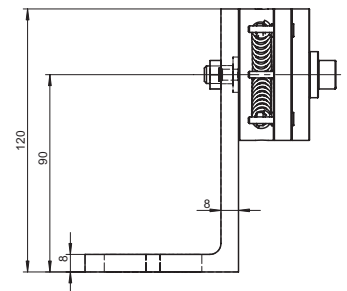
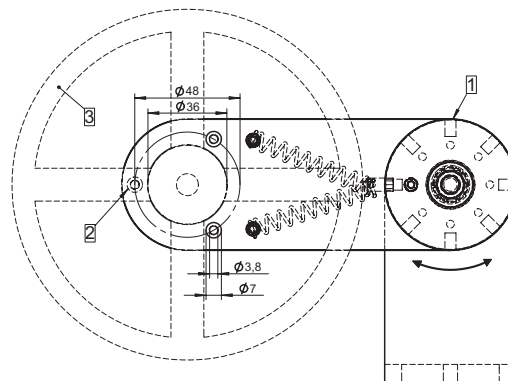
**Order code**

**8.0010.7000.0010**

### Dimensions

Dimensions in mm

- 1 Setting with a size 0 or 1 screwdriver
- 2 3 pcs. screws M3 x 8 DIN 912 included
- 3 Measuring wheel

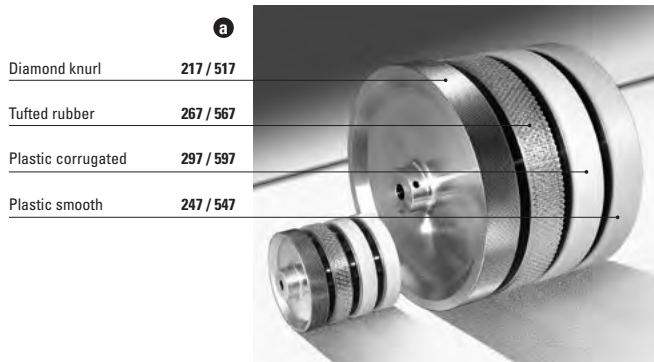


Linear measuring  
technology

# Linear measuring technology

## Length measuring kits measuring wheels

## Various wheel coatings



|                    |           |
|--------------------|-----------|
| Diamond knurl      | 217 / 517 |
| Tufted rubber      | 267 / 567 |
| Plastic corrugated | 297 / 597 |
| Plastic smooth     | 247 / 547 |

Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various tires to meet the requirements of the various surfaces of the product to be measured – various diameters, designed for use with Kübler encoders, available for metric and imperial systems.

### Selection of the measuring wheel profile according to the surface of the measured material

| Surface of the measured material              | Recommended profile no. |
|---|-------------------------|
| Cardboard                                     | 1, 2, 3, 4, 5           |
| Wood  | 1, 2, 3, 4, 5           |
| Textile                                       | 1, 2, 3, 4              |
| Plastic (e.g. PVC, PE, ...)                   | 2, 3, 4, 5              |
| Paper   | 2, 3, 4, 5              |
| Wire, greased metals, steel profiles, leather | 2                       |
| Carpet, cables, nonwoven                      | 3                       |
| Greased metals, glass, floor coverings        | 4                       |
| Painted surfaces                              | 2, 4                    |
| Rubber, soft plastic                          | 1                       |

Please note:

If a measuring wheel is mounted directly on the shaft of a rotary encoder, the pressure force between the measuring wheel and measured material should not exceed the radial shaft load listed in the data sheet of the encoder.

In addition, the measuring wheels can only be used for in-house purposes which are not subject to the stipulations of the German calibration code.

### Order code Measuring wheels

8.0000 . 3 XXX . 00 XX

| Measuring wheel<br>Circumference / $\phi$ / width                 | Profile<br>measuring<br>wheels<br>(see above) | Coating                           | Coating<br>hard-<br>ness<br>Shore A | Wheel<br>no.<br>a | Weight           | Standard<br>bore b 1)                   | Material<br>of wheel<br>body | Working<br>temperature                |
|---|---|-----------------------------------|-------------------------------------|-------------------|------------------|---|------------------------------|---------------------------------------|
| 0.2 m / $\phi$ 63.7 mm / 12 mm<br>[7.87" / $\phi$ 2.51" / 0.47"]  | 1   | diamond knurl (aluminum)          |                                     | 217               | 60 g [2.12 oz]   | 06 = 6 mm [0.24"]<br>10 = 10 mm [0.39"] | aluminum                     | -30°C ... +80°C<br>[-22°F ... +176°F] |
|   | 2   | plastic (polyurethane) smooth     | 90                                  | 247               | 60 g [2.12 oz]   |   |                              |                                       |
|   | 3   | tufted rubber (polyurethane)      | 60                                  | 267               | 60 g [2.12 oz]   |   |                              |                                       |
|   | 4   | plastic (polyurethane) corrugated | 90                                  | 297               | 60 g [2.12 oz]   |   |                              |                                       |
| 0.5 m / $\phi$ 159.2 mm / 25 mm<br>[19.69" / $\phi$ 6.27 / 0.98"] | 1   | diamond knurl (aluminum)          |                                     | 517               | 775 g [27.34 oz] | 10 = 10 mm [0.39"]                      | aluminum                     | -30°C ... +80°C<br>[-22°F ... +176°F] |
|   | 2   | plastic (polyurethane) smooth     | 90                                  | 547               | 700 g [24.69 oz] |   |                              |                                       |
|   | 3   | tufted rubber (polyurethane)      | 60                                  | 567               | 700 g [24.69 oz] |   |                              |                                       |
|   | 4   | plastic (polyurethane) corrugated | 90                                  | 597               | 700 g [24.69 oz] |   |                              |                                       |
| 12" / $\phi$ 3.82" / 0.38"  | 5   | natural rubber (NR) smooth        |                                     | 751               | 100 g [3.53 oz]  | 10 = 10 mm [0.39"]                      | aluminum                     | -30°C ... +80°C<br>[-22°F ... +176°F] |

1) Other bore diameters on request

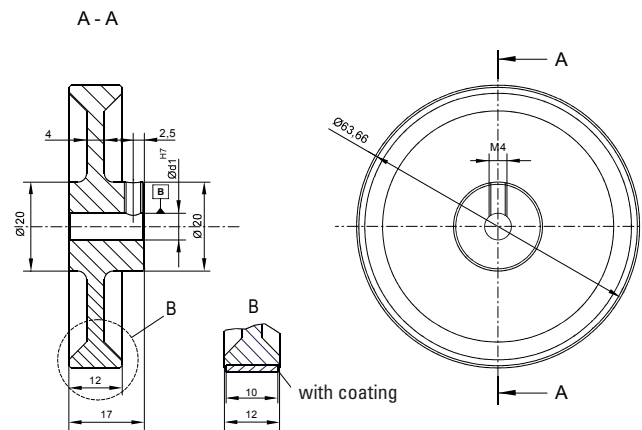
# Linear measuring technology

## Length measuring kits measuring wheels Various wheel coatings

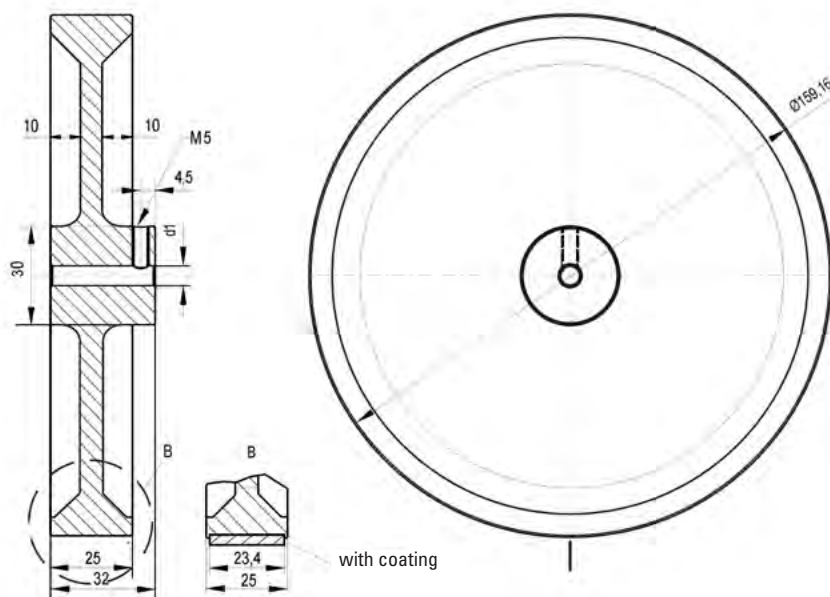
### Dimensions

Dimensions in mm [inch]

#### Measuring wheel no. 2XX



#### Measuring wheel no. 5XX



**Kübler** CE

Fritz Kübler GmbH  
Made in Germany  
www.kuebler.com

Type: 8.IN88.1721.123

10-30 VDC  $\approx$  70 mA

S-No.: 16131

**CANopen**


CAN\_0V 1  
+V 2  
0V 3  
CAN\_H 4  
CAN\_L 5



CAN\_0V 1  
+V 2  
0V 3  
CAN\_H 4  
CAN\_L 5



# Inclinometers

|   | Type   | Interface | Page       |
|---|--|-----------|------------|
| <b>Inclinometers, MEMS / capacitive</b> | IS40, 1-dimensional  | Analog    | <b>554</b> |
|   | IS40, 2-dimensional  | Analog    | <b>556</b> |
|   |  IN88, 1- and 2-dimensional | CANopen   | <b>558</b> |
|   | IS60, 1-dimensional  | CANopen   | <b>561</b> |
|   | IS60, 2-dimensional  | CANopen   | <b>563</b> |

# Inclinometers

|   |                            |               |
|---|----------------------------|---------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS40, 1-dimensional</b> | <b>Analog</b> |
|---|----------------------------|---------------|



With the IS40 inclinometer 1-dimensional inclinations in the measuring range 0 - 360° can be measured.  
The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.

|        |                       |                             |                             |
|--------|-----------------------|-----------------------------|-----------------------------|
|        |                       |                             |                             |
| Output | High protection level | Shock / vibration resistant | Reverse polarity protection |

### Innovative

- Rugged construction – high shock resistance.
- High resolution and accuracy.
- Current or voltage interface.
- Adjusting of the measuring range via teach adapter.

### Compact / Many applications

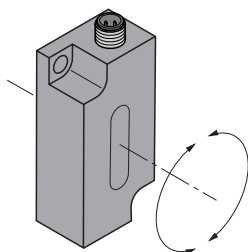
- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, cranes and hoists or in commercial vehicles.

|   |  |   |   |  |  |
|---|--|---|---|--|--|
| <b>Order code</b><br>Inclinometer IS40            | <b>8.IS40</b><br>Type                      | <b>. 1 4 X 2 1</b><br>a b c d e                               |   |  |  |
| <b>a</b> Measuring direction<br>1 = 1-dimensional | <b>b</b> Measuring range<br>4 = 0 ... 360° | <b>c</b> Interface<br>1 = 4 ... 20 mA<br>3 = 0.1 ... 4.9 V DC | <b>d</b> Power supply<br>2 = 10 ... 30 V DC | <b>e</b> Type of connection<br>1 = M12 connector |  |

| Accessories                                |  | Order no.                   |
|--|--|-----------------------------|
| <b>Teach adapter</b>                       | for inductive encoders, linear position, angle and ultrasonic sensors  | <b>05.TX40.1</b>            |
| Connection technology                      |  | Order no.                   |
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut, 5-pin<br>2 m [6.56'] PVC cable | <b>05.00.6081.2211.002M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut, 5-pin                          | <b>8.0000.5116.0000</b>     |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

### Direction of inclination



### Adjusting the measuring range via 05.TX40.1 teach adapter

- Setting the angular range in CW direction:
  - Move sensor to start position
  - Press and hold Teach-GND until the output is set to < 4 mA / 0.1 V (approx. 1 s)
  - Move sensor to end position
  - Press and hold Teach-GND until the output is set to 20 mA / 4.9 V (approx. 3 s)
- Resetting the angular range:
  - Press and hold Teach-GND until the output is set to 12 mA (approx. 6 s)
  - The angular range is reset to 360°



# Inclinometers

|   |                            |               |
|---|----------------------------|---------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS40, 1-dimensional</b> | <b>Analog</b> |
|---|----------------------------|---------------|

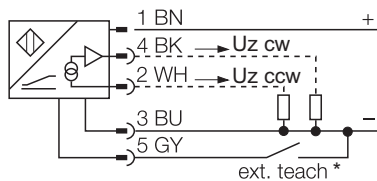
## Technical data

| Mechanical characteristics         |                                       |
|------------------------------------|---------------------------------------|
| <b>Connection</b>                  | M12 connector                         |
| <b>Weight</b>                      | 50 g [1.76 oz]                        |
| <b>Protection acc. to EN 60529</b> | IP68 / IP69k                          |
| <b>Working temperature range</b>   | -30°C ... +70°C [-22°F ... +158°F]    |
| <b>Material</b>                    | plastic PBT-GF20-V0                   |
| <b>Shock resistance</b>            | 300 m/s <sup>2</sup> , 11 ms          |
| <b>Vibration resistance</b>        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz |
| <b>Dimensions</b>                  | 60 x 30 x 20 mm [2.36 x 1.18 x 0.79"] |

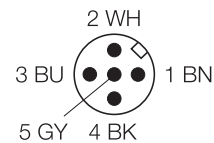
| Interface characteristics              |   |
|--|---|
| <b>Voltage output</b>                  | 0.1 ... 4.9 V DC<br>short-circuit protected to +V |
| <b>Load resistance voltage output</b>  | ≥ 40 kΩ   |
| <b>Output impedance voltage output</b> | 99 ... 105 Ω                                      |
| <b>Current output</b>                  | 4 ... 20 mA                                       |
| <b>Load resistance current output</b>  | ≤ 200 Ω   |

| Electrical characteristics         |   |
|------------------------------------|---|
| <b>Power supply</b>                | 10 ... 30 V DC  |
| <b>Power consumption</b>           | 50 ... 105 mA (depending on voltage)                                      |
| <b>Reverse polarity protection</b> | yes   |
| <b>Measuring axes</b>              | 1   |
| <b>Measuring range</b>             | 0 ... 360°  |
| <b>Resolution</b>                  | ≤ 0.14°   |
| <b>Repeat accuracy</b>             | ≤ 0.2 % of measuring range<br>≤ 0.1 % after a warm-up period<br>of 30 min |
| <b>Temperature drift</b>           | 0.03°/K   |
| <b>Reaction time</b>               | 0.1 s – Time that the output signal<br>requires to reach 90 % full scale  |
| <b>CE compliant acc. to</b>        | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU                     |

### Connections



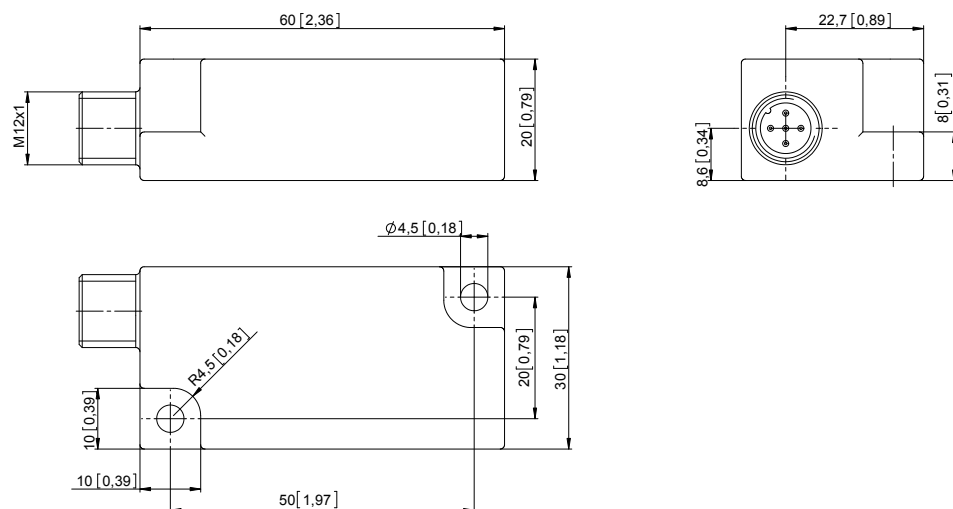
### Terminal assignment



\*) Teach adapter, accessory (Order no. 05.TX40.1)

### Dimensions

Dimensions in mm [inch]





# Inclinometers

**Inclinometer  
MEMS / capacitive**

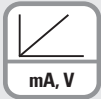
**IS40, 2-dimensional**

**Analog**



The inclinometer IS40 permits 2-dimensional inclinations to be measured.

Versions are available for the measuring ranges  $\pm 10^\circ$ ,  $\pm 45^\circ$  or  $\pm 60^\circ$ . The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.



Output



High protection level



Shock / vibration resistant



Reverse polarity protection

## Innovative

- Rugged construction.
- High resolution and accuracy.
- Current or voltage interface.
- High shock resistance.
- Zero point adjustment.

## Compact / Many applications

- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, commercial vehicles, cranes and hoists.

## Order code Inclinometer IS40

**8.IS40 . 2XXX1**  
Type

|   |  |   |   |  |
|---|--|---|---|--|
| <b>a</b> Measuring direction<br>2 = 2-dimensional x/y | <b>b</b> Measuring range<br>1 = $\pm 10^\circ$<br>2 = $\pm 45^\circ$<br>3 = $\pm 60^\circ$ | <b>c</b> Interface<br>1 = 4 ... 20 mA <sup>1)</sup><br>3 = 0.1 ... 4.9 V DC <sup>1)</sup><br>4 = ratiometric 2 % ... 98 % <sup>2)</sup> | <b>d</b> Power supply<br>1 = 5 V DC<br>2 = 10 ... 30 V DC | <b>e</b> Type of connection<br>1 = M12 connector |
|---|--|---|---|--|

## Connection technology

Order no.

### Cordset, pre-assembled

M12 female connector with coupling nut, 5-pin  
2 m [6.56'] PVC cable

**05.00.6081.2211.002M**

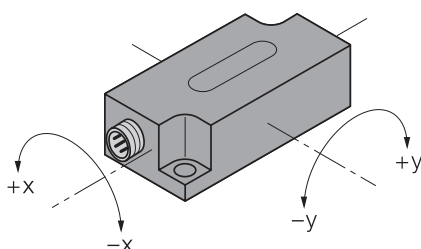
### Connector, self-assembly (straight)

M12 female connector with coupling nut, 5-pin

**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

## Direction of inclination



1) Available only in combination with power supply 10 ... 30 V DC  
2) In relation to the power supply 5 V DC (available only in combination with power supply 5 V DC)



# Inclinometers

|   |                            |               |
|---|----------------------------|---------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS40, 2-dimensional</b> | <b>Analog</b> |
|---|----------------------------|---------------|

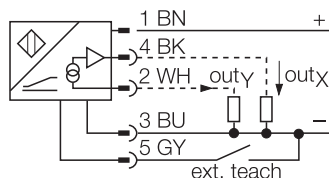
## Technical data

| Mechanical characteristics         |                                       |
|------------------------------------|---------------------------------------|
| <b>Connection</b>                  | M12 connector                         |
| <b>Weight</b>                      | 50 g [1.76 oz]                        |
| <b>Protection acc. to EN 60529</b> | IP68 / IP69k                          |
| <b>Working temperature range</b>   | -30°C ... +70°C [-22°F ... +158°F]    |
| <b>Material</b>                    | plastic PBT-GF20-V0                   |
| <b>Shock resistance</b>            | 300 m/s <sup>2</sup> , 11 ms          |
| <b>Vibration resistance</b>        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz |
| <b>Dimensions</b>                  | 60 x 30 x 20 mm [2.36 x 1.18 x 0.79"] |

| Interface characteristics              |   |
|--|---|
| <b>Voltage output</b>                  | at +V 10 ... 30 V DC 0.1 ... 4.9 V<br>short-circuit protected to +V<br>at +V 5 V DC 2 ... 98 %<br>ratiometric (in relation to +V) |
| <b>Load resistance voltage output</b>  | ≥ 40 kΩ   |
| <b>Output impedance voltage output</b> | 99 ... 105 Ω  |
| <b>Current output</b>                  | 4 ... 20 mA   |
| <b>Load resistance current output</b>  | ≤ 200 Ω   |

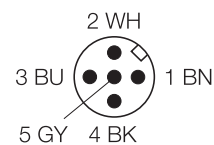
| Electrical characteristics         |  |
|------------------------------------|--|
| <b>Power supply</b>                | 5 V DC ±0.25 V or 10 ... 30 V DC (depending on version)  |
| <b>Power consumption (no load)</b> | ≤ 20 mA  |
| <b>Reverse polarity protection</b> | yes  |
| <b>Measuring axes</b>              | 2 (x/y)  |
| <b>Measuring range</b>             | ±10°, ±45°, ±60°   |
| <b>Resolution</b>                  | for version ±10° ≤ 0.05°<br>for version ±45° ≤ 0.1°<br>for version ±60° ≤ 0.15°                                  |
| <b>Repeat accuracy</b>             | ≤ 0.2 % of measuring range<br>≤ 0.1 % after a warm-up period of 30 min   |
| <b>Absolute accuracy</b>           | for version ±10° 0.3°<br>for version ±45° and ±60° 0.5°  |
| <b>Cross sensitivity</b>           | 3 %  |
| <b>Temperature drift</b>           | for version ±10° typ. 0.01°/K<br>for version ±45° and ±60° 0.03°/K   |
| <b>Reaction time</b>               | 0.1 s – time that the output signal requires to reach 90 % full scale, if the angle is changed from -60° to +60° |
| <b>Zero point adjustment</b>       | for version ±10° ±5°<br>for version ±45° and ±60° ±15°   |
| <b>CE compliant acc. to</b>        | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |

### Connections



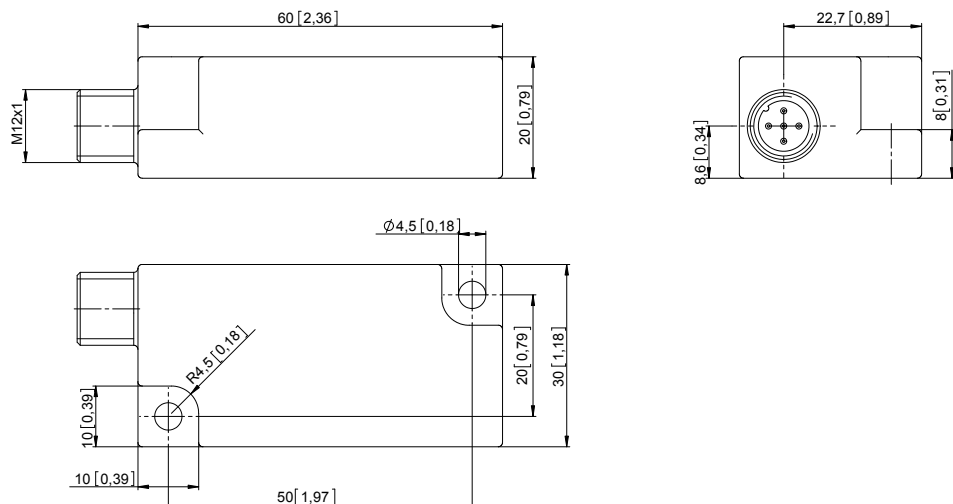
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

### Terminal assignment



### Dimensions

Dimensions in mm [inch]



# Inclinometers

**Inclinometer  
MEMS / capacitive**

**IN88, 1- and 2-dimensional**

**CANopen**



The inclinometers of the IN88 series allow measuring 2-dimensional inclinations in the range of  $\pm 85^\circ$  or 1-dimensional inclinations up to  $360^\circ$ .

With their high robustness, their protection level up to max. IP69k and their wide temperature range from  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , these devices are ideally suitable for outdoor use – e.g. for mobile automation applications.



High protection level



Shock / vibration resistant



Reverse polarity protection



Redundancy

## Robust

- High protection rating IP67 and IP69k in one device.
- Stable accuracy over a wide temperature range from  $-40^\circ\text{C}$  up to  $+85^\circ\text{C}$ .
- High shock resistance up to 100 g and vibration resistance up to 10 g.

## Versatile

- Parameterizable filter.
- Measuring direction 1- or 2-dimensional.
- With 1 x M12 connector or 2 x M12-connector.
- Stacked installation possible for redundancy.

**Order code  
Inclinometer IN88**

8.IN88 . XX21 . 12X  
Type      a b c      d e

**a** Measuring direction  
1 = 1-dimensional  
2 = 2-dimensional

**b** Measuring range  
6 =  $\pm 85^\circ$  <sup>1)</sup>  
7 =  $0^\circ \dots 360^\circ$  <sup>2)</sup>

**c** Interface  
2 = CANopen DS410

**d** Power supply  
2 = 10 ... 30 V DC

**e** Type of connection  
1 = 1 x M12 connector, 5-pin  
3 = 2 x M12 connector, 5-pin

## Connection technology

Order no.

### Cordset, pre-assembled

M12 female connector with coupling nut for Bus in, 5-pin  
5 m [16.40'] PVC cable

05.00.6021.2211.005M

M12 male connector with external thread for Bus out, 5-pin  
5 m [16.40'] PVC cable

05.00.6021.2411.005M

### Connector, self-assembly (straight)

M12 female connector with coupling nut for Bus in, 5-pin

05.B-8151-0/9

M12 male connector with external thread for Bus out, 5-pin

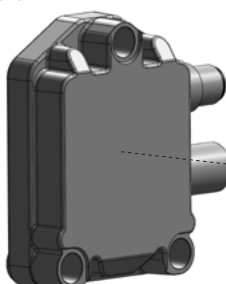
05.BS-8151-0/9

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)

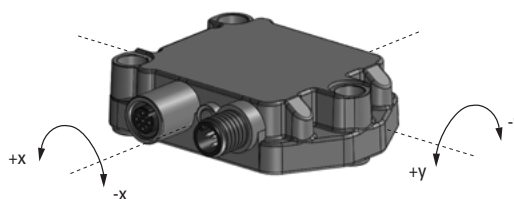
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

## Direction of inclination

1-dimensional



2-dimensional



1) Can only be ordered in conjunction with measuring direction 2-dimensional.  
2) Can only be ordered in conjunction with measuring direction 1-dimensional.

|   |                                   |                |
|---|-----------------------------------|----------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IN88, 1- and 2-dimensional</b> | <b>CANopen</b> |
|---|-----------------------------------|----------------|

## Technical data

| General electrical characteristics                             |  |
|--|--|
| <b>Power supply</b>  | 10 ... 30 V DC   |
| <b>Power consumption</b>                                       | max. 70 mA   |
| <b>Reverse polarity protection</b>                             | yes  |
| <b>Measuring axes</b>  | 1 or 2   |
| <b>Measuring range</b>   | 1-dimensional 360°, no limit stop<br>2-dimensional ±85°  |
| <b>Resolution</b>  | 0.01°  |
| <b>Absolute accuracy (at 25°C)</b>                             | ±0.4°  |
| <b>Transverse sensitivity <sup>1)</sup></b>                    | max. ±0.5°   |
| <b>Repeat accuracy</b>   | ±0.2°  |
| <b>Temperature drift</b>                                       | typ. ±0,006°/K   |
| <b>Sampling rate</b>   | 50 Hz (20 ms)  |
| <b>Limit frequency</b> with Butterworth filter factory setting | 0.1 ... 20 Hz, 8th order<br>typ. 10 Hz   |
| <b>CE compliant</b> acc. to                                    | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU  |
| Harmonized standards   |  |
| DIN EN 61326-1   | Electrical equipment for measurement, control and laboratory use   |
| DIN EN 61000-6-2   | Immunity for industrial environments   |
| DIN EN 61000-6-3   | Emitted interferences for residential environments   |
| DIN EN ISO 14982   | Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria |
| DIN EN 13309   | Construction machinery - Electromagnetic compatibility of machines with internal power supply            |

| Mechanical characteristics         |  |
|------------------------------------|--|
| <b>Connection CAN</b>              | 1 x M12 connector 5-pin, male connector<br>2 x M12 connector 5-pin, male connector / 5-pin, female connector |
| <b>Weight</b>                      | approx. 185 g  |
| <b>Protection</b> acc. to EN 60529 | IP67 / IP69k   |
| <b>Working temperature range</b>   | -40°C ... +85°C [-40°F ... +185°F]   |
| <b>Material</b> housing            | Aluminium  |
| <b>Shock resistance</b>            | 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance</b>        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz  |
| <b>Dimensions</b>                  | 80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]  |

A full description of the technical data can be found in the relevant product manual at [www.kuebler.com](http://www.kuebler.com).

1) Only for 2-dimensional measuring direction.

| Interface characteristics CANopen |  |
|-----------------------------------|--|
| <b>Code</b>                       | binary   |
| <b>Interface</b>                  | CAN high-speed acc. to ISO 11898, Basic- and Full-CAN<br>CAN specification 2.0 B                                   |
| <b>Protocol</b>                   | CANopen profile DS406 V3.2 with manufacturer-specific add-ons, communication profile DS301 V4.2.0                  |
| <b>Baud rate</b>                  | 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s<br>software configurable |
| <b>Node address</b>               | 1 ... 127<br>software configurable   |
| <b>Termination switchable</b>     | software configurable  |
| <b>LSS protocol</b>               | DS305 layer setting services 2.2   |

### General information on CANopen

The CANopen inclinometers support the latest CANopen communications profile according to DS301. In addition, device-specific profiles such as the inclinometer profile DS410 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values and many other additional parameters can be programmed via the CAN bus. When switching the appliance on, all parameters are loaded from a flash memory. These parameters have previously been stored in a zero-voltage secure manner. The output values **position, position raw value, sensor temperature and sensor information** can be combined very variably as a PDO (PDO mapping). The inclinometers are available with one or two connectors.

The device address and baud rate can be set/modified by means of the software.

The two-color LED indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

### LSS layer setting services DS305 V2.2

- Global command support for node address and baud rate configuration.
- Selective protocol via identity object (1018h).

### CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated (Class C2 functionality):

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping, 2 sending PDO's.
- Node address, baud rate and programmable CANbus termination.

### CANopen inclinometer profile DS410 V1.3.0

The following parameters can be programmed:

- Variable PDO mapping of position, position raw value, sensor temperature and sensor information.
- Extended failure management.
- User interface with visual display of bus and failure status - 1 LED two-color.
- Customer-specific protocol.
- "Watchdog controlled" device.

# Inclinometers

|   |                                   |                |
|---|-----------------------------------|----------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IN88, 1- and 2-dimensional</b> | <b>CANopen</b> |
|---|-----------------------------------|----------------|

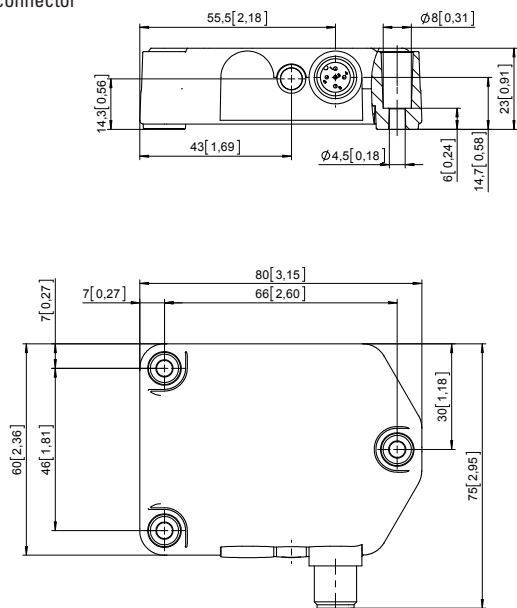
## Terminal assignment

| Interface | Type of connection | 1 x M12 connector, 5-pin |    |     |         |       |  |       |
|-----------|--------------------|--------------------------|----|-----|---------|-------|--|-------|
| 2         | 1                  | Bus IN                   |    |     |         |       |  |       |
|           |                    | Signal:                  | +V | 0 V | CAN_GND | CAN_H |  | CAN_L |
|           |                    | Pin:                     | 2  | 3   | 1       | 4     |  | 5     |
| Interface | Type of connection | 2 x M12 connector, 5-pin |    |     |         |       |  |       |
| 2         | 3                  | Bus OUT                  |    |     |         |       |  |       |
|           |                    | Signal:                  | +V | 0 V | CAN_GND | CAN_H |  | CAN_L |
|           |                    | Pin:                     | 2  | 3   | 1       | 4     |  | 5     |
|           |                    | Bus IN                   |    |     |         |       |  |       |
|           |                    | Signal:                  | +V | 0 V | CAN_GND | CAN_H |  | CAN_L |
|           |                    | Pin:                     | 2  | 3   | 1       | 4     |  | 5     |

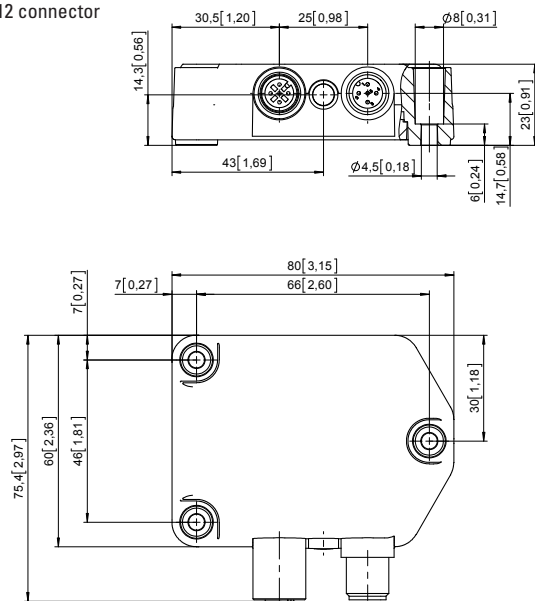
## Dimensions

Dimensions in mm [inch]

1 x M12 connector



2 x M12 connector



# Inclinometers

|   |                            |                |
|---|----------------------------|----------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS60, 1-dimensional</b> | <b>CANopen</b> |
|---|----------------------------|----------------|



With the IS60 inclinometer 1-dimensional inclinations in the measuring range 360° can be measured.  
The sensor has a standardized CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.



High protection level



Shock / vibration resistant



Reverse polarity protection

### Robust and reliable

- Protection rating IP68/IP69k.
- Robust plastic housing.
- High shock resistance.

### User-friendly and accurate

- High resolution and accuracy.
- Programmable vibration suppression.
- High sampling rate and bandwidth.

### Order code Inclinometer IS60

**8.IS60** . **14523**  
Type      a b c d e

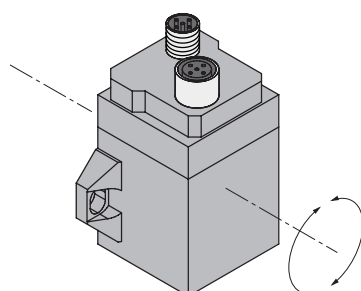
**Attention:**  
This is not a standard product. Delivery on request.  
Min. order quantity / frame order required.

- a** Measuring direction  
1 = 1-dimensional
- b** Measuring range  
4 = 360°
- c** Interface  
5 = CANopen
- d** Power supply  
2 = 10 ... 30 V DC
- e** Type of connection  
3 = 2 x M12 connector

| Connection technology                      |  | Order no.                   |
|--|--|-----------------------------|
| <b>Cordset, pre-assembled</b>              | M12 female connector with coupling nut for Bus in, 5-pin<br>5 m [16.40'] PVC cable   | <b>05.00.6021.2211.005M</b> |
|  | M12 male connector with external thread for Bus out, 5-pin<br>5 m [16.40'] PVC cable | <b>05.00.6021.2411.005M</b> |
| <b>Connector, self-assembly (straight)</b> | M12 female connector with coupling nut for Bus in, 5-pin                             | <b>05.B-8151-0/9</b>        |
|  | M12 male connector with external thread for Bus out, 5-pin                           | <b>05.BS-8151-0/9</b>       |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

### Direction of inclination



# Inclinometers

**Inclinometer  
MEMS / capacitive**

**IS60, 1-dimensional**

**CANopen**

## Technical data

### Mechanical characteristics

|                                    |   |
|------------------------------------|---|
| <b>Connection CAN</b>              | M12 connector, 5-pin                      |
| <b>Weight</b>                      | approx. 0.2 kg [7.06 oz]                  |
| <b>Protection acc. to EN 60529</b> | IP68 / IP69k                              |
| <b>Working temperature range</b>   | -40°C ... +80°C [-40°F ... +176°F]        |
| <b>Material</b>                    | plastic PA12-GF30                         |
| <b>Shock resistance</b>            | 300 m/s <sup>2</sup> , 11 ms              |
| <b>Vibration resistance</b>        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz     |
| <b>Dimensions</b>                  | 68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"] |

### Interface characteristics CANopen

|                   |   |
|-------------------|---|
| <b>Interface</b>  | CANopen according to CiA DS-301, Profile to CiA DSP-410   |
| <b>Data rates</b> | 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s   |
| <b>Functions</b>  | TPDO (RTR, cyclic, event-driven, synchronized), parametrization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding |

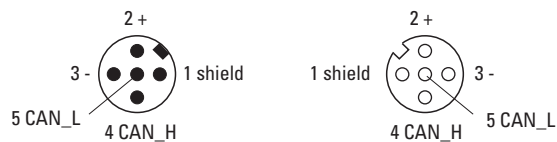
### General electrical characteristics

|                                       |   |
|---------------------------------------|---|
| <b>Power supply</b>                   | 10 ... 30 V DC  |
| <b>Power consumption</b>              | 40 ... 105 mA   |
| <b>Reverse polarity protection</b>    | yes   |
| <b>Measuring axes</b>                 | 1   |
| <b>Measuring range</b>                | 360°, no limit stop                                   |
| <b>Resolution</b>                     | 0.1°  |
| <b>Linearity deviation</b>            | max. ±0.4°  |
| <b>Calibration accuracy (at 25°C)</b> | ±0.1° (Zero point and final values)                   |
| <b>Temperature drift (Zero point)</b> | typ. ±0.008°/K  |
| <b>Sampling rate</b>                  | 100 Hz  |
| <b>CE compliant acc. to</b>           | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

A full description of the technical data can be found in the relevant product manual at [www.kuebler.com](http://www.kuebler.com).

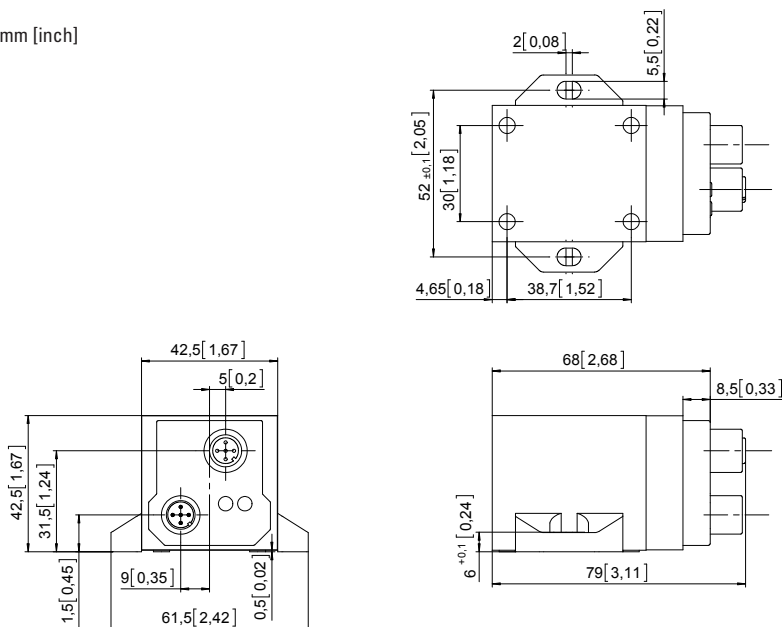
## Terminal assignment

| PIN | Signal   | Assignment                |
|-----|----------|---------------------------|
| 1   | CAN_SHLD | Shield                    |
| 2   | CAN V+   | Supply voltage (+24 V DC) |
| 3   | CAN_GND  | 0 V                       |
| 4   | CAN_H    | CAN_H Bus cable           |
| 5   | CAN_L    | CAN_L-Bus cable           |



## Dimensions

Dimensions in mm [inch]



# Inclinometers

|   |                            |                |
|---|----------------------------|----------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS60, 2-dimensional</b> | <b>CANopen</b> |
|---|----------------------------|----------------|



The inclinometer IS60 permits 2-dimensional inclinations to be measured. Versions are available for the measuring ranges  $\pm 10^\circ$ ,  $\pm 45^\circ$  or  $\pm 60^\circ$ .

The sensor has a standardized CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

Can be supplied with customer-specific parametrization.



High protection level



Shock / vibration resistant



Reverse polarity protection

### Robust and reliable

- Protection rating IP68 / IP69k.
- Robust plastic housing.
- High shock resistance.

### User-friendly and accurate

- High resolution and accuracy.
- Programmable vibration suppression.
- High sampling rate and bandwidth.

### Order code Inclinometer IS60

**8.IS60** . **2X523**  
Type      a b c d e

**a** Measuring direction  
2 = 2-dimensional x/y

**b** Measuring range  
1 =  $\pm 10^\circ$   
2 =  $\pm 45^\circ$   
3 =  $\pm 60^\circ$

**c** Interface  
5 = CANopen

**d** Power supply  
2 = 10 ... 30 V DC

**e** Type of connection  
3 = 2 x M12 connector

### Connection technology

Order no.

#### Cordset, pre-assembled

M12 female connector with coupling nut for Bus in, 5-pin  
5 m [16.40'] PVC cable

**05.00.6021.2211.005M**

M12 male connector with external thread for Bus out, 5-pin  
5 m [16.40'] PVC cable

**05.00.6021.2411.005M**

#### Connector, self-assembly (straight)

M12 female connector with coupling nut for Bus in, 5-pin

**05.B-8151-0/9**

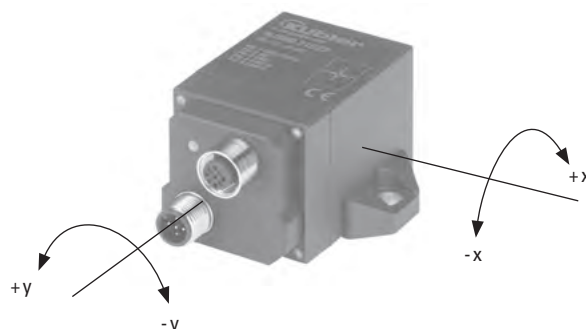
M12 male connector with external thread for Bus out, 5-pin

**05.BS-8151-0/9**

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology)

### Direction of inclination



# Inclinometers

|   |                            |                |
|---|----------------------------|----------------|
| <b>Inclinometer<br/>MEMS / capacitive</b> | <b>IS60, 2-dimensional</b> | <b>CANopen</b> |
|---|----------------------------|----------------|

## Technical data

| Mechanical characteristics         |   |
|------------------------------------|---|
| <b>Connection CAN</b>              | M12 connector, 5-pin                      |
| <b>Weight</b>                      | approx. 0.2 kg [7.06 oz]                  |
| <b>Protection acc. to EN 60529</b> | IP68 / IP69k                              |
| <b>Working temperature range</b>   | -40°C ... +80°C [-40°F ... +176°F]        |
| <b>Material</b>                    | plastic PA12-GF30                         |
| <b>Shock resistance</b>            | 300 m/s <sup>2</sup> , 11 ms              |
| <b>Vibration resistance</b>        | 100 m/s <sup>2</sup> , 10 ... 2000 Hz     |
| <b>Dimensions</b>                  | 68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"] |

| Interface characteristics CANopen |  |
|-----------------------------------|--|
| <b>Interface</b>                  | CANopen according to CiA DS-301, Profile to CiA DSP-410  |
| <b>Data rates</b>                 | 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s  |
| <b>Functions</b>                  | TPDO (RTR, cyclic, event-driven, synchronized), parameterization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding |
| <b>Note ID</b>                    | 1 ... 127  |

| Electrical characteristics                   |   |
|--|---|
| <b>Power supply</b>                          | 10 ... 30 V DC  |
| <b>Power consumption (no load)</b>           | 40 ... 105 mA   |
| <b>Reverse polarity protection</b>           | yes   |
| <b>Measuring axes</b>                        | 2 (x/y)   |
| <b>Measuring range</b>                       | ±10°, ±45°, ±60°                                      |
| <b>Resolution</b>                            | 0.1°  |
| <b>Linearity deviation</b>                   | max. ±0.4°  |
| <b>Calibration accuracy – at 25°C [77°F]</b> | ±0.1° (Zero point and final values)                   |
| <b>Temperature drift (Zero point)</b>        | typ. ±0.008°/K  |
| <b>Sampling rate</b>                         | 100 Hz  |
| <b>CE compliant acc. to</b>                  | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

A full description of the technical data can be found in the relevant product manual at [www.kuebler.com](http://www.kuebler.com).

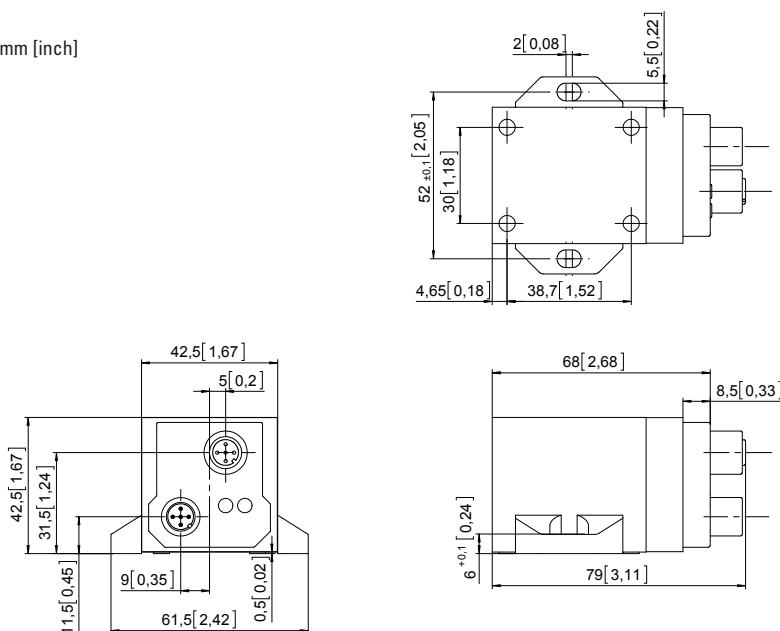
### Terminal assignment

| PIN | Signal   | Assignment              |
|-----|----------|-------------------------|
| 1   | CAN_SHLD | Shield                  |
| 2   | CAN V+   | Power supply (+24 V DC) |
| 3   | CAN_GND  | 0 V                     |
| 4   | CAN_H    | CAN_H Bus cable         |
| 5   | CAN_L    | CAN_L Bus cable         |



### Dimensions

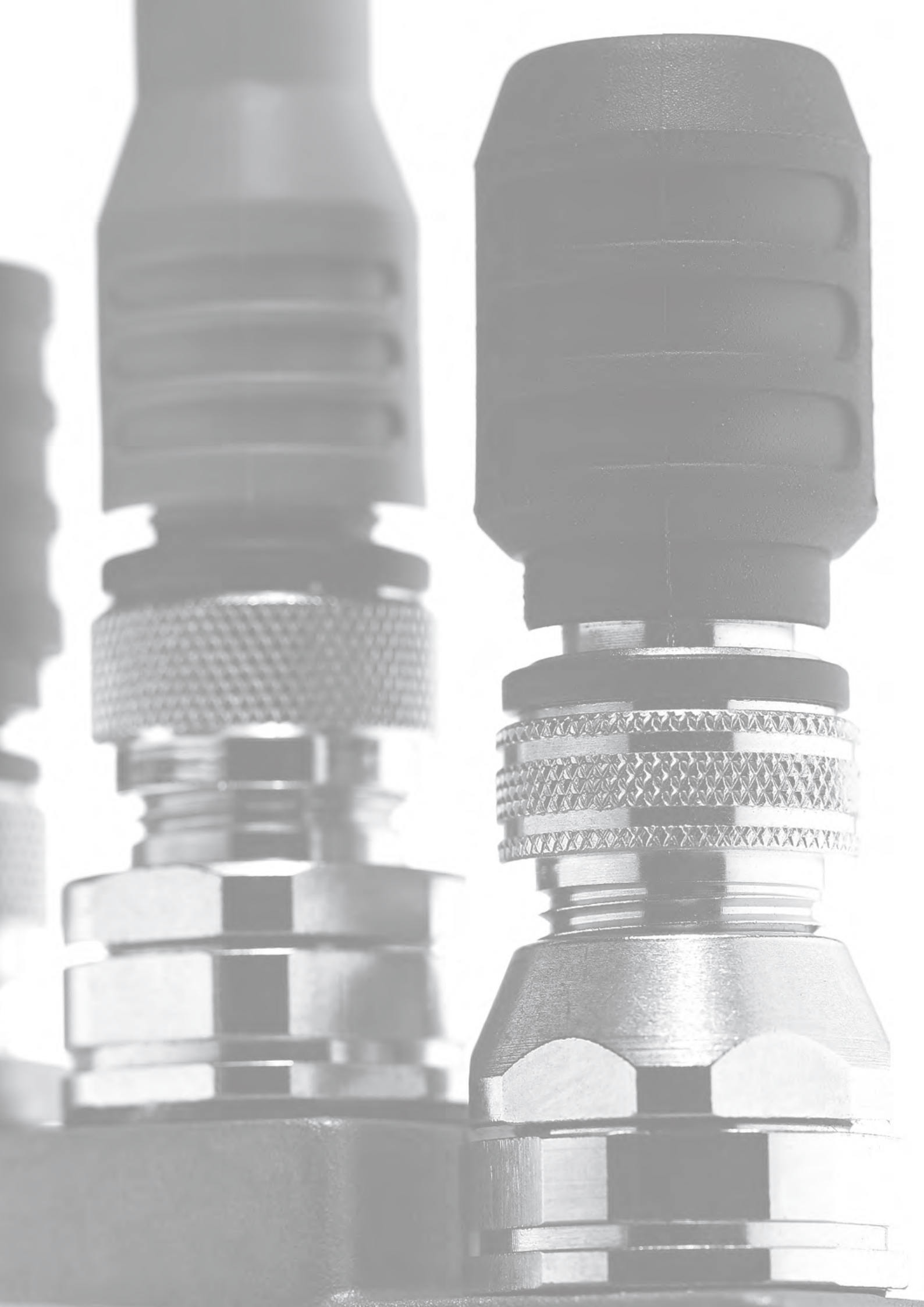
Dimensions in mm [inch]





# Inclinometers

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## Connection technology

|   |  |             | Page       |
|---|--|-------------|------------|
| <b>Cable</b>                              | Unprepared, cut to length              |             | <b>568</b> |
| <b>M12 connection technology</b>          | Connectors, self-assembly              |             | <b>571</b> |
|   | Cordsets, pre-assembled                |             | <b>577</b> |
| <b>M23 connection technology</b>          | Connectors, self-assembly              |             | <b>589</b> |
|   | Cordsets, pre-assembled                |             | <b>591</b> |
| <b>MIL connection technology</b>          | Connectors, self-assembly              |             | <b>595</b> |
| <b>Sub-D connection technology</b>        | Cordsets, pre-assembled                |             | <b>596</b> |
| <b>Optical fiber transmission modules</b> | Optical fiber transmitter and receiver | RS422 / HTL | <b>604</b> |
|   | Optical fiber transmitter and receiver | SSI         | <b>606</b> |

### The idea behind our Connection Technology System



### Connection Technology from Kübler = System Safety!

















All the products in the Connection Technology section have been tested and approved with the relevant compatible Kübler sensors.

They ensure the full functionality and high signal quality of our sensors.

#### Your benefit:









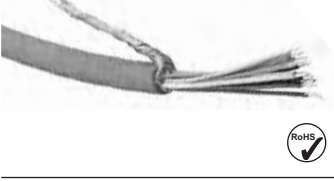





- Elimination of connection errors  
– no laborious fault finding
- Optimal shielding  
– avoids EMC problems
- Shorter installation times  
– saves time, cuts costs
- No time-consuming search for the right connector or cable  
– saves time, eliminates errors

# Connection technology

| Cable  |  | Unprepared, cut to length  |               |   | Order no. |
|--|--|--|---------------|---|-----------|
| <b>5 core + shield</b>   |  |  |               |   |           |
| <b>PVC electronic cable LiVCY</b><br><br>  | <b>Cross section</b>                       | 5 x 0.14 mm <sup>2</sup> [AWG25]   | suitable for: | <b>8.0000.6300.XXXX</b> <sup>1)</sup><br>incremental encoders without inversions                                |           |
|  | <b>Permanent working temperature range</b> | flexible installation -5°C ... +70°C [+23°F ... +158°F]<br>secure installation -30°C ... +70°C [-22°F ... +158°F]    |               |   |           |
|  | <b>Bending radius</b>                      | flexible installation min. 70 mm [2.76"]<br>secure installation min. 45 mm [1.77"]                                   |               |   |           |
|  | <b>Cable diameter</b>                      | approx. 4.7 mm ±0.2 mm   |               |   |           |
| <b>8 core + shield</b>   |  |  |               |   |           |
| <b>TPE electronic trailing cable halogen-free, silicon-free</b><br><br>  | <b>Cross section</b>                       | 5 x 0.75 mm <sup>2</sup> [AWG18]   | suitable for: | <b>8.0000.6600.XXXX</b> <sup>1)</sup><br>H100 with speed switch, robust incremental encoders without inversions |           |
|  | <b>Permanent working temperature range</b> | flexible installation -35°C ... +100°C [-31°F ... +212°F]<br>secure installation -40°C ... +100°C [-40°F ... +212°F] |               |   |           |
|  | <b>Bending radius</b>                      | flexible installation min. 40 mm [1.57"]<br>secure installation min. 25 mm [0.98"]                                   |               |   |           |
|  | <b>Cable diameter</b>                      | approx. 7.5 mm ±0.3 mm   |               |   |           |
| <b>8 core + shield</b>   |  |  |               |   |           |
| <b>PUR trailing cable halogen-free</b><br><br>     | <b>Cross section</b>                       | 8 x 0.14 mm <sup>2</sup> [AWG25]   | suitable for: | <b>8.0000.6P00.XXXX</b> <sup>1)</sup><br>Limes, 365X, 368X SSI and analog Safety-M                              |           |
|  | <b>Permanent working temperature range</b> | flexible installation -20°C ... +90°C [-4°F ... +194°F]<br>secure installation -40°C ... +90°C [-40°F ... +194°F]    |               |   |           |
|  | <b>Bending radius</b>                      | flexible installation min. 65 mm [2.56"]<br>secure installation min. 45 mm [1.77"]                                   |               |   |           |
|  | <b>Cable diameter</b>                      | approx. 5.5 mm ±0.2 mm   |               |   |           |
| <b>8 core + shield</b>   |  |  |               |   |           |
| <b>PUR trailing cable halogen-free</b><br><br>    | <b>Cross section</b>                       | 3 x 2 x 0.14 mm <sup>2</sup> [AWG25]<br>+ 2 x 0.5 mm <sup>2</sup> [AWG20]  | suitable for: | <b>8.0000.6F00.XXXX</b> <sup>1)</sup><br>Limes, 365X, 368X SSI and analog Safety-M                              |           |
|  | <b>Permanent working temperature range</b> | flexible installation -40°C ... +90°C [-40°F ... +194°F]<br>secure installation -50°C ... +90°C [-58°F ... +194°F]   |               |   |           |
|  | <b>Bending radius</b>                      | flexible installation min. 111 mm [4.37"]<br>secure installation min. 55 mm [2.17"]                                  |               |   |           |
|  | <b>Cable diameter</b>                      | approx. 7.4 mm ±0.3 mm   |               |   |           |
| <b>10 core + shield</b>  |  |  |               |   |           |
| <b>PUR electronic trailing cable halogen-free</b><br><br>  | <b>Cross section</b>                       | 4 x 2 x 0.25 mm <sup>2</sup> [AWG23]<br>+ 2 x 1 mm <sup>2</sup> [AWG17]  | suitable for: | <b>8.0000.6400.XXXX</b> <sup>1)</sup><br>H100, H120 LA10, LA50 Safety-M   |           |
|  | <b>Permanent working temperature range</b> | flexible installation -40°C ... +90°C [-40°F ... +194°F]<br>secure installation -50°C ... +90°C [-58°F ... +194°F]   |               |   |           |
|  | <b>Bending radius</b>                      | flexible installation min. 95 mm [3.74"]<br>secure installation min. 40 mm [1.57"]                                   |               |   |           |
|  | <b>Cable diameter</b>                      | approx. 7.9 mm ±0.8 mm   |               |   |           |














1) XXXX = cable length in meters (e.g. 10 m = 0010)

# Connection technology

| Cable   |   | Unprepared, cut to length                    |  |  | Order no.                             |
|---|---|--|--|--|---------------------------------------|
| <b>12 core + shield</b>   |   |  |  |  |                                       |
| <b>PUR electronic trailing cable halogen-free</b><br>  | <b>Cross section</b>  |  | 10 x 0.14 mm <sup>2</sup> [AWG25]<br>+ 2 x 0.5 mm <sup>2</sup> [AWG20]     | suitable for:  | <b>8.0000.6100.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -30°C ... +80°C [-22°F ... +176°F]<br>-50°C ... +90°C [-58°F ... +194°F]   | robust incremental encoders  |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 50 mm [1.97"]<br>min. 35 mm [1.38"]                                   |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 6.9 mm ±0.3 mm   |  |                                       |
|   |    |  |  |  |                                       |
| <b>PVC electronic cable LiYCY</b><br>                  | <b>Cross section</b>  |  | 12 x 0.14 mm <sup>2</sup> [AWG25]  | suitable for:  | <b>8.0000.6200.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -10°C ... +90°C [+14°F ... +194°F]<br>-30°C ... +90°C [-22°F ... +194°F]   | incremental encoders<br>standard cable   |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 100 mm [3.94"]<br>min. 65 mm [2.56"]                                  |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 6.7 mm ±0.2 mm   |  |                                       |
|   |    |  |  |  |                                       |
| <b>PUR electronic trailing cable halogen-free</b><br> | <b>Cross section</b>  |  | 6 x 2 x 0.14 mm <sup>2</sup> [AWG25]                                       | suitable for:  | <b>8.0000.6Y00.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -30°C ... +90°C [-22°F ... +194°F]<br>-40°C ... +90°C [-40°F ... +194°F]   | robust incremental encoders<br>LA10  |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 90 mm [3.54"]<br>min. 40 mm [1.57"]                                   |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 7.5 mm ±0.2 mm   |  |                                       |
|   |  |  |  |  |                                       |
| <b>TPE electronic cable halogen-free</b><br>         | <b>Cross section</b>  |  | 5 x 2 x 0.14 mm <sup>2</sup><br>+ 2 x 0.5 mm <sup>2</sup>                  | suitable for:  | <b>8.0000.6E00.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -25°C ... +110°C [-13°F ... +230°F]<br>-40°C ... +135°C [-40°F ... +275°F] | high temperatures or encoders with sine wave output                              |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 90 mm [3.54"]<br>min. 70 mm [2.76"]                                   |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 8.5 mm ±0.9 mm   |  |                                       |
|   |  |  |  |  |                                       |
| <b>PVC electronic cable LiYCY</b><br>                | <b>Cross section</b>  |  | 6 x 2 x 0.14 mm <sup>2</sup> [AWG25]                                       | suitable for:  | <b>8.0000.6900.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -5°C ... +70°C [+23°F ... +158°F]<br>-30°C ... +80°C [-22°F ... +176°F]    | absolute encoders with SSI or 4 ... 20 mA analog output, twisted pair conductors |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 110 mm [4.33"]<br>min. 75 mm [2.95"]                                  |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 7.3 mm ±0.2 mm   |  |                                       |
|   |  |  |  |  |                                       |
| <b>PUR electronic cable halogen-free</b><br>         | <b>Cross section</b>  |  | 6 x 2 x 0.14 mm <sup>2</sup> [AWG25]                                       | suitable for:  | <b>8.0000.6Q00.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -10°C ... +90°C [+14°F ... +194°F]<br>-30°C ... +90°C [-22°F ... +194°F]   | ATEX zone 2/22 encoders  |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 120 mm [4.72"]<br>min. 80 mm [3.15"]                                  |  |                                       |
|   | <b>Cable diameter</b>   |  | ca. 7,8 mm ±0,2 mm   |  |                                       |
|   |  |  |  |  |                                       |
| <b>18 core + shield</b>   |   |  |  |  |                                       |
| <b>PVC electronic cable LiYCY</b><br>                | <b>Cross section</b>  |  | 18 x 0.14 mm <sup>2</sup> [AWG25]  | suitable for:  | <b>8.0000.6700.XXXX</b> <sup>1)</sup> |
|   | <b>Permanent working temperature range</b>  | flexible installation<br>secure installation | -5°C ... +70°C [+23°F ... +158°F]<br>-30°C ... +80°C [-22°F ... +176°F]    | absolute encoders with parallel output, twisted pair conductors                  |                                       |
|   | <b>Bending radius</b>   | flexible installation<br>secure installation | min. 120 mm [4.72"]<br>min. 100 mm [3.94"]                                 |  |                                       |
|   | <b>Cable diameter</b>   |  | approx. 7.8 mm ±0.2 mm   |  |                                       |
|   |  |  |  |  |                                       |

1) XXXX = cable length in meters (e.g. 10 m = 0010)


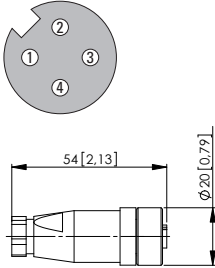

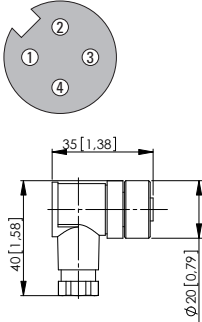

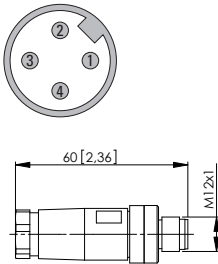

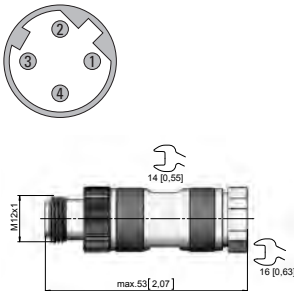


# Connection technology

| Cable  |  | Unprepared, cut to length  |  |   |
|--|--|--|--|---|
| <b>PROFIBUS DP - cable</b>   |  |  |  | Order no.                                 |
| <b>PUR outer jacket, PE wire insulation<br/>halogen-free</b><br><br> | <b>Cross section</b>                       | 2 x 0.34 mm <sup>2</sup> [AWG22]   | suitable for:  | <b>05.KABEL451.XXX</b> <sup>1)</sup>      |
|  | <b>Permanent working temperature range</b> | flexible installation -25°C ... +60°C [-13°F ... +140°F]<br>secure installation -50°C ... +90°C [-58°F ... +194°F] | all Profibus fieldbus encoders, Safety-M modular SMBU and SMBS   |   |
|  | <b>Bending radius</b>                      | flexible installation min. 80 mm [3.15"]<br>secure installation min. 40 mm [1.57"]                                 |  |   |
|  | <b>Cable diameter</b>                      | approx. 7.6 mm ±0.2 mm   |   |   |
| <b>DeviceNet - cable</b>   |  |  |  | Order no.                                 |
| <b>PUR outer jacket, PE wire insulation</b><br><br>                  | <b>Cross section</b>                       | 2 x 0.52 mm <sup>2</sup> [AWG24]<br>+ 2 x 1.04 mm <sup>2</sup> [AWG17]   | suitable for:  | <b>05.KABEL5723.XXX</b> <sup>1)</sup>     |
|  | <b>Permanent working temperature range</b> | flexible installation -30°C ... +70°C [-22°F ... +158°F]<br>secure installation -40°C ... +80°C [-40°F ... +176°F] | all DeviceNet fieldbus encoders  |   |
|  | <b>Bending radius</b>                      | flexible installation min. 70 mm [2.76"]<br>secure installation min. 50 mm [1.97"]                                 |  |   |
|  | <b>Cable diameter</b>                      | approx. 8.4 mm ±0.2 mm   |   |   |
| <b>CANopen - cable</b>   |  |  |  | Order no.                                 |
| <b>PVC electronic cable</b><br><br>                              | <b>Cross section</b>                       | 3 x 2 x 0.25 mm <sup>2</sup> [AWG23]   | suitable for:  | <b>8.0000.6V00.XXXX</b> <sup>1)</sup>     |
|  | <b>Permanent working temperature range</b> | flexible installation -10°C ... +90°C [+14°F ... +194°F]<br>secure installation -30°C ... +90°C [-22°F ... +194°F] | all CANopen fieldbus encoders, Safety-M modular SMBU   |   |
|  | <b>Bending radius</b>                      | flexible installation min. 130 mm [5.12"]<br>secure installation min. 60 mm [2.36"]                                |  |   |
|  | <b>Cable diameter</b>                      | approx. 6.2 mm ±0.2 mm   |   |   |
| <b>Industrial Ethernet - cable</b>   |  |  |  | Order no.                                 |
| <b>PUR electronic cable</b><br><br>                              | <b>Cross section</b>                       | 2 x 2 x 0.34 mm <sup>2</sup> [AWG22]   | suitable for:  | <b>05.00.6031.1111.XXXM</b> <sup>1)</sup> |
|  | <b>Permanent working temperature range</b> | flexible installation -30°C ... +70°C [-22°F ... +158°F]<br>secure installation -40°C ... +80°C [-40°F ... +176°F] | all EtherCAT / PROFINET I/O / EtherNet/IP encoders, Safety-M modular SMBU and SMBS   |   |
|  | <b>Bending radius</b>                      | flexible installation min. 50 mm [1.97"]<br>secure installation min. 25 mm [0.98"]                                 |  |   |
|  | <b>Cable diameter</b>                      | approx. 4.8 mm ±0.2 mm   | <br><br><b>EtherNet/IP</b> |   |

1) XXXX = cable length in meters (e.g. 10 m = 0010)


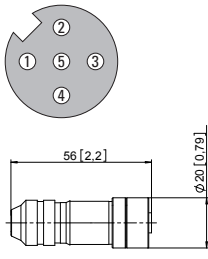

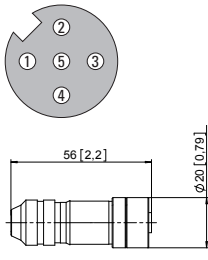

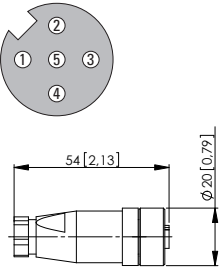

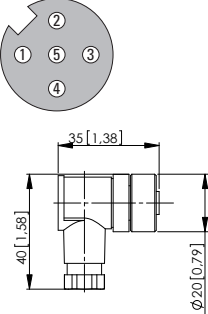


# Connection technology

| M12 connection technology  |  | Connectors, self-assembly  |                    | Order no. |
|--|--|--|--------------------|-----------|
| <b>4 pin</b>   |  |  |                    |           |
| <b>Female connector with coupling nut</b><br><b>A coded, straight</b><br><b>power supply</b><br>Housing: plastic, IP67<br>            | screw connections,<br>for cable $\varnothing$ 4 ... 6 mm [0.16 ... 0.24"]<br>   | suitable for our series:<br><br>EMIO.SIO.10xP<br><br>F5858 / F5878<br>F5868 / F5888<br>5858 / 5878<br>5868 / 5888<br>9080  | <b>05.B8141-0</b>  |           |
| <b>Female connector with coupling nut</b><br><b>A coded, right-angle</b><br><b>power supply</b><br>Housing: plastic, IP67<br>        | screw connections,<br>for cable $\varnothing$ 4 ... 6 mm [0.16 ... 0.24"]<br>  | suitable for our series:<br><br>EMIO.SIO.10xP<br><br>5858 / 5878<br>5868 / 5888<br>9080  | <b>05.B8241-0</b>  |           |
| <b>Male connector with external thread</b><br><b>A coded, straight</b><br><b>power supply</b><br>Housing: metal / plastic, IP67<br> | screw connections,<br>for cable $\varnothing$ 4 ... 6 mm [0.16 ... 0.24"]<br> | suitable for:<br><br>versions with<br>cable outlet   | <b>05.BS8141-0</b> |           |
| <b>Male connector with external thread</b><br><b>D coded, straight</b><br>Housing: metal, IP67<br>                                  | screw connections,<br>for cable $\varnothing$ 4 ... 9 mm [0.16 ... 0.35"]<br> | suitable for our series:<br><br>F5858 / F5878<br>F5868 / F5888<br>5858 / 5878<br>5868 / 5888<br><br><br>Conformance tested<br><br><br><br><b>EtherNet/IP</b> | <b>05.WASCSY4S</b> |           |




# Connection technology

## M12 connection technology **Connectors, self-assembly**


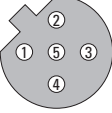
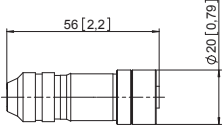


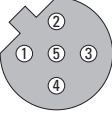
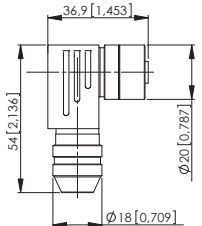



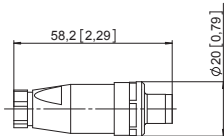



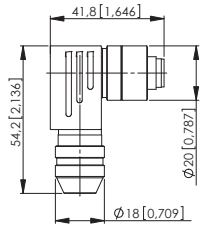

| 5 pin   |  | Order no.   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
|---|--|---|-----------------------------------|---------------|---------------|-------------|---------------|--------|---------------|--------|---------------|---------------|-------|-------|-------------|------|--------------------------------|
| <p><b>Female connector with coupling nut<br/>A coded, straight</b></p> <p>Housing: metal, IP67</p>         | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>    | <p>suitable for our series:</p> <p>A50, B80, C120, D135<br/>IS40, IS60, IN88</p> <table border="0"> <tr> <td>3651 / 3671</td> <td>M3658 / M3678</td> </tr> <tr> <td>F3658 / F3658</td> <td>5858 / 5878</td> </tr> <tr> <td>M3661 / M3681</td> <td>M3661R</td> </tr> <tr> <td>M3668 / M3688</td> <td>M3668R</td> </tr> <tr> <td>F3668 / F3688</td> <td>F5868 / F5888</td> </tr> <tr> <td>M5861</td> <td>M5868</td> </tr> <tr> <td>5868 / 5888</td> <td>9080</td> </tr> </table> <p><b>CANopen</b><br/><b>DeviceNet</b></p> | 3651 / 3671                       | M3658 / M3678 | F3658 / F3658 | 5858 / 5878 | M3661 / M3681 | M3661R | M3668 / M3688 | M3668R | F3668 / F3688 | F5868 / F5888 | M5861 | M5868 | 5868 / 5888 | 9080 | <p><b>8.0000.5116.0000</b></p> |
| 3651 / 3671   | M3658 / M3678  |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| F3658 / F3658   | 5858 / 5878  |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| M3661 / M3681   | M3661R   |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| M3668 / M3688   | M3668R   |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| F3668 / F3688   | F5868 / F5888  |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| M5861   | M5868  |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| 5868 / 5888   | 9080   |   |                                   |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| <p><b>Female connector with coupling nut<br/>A coded, straight</b></p> <p>Housing: metal, IP67</p>        | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>   | <p>suitable for our series:</p> <p>ATEX zone 2/22 encoders</p> <p><b>Ex</b> 2/22</p>  | <p><b>8.0000.5116.0000.Ex</b></p> |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| <p><b>Female connector with coupling nut<br/>A coded, straight</b></p> <p>Housing: plastic, IP67</p>     | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>  | <p>suitable for our series:</p> <p>A50, B80, C120, D135,<br/>IS40, IS60, IN88</p> <p>3651 / 3671<br/>9080</p> <p><b>DeviceNet</b></p>   | <p><b>05.B-8151-0/9</b></p>       |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |
| <p><b>Female connector with coupling nut<br/>A coded, right-angle</b></p> <p>Housing: plastic, IP67</p>  | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>  | <p>suitable for our series:</p> <p>A50, B80, C120, D135<br/>IS40, IS60, IN88</p> <p>3651 / 3671<br/>9080</p> <p><b>DeviceNet</b></p>  | <p><b>05.B-8251-0/9</b></p>       |               |               |             |               |        |               |        |               |               |       |       |             |      |                                |




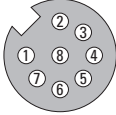
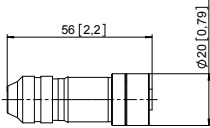


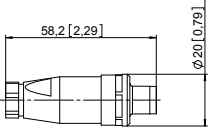

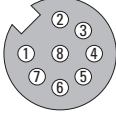
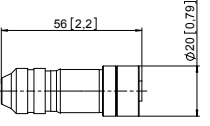


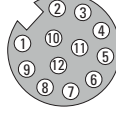
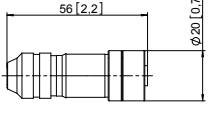
# Connection technology

| M12 connection technology   |  | Connectors, self-assembly  |                              | Order no.     |               |               |                 |               |             |             |      |  |      |  |                                |  |
|---|--|--|------------------------------|---------------|---------------|---------------|-----------------|---------------|-------------|-------------|------|--|------|--|--------------------------------|--|
| <b>5 pin</b>  |  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| <p><b>Male connector with external thread</b><br/><b>A coded, straight</b></p> <p>Housing: metal, IP67</p>                 | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>    | <p>suitable for our series:</p> <table border="0"> <tr> <td>F3658 / F3658</td> <td>F3668 / F3688</td> </tr> <tr> <td>M3658 / M3678</td> <td>M3668 / M3688</td> </tr> <tr> <td>M3668R / M3688R</td> <td>F5868 / F5888</td> </tr> <tr> <td>5858 / 5878</td> <td>5868 / 5888</td> </tr> <tr> <td>9080</td> <td></td> </tr> <tr> <td>IS60</td> <td></td> </tr> </table> <p><b>CANopen</b><br/><b>DeviceNet</b></p> | F3658 / F3658                | F3668 / F3688 | M3658 / M3678 | M3668 / M3688 | M3668R / M3688R | F5868 / F5888 | 5858 / 5878 | 5868 / 5888 | 9080 |  | IS60 |  | <p><b>8.0000.5111.0000</b></p> |  |
| F3658 / F3658   | F3668 / F3688  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| M3658 / M3678   | M3668 / M3688  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| M3668R / M3688R   | F5868 / F5888  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| 5858 / 5878   | 5868 / 5888  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| 9080  |  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| IS60  |  |  |                              |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| <p><b>Male connector with external thread</b><br/><b>A coded, straight</b></p> <p>Housing: metal / plastic, IP67</p>      | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>   | <p>suitable for our series:</p> <p>9080<br/>IS60, IN88</p> <p>EMIO.SIO.10xP</p> <p><b>DeviceNet</b></p>  | <p><b>05.BS-8151-0/9</b></p> |               |               |               |                 |               |             |             |      |  |      |  |                                |  |
| <p><b>Male connector with external thread</b><br/><b>A coded, right-angle</b></p> <p>Housing: metal / plastic, IP67</p>  | <p>screw connections,<br/>for cable <math>\varnothing</math> 6 ... 8 mm [0.24 ... 0.32"]</p>  | <p>suitable for our series:</p> <p>9080<br/>IS60, IN88</p> <p><b>DeviceNet</b></p>   | <p><b>05.BS-8251-0/9</b></p> |               |               |               |                 |               |             |             |      |  |      |  |                                |  |

# Connection technology



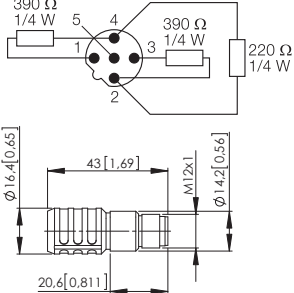


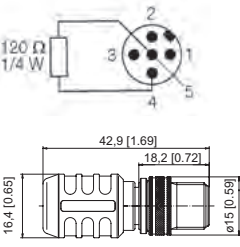


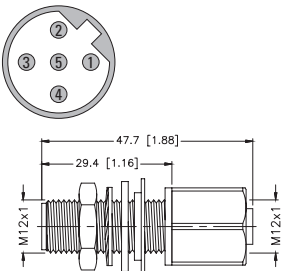


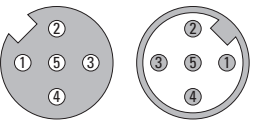

| M12 connection technology  |   | Connectors, self-assembly  |                          | Order no. |
|--|---|--|--------------------------|-----------|
| <b>5 pin</b>   |   |  |                          |           |
| <b>Female connector with coupling nut B coded, straight</b><br>Housing: metal, IP67<br>       | screw connections,<br>for cable $\varnothing$ 4 ... 9 mm [0.16 ... 0.35"]<br><br>     | suitable for our series:<br>5858 / 5878<br>5868 / 5888<br>9080<br>   | <b>05.BMWS 8151-8.5</b>  |           |
| <b>Female connector with coupling nut B coded, right-angle</b><br>Housing: metal, IP67<br>   | screw connections,<br>for cable $\varnothing$ 4 ... 9 mm [0.16 ... 0.35"]<br><br>    | suitable for our series:<br>5858 / 5878<br>5868 / 5888<br>9080<br> | <b>05.BMWS 8251-8.5</b>  |           |
| <b>Male connector with external thread B coded, straight</b><br>Housing: metal, IP67<br>    | screw connections,<br>for cable $\varnothing$ 4 ... 9 mm [0.16 ... 0.35"]<br><br> | suitable for our series:<br>5858 / 5878<br>5868 / 5888<br>9080<br> | <b>05.BMSWS 8151-8.5</b> |           |
| <b>Male connector with external thread B coded, right-angle</b><br>Housing: metal, IP67<br> | screw connections,<br>for cable $\varnothing$ 4 ... 9 mm [0.16 ... 0.35"]<br><br> | suitable for our series:<br>5858 / 5878<br>5868 / 5888<br>9080<br> | <b>05.BMSWS 8251-8.5</b> |           |

# Connection technology

| M12 connection technology  |   |  | Connectors, self-assembly  | Order no. |
|--|---|--|----------------------------|-----------|
| <b>8 pin</b>   |   |  |                            |           |
| <b>Female connector with coupling nut</b><br><b>A coded, straight</b><br>Housing: metal, IP67<br>   | screw connections,<br>for cable $\varnothing$ 6 ... 8 mm [0.24 ... 0.32"]<br><br>     | suitable for our series:<br>3610 / 3620      5814 / 5834<br>F3653 / F3673    5853 / 5873<br>F3663 / F3683    5863 / 5883<br>M3663 / M3683    58x4FSx<br>M3663R            F5883M<br>M5863<br>5000 / 5020      5821<br>5006 / 5026      5876<br>KIS40 / KIH40    KIS50 / KIH50<br>A020 / A02H      H120 | <b>05.CMB 8181-0</b>       |           |
| <b>Male connector with external thread</b><br><b>A coded, straight</b><br>Housing: metal, IP67<br> | screw connections,<br>for cable $\varnothing$ 6 ... 8 mm [0.24 ... 0.32"]<br><br>    | suitable for:<br>versions with cable outlet  | <b>05.CMBS 8181-0</b>      |           |
| <b>Female connector with coupling nut</b><br><b>A coded, straight</b><br>Housing: metal, IP67<br> | screw connections,<br>for cable $\varnothing$ 6 ... 9 mm [0.24 ... 0.35"]<br><br> | suitable for our series:<br>ATEX zone 2/22 encoders<br>  | <b>8.0000.5136.0000.Ex</b> |           |
| <b>12 pin</b>  |   |  |                            |           |
| <b>Female connector with coupling nut</b><br><b>A coded, straight</b><br>Housing: metal, IP67<br> | screw connections,<br>for cable $\varnothing$ 6 ... 8 mm [0.24 ... 0.32"]<br><br> | suitable for:<br>LA10  | <b>8.0000.5162.0000</b>    |           |

# Connection technology

## M12 connection technology **Connectors, self-assembly**

| Accessories  |   | Order no.  |                                 |
|--|---|--|---------------------------------|
| <p><b>Securing clip for M12 connectors</b></p> <p>Material: plastic</p>   | <p>against accidental disconnection under load</p> <p>working temperature range<br/>-25°C ... +90°C [-13°F ... +194°F]</p>  | <p><b>8.0000.5000.0006</b></p>   |                                 |
| <p><b>Terminating resistor<br/>Male connector with external thread<br/>B coded, straight</b></p> <p>Housing: metal / plastic, IP67</p>   |   | <p>suitable for our series:</p> <p>5858 / 5878<br/>5868 / 5888<br/>9080</p>                     | <p><b>05.RSS4.5-PDP-TR</b></p>  |
| <p><b>Terminating resistor<br/>Male connector with external thread<br/>A coded, straight</b></p> <p>Housing: metal / plastic, IP67</p>  |    | <p>suitable for our series:</p> <p>F5868 / F5888<br/>5858 / 5878<br/>5868 / 5888<br/>9080</p>  | <p><b>05.RSE 57 TR2</b></p>     |
| <p><b>M12 lead-through<br/>B coded, straight</b></p> <p>Housing: metal, IP67</p>    |    | <p>suitable for our series:</p> <p>5858 / 5878<br/>5868 / 5888<br/>9080</p>                    | <p><b>05.FKW-FSW45/M12</b></p>  |
| <p><b>T-junction<br/>A coded, 5 pin</b></p> <p>Housing: metal / plastic, IP67</p>   | <p>2 x female connector with coupling nut<br/>1 x male connector with external thread</p>  | <p>suitable for:</p> <p>M12 connectors</p>   | <p><b>05.FKM5-FKM5-FSM5</b></p> |

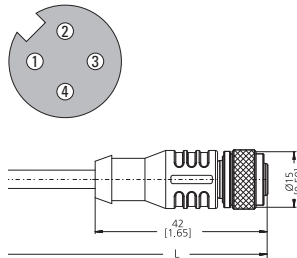
# Connection technology

## M12 connection technology Cordsets, pre-assembled

With connector, 4 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Female connector with coupling nut + single-ended A coded, straight power supply**

Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]  
Housing: metal / plastic, IP67



Terminal assignment

|                      |    |    |    |    |
|----------------------|----|----|----|----|
| Pin female contacts: | 1  | 2  | 3  | 4  |
| Wire color:          | BN | WH | BU | BK |

suitable for our series:

EMIO.SIO.10xP

5858 / 5878 5868 / 5888  
F5858 / F5878 F5868 / F5888  
9080  
H120

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

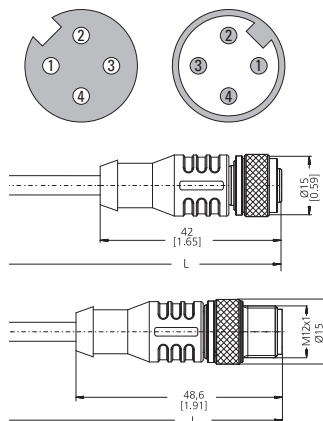
**05.00.6061.6211.002M**  
**05.00.6061.6211.005M**  
**05.00.6061.6211.010M**  
**05.00.6061.6211.015M**

other cable lengths  
(minimum order quantity 4 pieces)

**05.00.6061.6211.0xxM**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

**Female connector with coupling nut + male connector with external thread A coded, straight power supply**

Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]  
Housing: metal / plastic, IP67



suitable for our series:

EMIO.SIO.10xP

5858 / 5878 5868 / 5888  
9080

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

**05.00.6061.6462.002M**  
**05.00.6061.6462.005M**  
**05.00.6061.6462.010M**  
**05.00.6061.6462.015M**

other cable lengths  
(minimum order quantity 4 pieces)


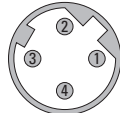
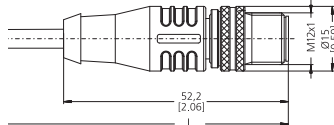


**05.00.6061.6462.0xxM**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30


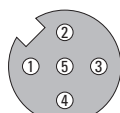
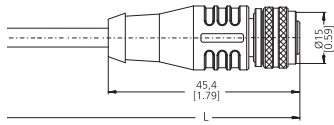

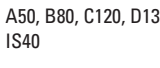
1) Other cable lengths on request.

# Connection technology

## M12 connection technology

## Cordsets, pre-assembled

| With connector, 4 pin   |    | Working temp. -30°C ... +80°C [-22°F ... +176°F]   | Order no. |    |   |   |             |    |    |    |    |   |  |
|---|----|--|-----------|----|---|---|-------------|----|----|----|----|---|--|
| <b>Male connector with external thread</b><br><b>single-ended</b><br><b>D coded, straight</b><br>Cable: PUR, 2 x 2 x 0.34 mm <sup>2</sup> [AWG22]<br>Housing: metal / plastic, IP67   |    | suitable for our series:<br><br>5858 / 5878      5868 / 5888<br>F5858 / F5878      F5868 / F5888   |           |    |   |   |             |    |    |    |    |   |  |
|  <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Port A (1) and B (2)</p>  </div> <div style="text-align: center;">  </div> </div> |    | <br>Conformance tested<br><br><br><br><b>EtherNet/IP</b> |           |    |   |   |             |    |    |    |    |   |  |
| <b>Terminal assignment</b> <table border="1" style="width: 100%;"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Wire color:</td> <td>YE</td> <td>OG</td> <td>WH</td> <td>BU</td> </tr> </table>  |    | Pin male contacts:   | 1         | 2  | 3 | 4 | Wire color: | YE | OG | WH | BU | <i>cable length</i> <sup>1)</sup><br><br>standard cable length      2 m [6.56']<br>(available from 1 piece)      5 m [16.40']<br>10 m [32.81']<br>15 m [49.21']<br><br>other cable lengths<br>(minimum order quantity 4 pieces) | <b>05.00.6031.4411.002M</b><br><b>05.00.6031.4411.005M</b><br><b>05.00.6031.4411.010M</b><br><b>05.00.6031.4411.015M</b><br><br><b>05.00.6031.4411.0xxM</b><br>xx = length in meters:<br>1, 3, 8, 12, 20, 25, 30 |
| Pin male contacts:  | 1  | 2  | 3         | 4  |   |   |             |    |    |    |    |   |  |
| Wire color:   | YE | OG   | WH        | BU |   |   |             |    |    |    |    |   |  |

| With connector, 5 pin   |    | Working temp. -30°C ... +80°C [-22°F ... +176°F]   | Order no. |    |    |                  |   |                  |             |    |    |    |    |    |                  |   |  |
|---|----|--|-----------|----|----|------------------|---|------------------|-------------|----|----|----|----|----|------------------|---|--|
| <b>Female connector with coupling nut +</b><br><b>single-ended</b><br><b>A coded, straight</b><br>Cable: PVC, 5 x 0.25 mm <sup>2</sup> [AWG23]<br>Housing: metal / plastic, IP67  |    | suitable for our series:<br><br>M3661 / M3681      M3661R<br>M5861<br><br>A50, B80, C120, D135<br>IS40   |           |    |    |                  |   |                  |             |    |    |    |    |    |                  |   |  |
|  <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> |    | <br>Conformance tested<br><br><br><br><b>EtherNet/IP</b> |           |    |    |                  |   |                  |             |    |    |    |    |    |                  |   |  |
| <b>Terminal assignment</b> <table border="1" style="width: 100%;"> <tr> <td>Pin female contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>PH<sup>2)</sup></td> </tr> <tr> <td>Wire color:</td> <td>BN</td> <td>WH</td> <td>BU</td> <td>BK</td> <td>GY</td> <td>PH<sup>2)</sup></td> </tr> </table>   |    | Pin female contacts:   | 1         | 2  | 3  | 4                | 5 | PH <sup>2)</sup> | Wire color: | BN | WH | BU | BK | GY | PH <sup>2)</sup> | <i>cable length</i> <sup>1)</sup><br><br>standard cable length      2 m [6.56']<br>(available from 1 piece)      5 m [16.40']<br>10 m [32.81']<br>15 m [49.21']<br><br>other cable lengths<br>(minimum order quantity 4 pieces) | <b>05.00.6081.2211.002M</b><br><b>05.00.6081.2211.005M</b><br><b>05.00.6081.2211.010M</b><br><b>05.00.6081.2211.015M</b><br><br><b>05.00.6081.2211.0xxM</b><br>xx = length in meters:<br>1, 3, 8, 12, 20, 25, 30 |
| Pin female contacts:  | 1  | 2  | 3         | 4  | 5  | PH <sup>2)</sup> |   |                  |             |    |    |    |    |    |                  |   |  |
| Wire color:   | BN | WH   | BU        | BK | GY | PH <sup>2)</sup> |   |                  |             |    |    |    |    |    |                  |   |  |

1) Other cable lengths on request.

# Connection technology

## M12 connection technology Cordsets, pre-assembled

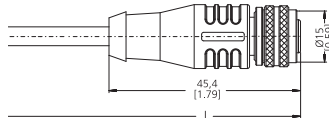
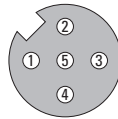
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Female connector with coupling nut + single-ended**  
**A coded, straight**

Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]  
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

9080  
IS60, IN88

**DeviceNet**

Terminal assignment

|                      |      |    |    |    |    |
|----------------------|------|----|----|----|----|
| Pin female contacts: | 1    | 2  | 3  | 4  | 5  |
| Wire color:          | ± 3) | RD | BK | WH | BU |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

**05.00.6021.2211.002M**  
**05.00.6021.2211.005M**  
**05.00.6021.2211.010M**  
**05.00.6021.2211.015M**

other cable lengths  
(minimum order quantity 4 pieces)

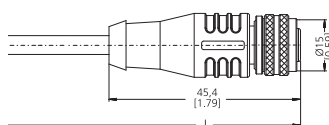
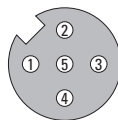
**05.00.6021.2211.0xxM**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

**Female connector with coupling nut + single-ended**  
**A coded, straight**

Cable: PVC, 3 x 2 x 0.25 mm<sup>2</sup>  
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

M3658 / M3678 M3668 / M3688  
M3668R F5868 / F5888  
5858 / 5878 5868 / 5888  
M5868 9080

**CANopen**

Terminal assignment

|                      |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | PH <sup>2)</sup> |
| Wire color:          | GY | BN | WH | GN | YE | PH <sup>2)</sup> |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

**05.00.6091.A211.002M**  
**05.00.6091.A211.005M**  
**05.00.6091.A211.010M**  
**05.00.6091.A211.015M**

other cable lengths  
(minimum order quantity 4 pieces)



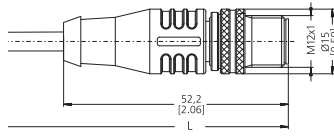


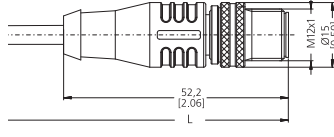
**05.00.6091.A211.0xxM**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
2) Shield on housing.  
3) Shield with pin 1.

# Connection technology

## M12 connection technology

## Cordsets, pre-assembled


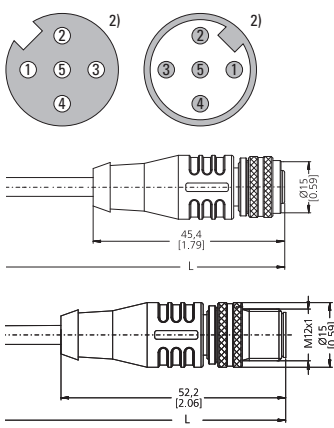

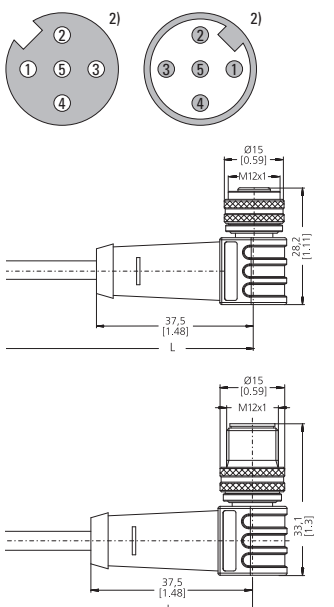
| With connector, 5 pin   |                 | Working temp. -30°C ... +80°C [-22°F ... +176°F]   | Order no.   |    |    |                  |   |                  |                 |    |    |    |    |    |                  |  |  |
|---|-----------------|--|---|----|----|------------------|---|------------------|-----------------|----|----|----|----|----|------------------|--|--|
| <p><b>Male connector with external thread + single-ended</b><br/> <b>A coded, straight</b></p> <p>Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]<br/>           Housing: metal / plastic, IP67</p>                          |                 | <p>Bus out</p>   <p>suitable for our series:</p> <p>9080<br/>IS60, IN88</p> <p><b>DeviceNet</b></p> <p><i>cable length <sup>1)</sup></i></p> <p>standard cable length 2 m [6.56']<br/>           (available from 1 piece) 5 m [16.40']<br/>           10 m [32.81']<br/>           15 m [49.21']</p> <p>other cable lengths<br/>           (minimum order quantity 4 pieces)</p>   | <p><b>05.00.6021.2411.002M</b><br/> <b>05.00.6021.2411.005M</b><br/> <b>05.00.6021.2411.010M</b><br/> <b>05.00.6021.2411.015M</b></p> <p><b>05.00.6021.2411.0xxM</b><br/>           xx = length in meters:<br/>           1, 3, 8, 12, 20, 25, 30</p> |    |    |                  |   |                  |                 |    |    |    |    |    |                  |  |  |
| <p><b>Male connector with external thread + single-ended</b><br/> <b>A coded, straight</b></p> <p>Cable: PVC, 3 x 2 x 0.25 mm<sup>2</sup> [AWG23]<br/>           Housing: metal / plastic, IP67</p>                    |                 | <p>Bus out</p>   <p>suitable for our series:</p> <p>EMIO.SIO.10xP</p> <p>M3658 / M3678 F5868 / F5888<br/>           5858 / 5878 5868 / 5888<br/>           9080</p> <p><b>CANopen</b></p> <p><i>cable length <sup>1)</sup></i></p> <p>standard cable length 2 m [6.56']<br/>           (available from 1 piece) 5 m [16.40']<br/>           10 m [32.81']<br/>           15 m [49.21']</p> <p>other cable lengths<br/>           (minimum order quantity 4 pieces)</p> | <p><b>05.00.6091.A411.002M</b><br/> <b>05.00.6091.A411.005M</b><br/> <b>05.00.6091.A411.010M</b><br/> <b>05.00.6091.A411.015M</b></p> <p><b>05.00.6091.A411.0xxM</b><br/>           xx = length in meters:<br/>           1, 3, 8, 12, 20, 25, 30</p> |    |    |                  |   |                  |                 |    |    |    |    |    |                  |  |  |
| <p><b>Terminal assignment</b></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Wire color:</td> <td>⊥<sup>3)</sup></td> <td>RD</td> <td>BK</td> <td>WH</td> <td>BU</td> </tr> </table>                                       |                 | Pin male contacts:   | 1   | 2  | 3  | 4                | 5 | Wire color:      | ⊥ <sup>3)</sup> | RD | BK | WH | BU |    |                  |  |  |
| Pin male contacts:  | 1               | 2  | 3   | 4  | 5  |                  |   |                  |                 |    |    |    |    |    |                  |  |  |
| Wire color:   | ⊥ <sup>3)</sup> | RD   | BK  | WH | BU |                  |   |                  |                 |    |    |    |    |    |                  |  |  |
| <p><b>Terminal assignment</b></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>PH<sup>2)</sup></td> </tr> <tr> <td>Wire color:</td> <td>GY</td> <td>BN</td> <td>WH</td> <td>GN</td> <td>YE</td> <td>PH<sup>2)</sup></td> </tr> </table> |                 | Pin male contacts:   | 1   | 2  | 3  | 4                | 5 | PH <sup>2)</sup> | Wire color:     | GY | BN | WH | GN | YE | PH <sup>2)</sup> |  |  |
| Pin male contacts:  | 1               | 2  | 3   | 4  | 5  | PH <sup>2)</sup> |   |                  |                 |    |    |    |    |    |                  |  |  |
| Wire color:   | GY              | BN   | WH  | GN | YE | PH <sup>2)</sup> |   |                  |                 |    |    |    |    |    |                  |  |  |

1) Other cable lengths on request.  
 2) Shield on housing.  
 3) Shield with pin 1.



# Connection technology

## M12 connection technology Cordsets, pre-assembled

| With connector, 5 pin   |   | Working temp. -30°C ... +80°C [-22°F ... +176°F]  | Order no.             |             |                          |              |  |               |  |               |  |
|---|---|---|-----------------------|-------------|--------------------------|--------------|--|---------------|--|---------------|--|
| <p><b>Female connector with coupling nut + male connector with external thread A coded, straight</b></p> <p>Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]<br/>Housing: metal / plastic, IP67</p>       | <p>Bus in / out</p>    | <p>suitable for our series:</p> <p>EMIO.SIO.10xP<br/>9080</p> <p><b>DeviceNet</b></p> <p><i>cable length <sup>1)</sup></i></p> <table border="0"> <tr> <td>standard cable length</td> <td>2 m [6.56']</td> </tr> <tr> <td>(available from 1 piece)</td> <td>5 m [16.40']</td> </tr> <tr> <td></td> <td>10 m [32.81']</td> </tr> <tr> <td></td> <td>15 m [49.21']</td> </tr> </table> <p>other cable lengths<br/>(minimum order quantity 4 pieces)</p> | standard cable length | 2 m [6.56'] | (available from 1 piece) | 5 m [16.40'] |  | 10 m [32.81'] |  | 15 m [49.21'] | <p><b>05.00.6021.2422.002M</b><br/><b>05.00.6021.2422.005M</b><br/><b>05.00.6021.2422.010M</b><br/><b>05.00.6021.2422.015M</b></p> <p><b>05.00.6021.2422.0xxM</b><br/>xx = length in meters:<br/>1, 3, 8, 12, 20, 25, 30</p> |
| standard cable length   | 2 m [6.56']   |   |                       |             |                          |              |  |               |  |               |  |
| (available from 1 piece)  | 5 m [16.40']  |   |                       |             |                          |              |  |               |  |               |  |
|   | 10 m [32.81']   |   |                       |             |                          |              |  |               |  |               |  |
|   | 15 m [49.21']   |   |                       |             |                          |              |  |               |  |               |  |
| <p><b>Female connector with coupling nut + male connector with external thread A coded, right-angle</b></p> <p>Cable: PUR, 4 x 0.34 mm<sup>2</sup> [AWG22]<br/>Housing: metal / plastic, IP67</p>  | <p>Bus in / out</p>  | <p>suitable for our series:</p> <p>9080</p> <p><b>DeviceNet</b></p> <p><i>cable length <sup>1)</sup></i></p> <table border="0"> <tr> <td>standard cable length</td> <td>2 m [6.56']</td> </tr> <tr> <td>(available from 1 piece)</td> <td>5 m [16.40']</td> </tr> <tr> <td></td> <td>10 m [32.81']</td> </tr> <tr> <td></td> <td>15 m [49.21']</td> </tr> </table> <p>other cable lengths<br/>(minimum order quantity 4 pieces)</p>                   | standard cable length | 2 m [6.56'] | (available from 1 piece) | 5 m [16.40'] |  | 10 m [32.81'] |  | 15 m [49.21'] | <p><b>05.00.6021.2523.002M</b><br/><b>05.00.6021.2523.005M</b><br/><b>05.00.6021.2523.010M</b><br/><b>05.00.6021.2523.015M</b></p> <p><b>05.00.6021.2523.0xxM</b><br/>xx = length in meters:<br/>1, 3, 8, 12, 20, 25, 30</p> |
| standard cable length   | 2 m [6.56']   |   |                       |             |                          |              |  |               |  |               |  |
| (available from 1 piece)  | 5 m [16.40']  |   |                       |             |                          |              |  |               |  |               |  |
|   | 10 m [32.81']   |   |                       |             |                          |              |  |               |  |               |  |
|   | 15 m [49.21']   |   |                       |             |                          |              |  |               |  |               |  |

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology

## M12 connection technology

## Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

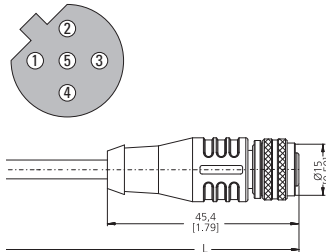
Order no.

**Female connector with coupling nut + single-ended**  
**B coded, straight**

Cable: PUR, 2 x 0.34 mm<sup>2</sup>  
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

5858 / 5878  
5868 / 5888  
9080



Terminal assignment

|                      |      |    |      |    |      |                  |
|----------------------|------|----|------|----|------|------------------|
| Pin female contacts: | 1    | 2  | 3    | 4  | 5    | PH <sup>2)</sup> |
| Wire color:          | n.c. | GN | n.c. | RD | n.c. | PH <sup>2)</sup> |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

other cable lengths  
(minimum order quantity 4 pieces)

**05.00.6011.3211.002M**  
**05.00.6011.3211.005M**  
**05.00.6011.3211.010M**  
**05.00.6011.3211.015M**

**05.00.6011.3211.0xxM**

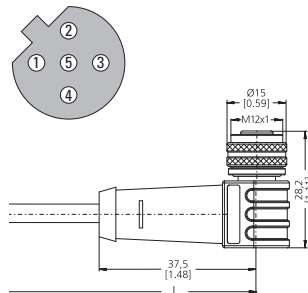
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

**Female connector with coupling nut + single-ended**  
**B coded, right-angle**

Cable: PUR, 2 x 0.34 mm<sup>2</sup> [AWG22]  
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

5858 / 5878  
5868 / 5888  
9080



Terminal assignment

|                      |      |    |      |    |      |                  |
|----------------------|------|----|------|----|------|------------------|
| Pin female contacts: | 1    | 2  | 3    | 4  | 5    | PH <sup>2)</sup> |
| Wire color:          | n.c. | GN | n.c. | RD | n.c. | PH <sup>2)</sup> |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
(available from 1 piece) 5 m [16.40']  
10 m [32.81']  
15 m [49.21']

other cable lengths  
(minimum order quantity 4 pieces)

**05.00.6011.3311.002M**  
**05.00.6011.3311.005M**  
**05.00.6011.3311.010M**  
**05.00.6011.3311.015M**

**05.00.6011.3311.0xxM**

xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology

## M12 connection technology Cordsets, pre-assembled

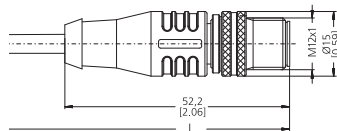
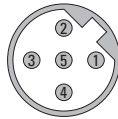
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Male connector with external thread + single-ended**  
**B coded, straight**

Cable: PUR, 2 x 0.34 mm<sup>2</sup>  
 Housing: metal / plastic, IP67



Bus-out



suitable for our series:

5858 / 5878  
 5868 / 5888  
 9080



Terminal assignment

|                    |      |    |      |    |      |                  |
|--------------------|------|----|------|----|------|------------------|
| Pin male contacts: | 1    | 2  | 3    | 4  | 5    | PH <sup>2)</sup> |
| Wire color:        | n.c. | GN | n.c. | RD | n.c. | PH <sup>2)</sup> |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
 (available from 1 piece) 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

**05.00.6011.3411.002M**  
**05.00.6011.3411.005M**  
**05.00.6011.3411.010M**  
**05.00.6011.3411.015M**

other cable lengths  
 (minimum order quantity 4 pieces)

**05.00.6011.3411.0xxM**

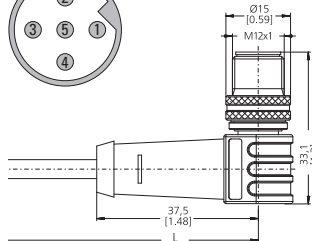
xx = length in meters:  
 1, 3, 8, 12, 20, 25, 30

**Male connector with external thread + single-ended**  
**B coded, right-angle**

Cable: PUR, 2 x 0.34 mm<sup>2</sup>  
 Housing: metal / plastic, IP67



Bus-out



suitable for our series:

5858 / 5878  
 5868 / 5888  
 9080



Terminal assignment

|                    |      |    |      |    |      |                  |
|--------------------|------|----|------|----|------|------------------|
| Pin male contacts: | 1    | 2  | 3    | 4  | 5    | PH <sup>2)</sup> |
| Wire color:        | n.c. | GN | n.c. | RD | n.c. | PH <sup>2)</sup> |

cable length <sup>1)</sup>

standard cable length 2 m [6.56']  
 (available from 1 piece) 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

**05.00.6011.3511.002M**  
**05.00.6011.3511.005M**  
**05.00.6011.3511.010M**  
**05.00.6011.3511.015M**

other cable lengths  
 (minimum order quantity 4 pieces)

**05.00.6011.3511.0xxM**


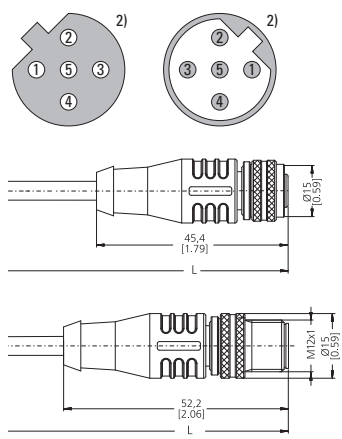


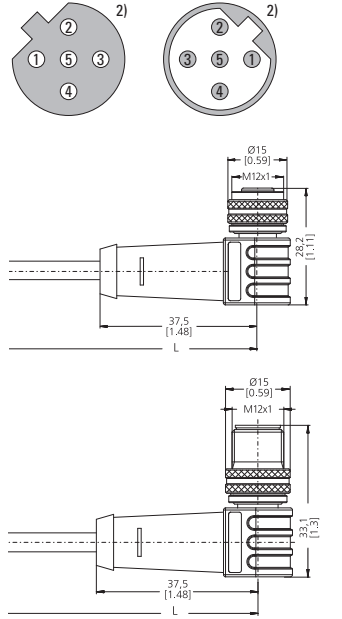

xx = length in meters:  
 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
 2) Shield on housing.

# Connection technology

## M12 connection technology

## Cordsets, pre-assembled

| With connector, 5 pin   |   | Working temp. -30°C ... +80°C [-22°F ... +176°F]   | Order no.  |
|---|---|--|--|
| <p><b>Female connector with coupling nut + male connector with external thread B coded, straight</b></p> <p>Cable: PUR, 2 x 0.34 mm<sup>2</sup><br/>Housing: metal / plastic, IP67</p>       | <p>Bus in / out</p>    | <p>suitable for our series:</p> <p>5858 / 5878<br/>5868 / 5888<br/>9080</p>  <p><i>cable length</i><sup>1)</sup></p> <p>standard cable length 2 m [6.56']<br/>(available from 1 piece) 5 m [16.40']<br/>10 m [32.81']<br/>15 m [49.21']</p> <p>other cable lengths<br/>(minimum order quantity 4 pieces)</p>   | <p><b>05.00.6011.3432.002M</b><br/><b>05.00.6011.3432.005M</b><br/><b>05.00.6011.3432.010M</b><br/><b>05.00.6011.3432.015M</b></p> <p><b>05.00.6011.3432.0xxM</b><br/>xx = length in meters:<br/>1, 3, 8, 12, 20, 25, 30</p> |
| <p><b>Female connector with coupling nut + male connector with external thread B coded, right-angle</b></p> <p>Cable: PUR, 2 x 0.34 mm<sup>2</sup><br/>Housing: metal / plastic, IP67</p>  | <p>Bus in / out</p>  | <p>suitable for our series:</p> <p>5858 / 5878<br/>5868 / 5888<br/>9080</p>  <p><i>cable length</i><sup>1)</sup></p> <p>standard cable length 2 m [6.56']<br/>(available from 1 piece) 5 m [16.40']<br/>10 m [32.81']<br/>15 m [49.21']</p> <p>other cable lengths<br/>(minimum order quantity 4 pieces)</p> | <p><b>05.00.6011.3533.002M</b><br/><b>05.00.6011.3533.005M</b><br/><b>05.00.6011.3533.010M</b><br/><b>05.00.6011.3533.015M</b></p> <p><b>05.00.6011.3533.0xxM</b><br/>xx = length in meters:<br/>1, 3, 8, 12, 20, 25, 30</p> |

1) Other cable lengths on request.  
2) Shield on housing.

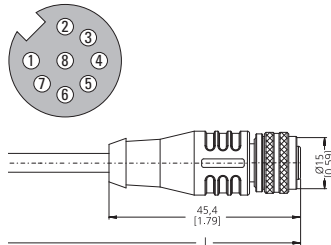
# Connection technology

## M12 connection technology Cordsets, pre-assembled

With connector, 8 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Female connector with coupling nut + single-ended A coded, straight**

Cable: PVC, 8 x 0.25 mm<sup>2</sup> [AWG23]  
Housing: metal / plastic, IP67



Terminal assignment

|                      |    |    |    |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | PH <sup>2)</sup> |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | PH <sup>2)</sup> |

suitable for our series:

|               |                   |
|---------------|-------------------|
| 3610 / 3620   | KIS50 / KIH50     |
| 5000 / 5020   | 5006 / 5026       |
| 5814 / 5834   | 5814FSx / 5834FSx |
| 5821          | A020 / A02H       |
| F3653 / F3673 | 5853 / 5873       |
| 5876          |                   |
| M3663 / M3683 | M3663R / M3683R   |
| F3663 / F3683 | F5863 / F5883     |
| 5863 / 5883   | F5883M            |

cable length <sup>1)</sup>

|                          |               |
|--------------------------|---------------|
| standard cable length    | 2 m [6.56']   |
| (available from 1 piece) | 5 m [16.40']  |
|                          | 10 m [32.81'] |
|                          | 15 m [49.21'] |

**05.00.6041.8211.002M**  
**05.00.6041.8211.005M**  
**05.00.6041.8211.010M**  
**05.00.6041.8211.015M**

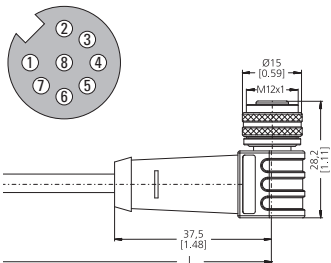
other cable lengths  
(minimum order quantity 4 pieces)

**05.00.6041.8211.0xxM**

xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

**Female connector with coupling nut + single-ended A coded, right-angle**

Cable: PVC, 8 x 0.25 mm<sup>2</sup> [AWG23]  
Housing: metal / plastic, IP67



Terminal assignment

|                      |    |    |    |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | PH <sup>2)</sup> |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | PH <sup>2)</sup> |

suitable for our series:

|               |                   |
|---------------|-------------------|
| 3610 / 3620   | 5000 / 5020       |
| 5814 / 5834   | 5814FSx / 5834FSx |
| 5006 / 5026   | 5821              |
| A020 / A02H   |                   |
| F3653 / F3673 | 5853 / 5873       |
| 5876          |                   |
| M3663 / M3683 | M3663R / M3683R   |
| F3663 / F3683 | F5863 / F5883     |
| 5863 / 5883   |                   |

cable length <sup>1)</sup>

|                          |               |
|--------------------------|---------------|
| standard cable length    | 2 m [6.56']   |
| (available from 1 piece) | 5 m [16.40']  |
|                          | 10 m [32.81'] |
|                          | 15 m [49.21'] |

**05.00.6041.8311.002M**  
**05.00.6041.8311.005M**  
**05.00.6041.8311.010M**  
**05.00.6041.8311.015M**

other cable lengths  
(minimum order quantity 4 pieces)

**05.00.6041.8311.0xxM**

xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology


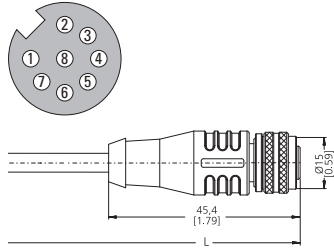
## M12 connection technology

## Cordsets, pre-assembled

**With connector, 8 pin** Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Female connector with coupling nut + single-ended**  
**A coded, straight**

Cable: PUR, 8 x 0.25 mm<sup>2</sup> [AWG23]  
 Housing: metal / plastic, IP67

suitable for our series:

|               |                   |
|---------------|-------------------|
| 3610 / 3620   | 5000 / 5020       |
| 5814 / 5834   | 5814FSx / 5834FSx |
| 5006 / 5026   | 5821              |
| A020 / A02H   |                   |
| F3653 / F3673 |                   |
| 5853 / 5873   |                   |
| M3663 / M3683 | M3663R / M3683R   |
| F3663 / F3683 | F5863 / F5883     |
| 5863 / 5883   | M5863             |
| 5876          |                   |

*cable length*<sup>1)</sup>

|                          |               |                             |                             |
|--------------------------|---------------|-----------------------------|-----------------------------|
| standard cable length    | 2 m [6.56']   | <b>05.00.6051.8211.002M</b> |                             |
| (available from 1 piece) | 5 m [16.40']  |                             | <b>05.00.6051.8211.005M</b> |
|                          | 10 m [32.81'] |                             | <b>05.00.6051.8211.010M</b> |
|                          | 15 m [49.21'] |                             | <b>05.00.6051.8211.015M</b> |

other cable lengths  
 (minimum order quantity 4 pieces)


**05.00.6051.8211.0xxM**  
 xx = length in meters:  
 1, 3, 8, 12, 20, 25, 30

**Terminal assignment**

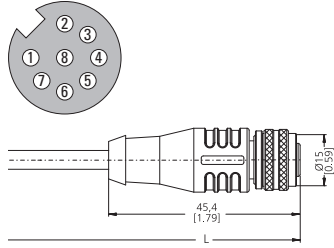
|                      |    |    |    |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | PH <sup>2)</sup> |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | PH <sup>2)</sup> |

**Female connector with coupling nut + single-ended**  
**A coded, straight**

Cable: PUR, 4 x 2 x 0.25 mm<sup>2</sup> [AWG23]  
 Housing: metal / plastic, IP67



**Twisted-pair cables - for particularly interference-free transmission**



suitable for our series with RS422, RS485 or SinCos output:

|               |                   |
|---------------|-------------------|
| 3610 / 3620   | 5000 / 5020       |
| 5814 / 5834   | 5814FSx / 5834FSx |
| 5006 / 5026   | 5821              |
| A020 / A02H   |                   |
| F3653 / F3673 |                   |
| 5853 / 5873   |                   |
| M3663 / M3683 | M3663R / M3683R   |
| F3663 / F3683 | F5863 / F5883     |
| 5863 / 5883   | 5876              |

*cable length*<sup>1)</sup>

|                          |               |                             |                             |
|--------------------------|---------------|-----------------------------|-----------------------------|
| standard cable length    | 2 m [6.56']   | <b>05.00.60E1.8211.002M</b> |                             |
| (available from 1 piece) | 5 m [16.40']  |                             | <b>05.00.60E1.8211.005M</b> |
|                          | 10 m [32.81'] |                             | <b>05.00.60E1.8211.010M</b> |
|                          | 15 m [49.21'] |                             | <b>05.00.60E1.8211.015M</b> |

other cable lengths  
 (minimum order quantity 4 pieces)

**05.00.60E1.8211.0xxM**  
 xx = length in meters:  
 1, 3, 8, 12, 20, 25, 30

**Terminal assignment**

|                      |    |    |    |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | PH <sup>2)</sup> |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | PH <sup>2)</sup> |

1) Other cable lengths on request.  
 2) Shield on housing.

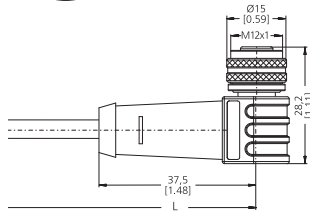
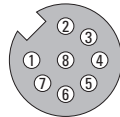
# Connection technology

## M12 connection technology Cordsets, pre-assembled

**With connector, 8 pin** Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

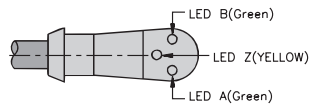
**Female connector with coupling nut + single-ended A coded, right-angle with integrated control LEDs**

Cable: PVC, 8 x 0.25 mm<sup>2</sup> [AWG23]  
Housing: metal / plastic, IP67



suitable for our series:

|             |      |
|-------------|------|
| 3610 / 3620 | 5006 |
| 5000 / 5020 | 5821 |
| A020        | A02H |



**Terminal assignment**

|                      |    |    |    |    |    |    |    |    |                  |
|----------------------|----|----|----|----|----|----|----|----|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | PH <sup>2)</sup> |
| Wire color:          | WH | BN | YE | GN | PK | GY | RD | BU | PH <sup>2)</sup> |

**cable length <sup>1)</sup>**

2 m [6.56']  
5 m [16.40']  
10 m [32.81']  
15 m [49.21']

**05.E-WKC 8T-PX3-930-0002**  
**05.E-WKC 8T-PX3-930-0005**  
**05.E-WKC 8T-PX3-930-0010**  
**05.E-WKC 8T-PX3-930-0015**

1) Other cable lengths on request.  
2) Shield on housing.

## M12 connection technology

## Cordsets, pre-assembled

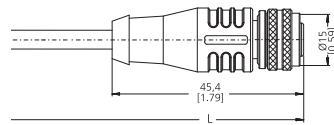
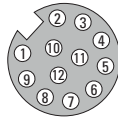
With connector, 12 pin

Working temp. -30°C ... +90°C [-22°F ... +194°F]

Order no.

**Female connector with coupling nut + single-ended**  
**A coded, straight**

Cable: PUR, 6 x 2 x 0.14 mm<sup>2</sup>  
 Housing: metal / plastic, IP67



suitable for our series:

LA10

### Terminal assignment

|                      |    |    |    |    |    |    |    |    |    |    |       |       |       |
|----------------------|----|----|----|----|----|----|----|----|----|----|-------|-------|-------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11    | 12    | PH 2) |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY/PK | RD/BU | PH 2) |

### cable length <sup>1)</sup>

|                          |               |
|--------------------------|---------------|
| standard cable length    | 2 m [6.56']   |
| (available from 1 piece) | 5 m [16.40']  |
|                          | 10 m [32.81'] |
|                          | 15 m [49.21'] |

other cable lengths  
 (minimum order quantity 4 pieces)

**05.00.60B1.B211.002M**  
**05.00.60B1.B211.005M**  
**05.00.60B1.B211.010M**  
**05.00.60B1.B211.015M**


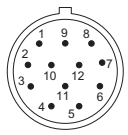
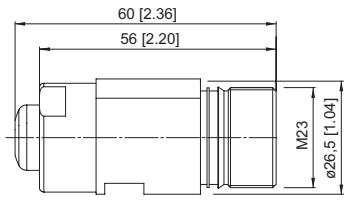

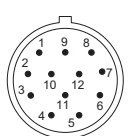
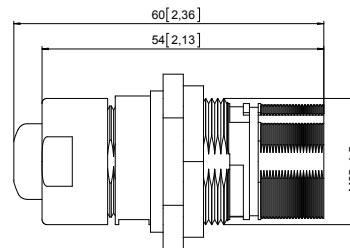


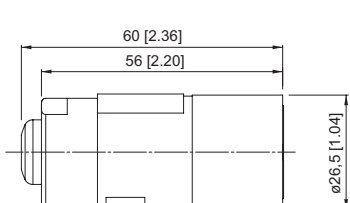
**05.00.60B1.B211.0xxM**

xx = length in meters:  
 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
 2) Shield on housing.



# Connection technology

| M23 connection technology  |  | Connectors, self-assembly  |                                | Order no. |
|--|--|--|--------------------------------|-----------|
| <b>12 pin</b>  |  |  |                                |           |
| <p><b>Male connector with external thread</b><br/>pin assignment ccw</p> <p>Housing: metal, IP67</p>                          | <p>solder connections,<br/>for cable <math>\varnothing</math> 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>       | <p>suitable for:</p> <p>versions with cable outlet</p>   | <p><b>8.0000.5015.0001</b></p> |           |
| <p><b>Male connector with external thread</b><br/>pin assignment ccw<br/>central fastening</p> <p>Housing: metal, IP67</p>  | <p>solder connections,<br/>for cable <math>\varnothing</math> 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>    | <p>suitable for:</p> <p>versions with cable outlet</p>   | <p><b>8.0000.5015.0000</b></p> |           |
| <p><b>Female connector with coupling nut</b><br/>pin socket assignment cw</p> <p>Housing: metal, IP67</p>                   | <p>solder connections,<br/>for cable <math>\varnothing</math> 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>   | <p>suitable for:</p> <p>KIS50 / KIH50 5000 / 5020<br/>5814 / 5834 5814FSx / 5834FSx<br/>580X / 582X</p> <p>F5863 / F5883 F5883M<br/>585x / 587x 5853FSx / 5873FSx<br/>586x / 588x 5863FSx / 5883FSx<br/>9000 908x<br/>A02x</p> | <p><b>8.0000.5012.0000</b></p> |           |

# Connection technology

## M23 connection technology Connectors, self-assembly

**17 pin** Order no.

**Female connector with coupling nut  
pin socket assignment ccw**

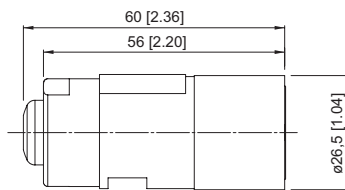
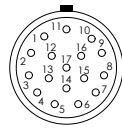
Housing: metal, IP67

solder connections,  
for cable  $\varnothing$  5.5 ... 10.5 mm [0.22 ... 0.41"]

suitable for:

5850 / 5870  
5852 / 5872

**8.0000.5042.0000**



# Connection technology

## M23 connection technology Cordsets, pre-assembled

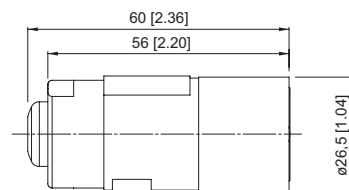
With connector, 12 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

### Female connector with coupling nut + single-ended

Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
Housing: metal, IP67



### pin socket assignment cw



suitable for our series with RS422 or SinCos output:

|                           |                                 |
|---------------------------|---------------------------------|
| KIS50 / KIH50             | 5000 / 5020                     |
| 5805 / 5825 <sup>3)</sup> |                                 |
| 5814 / 5834               | 5814FSx / 5834FSx <sup>3)</sup> |
| A020 / A02H               | H120                            |

### Terminal assignment

|                      |    |       |    |    |    |    |   |    |   |    |       |    |                  |
|----------------------|----|-------|----|----|----|----|---|----|---|----|-------|----|------------------|
| Pin female contacts: | 1  | 2     | 3  | 4  | 5  | 6  | 7 | 8  | 9 | 10 | 11    | 12 | PH <sup>2)</sup> |
| Wire color:          | PK | RD-BU | BU | RD | GN | YE | - | GY | - | WH | GY-PK | BN | PH <sup>2)</sup> |

|   |                            |               |
|---|----------------------------|---------------|
| standard cable length<br>(available from 1 piece) | cable length <sup>1)</sup> | 2 m [6.56']   |
|   |                            | 5 m [16.40']  |
|   |                            | 10 m [32.81'] |
|   |                            | 15 m [49.21'] |

other cable lengths  
(available from 1 piece)

**8.0000.6901.0002**  
**8.0000.6901.0005**  
**8.0000.6901.0010**  
**8.0000.6901.0015**

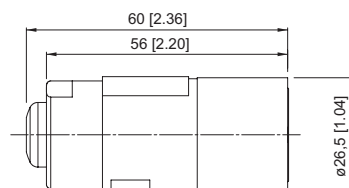
**8.0000.6901.00xx**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

### Female connector with coupling nut + single-ended

Cable: PUR, 10 x 0.14 mm<sup>2</sup> [AWG25] +  
2 x 0.5 mm<sup>2</sup> [AWG20]  
Housing: metal, IP67



### pin socket assignment cw



suitable for our series with RS422 or SinCos output:

|                             |                           |
|-----------------------------|---------------------------|
| KIS50 / KIH50 <sup>3)</sup> | 5000 / 5020 <sup>3)</sup> |
| 5803 / 5823                 | 5804 / 5824               |
| 5805 / 5825                 |                           |
| 5814 / 5834 <sup>3)</sup>   | 5814FSx / 5834FSx         |
| A020 / A02H <sup>3)</sup>   | H120 <sup>3)</sup>        |

### Terminal assignment

|                      |    |    |    |    |    |    |   |    |   |                           |                           |                           |                  |
|----------------------|----|----|----|----|----|----|---|----|---|---------------------------|---------------------------|---------------------------|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8  | 9 | 10                        | 11                        | 12                        | PH <sup>2)</sup> |
| Wire color:          | PK | BN | BU | RD | GN | YE | - | GY | - | WH<br>0.5 mm <sup>2</sup> | WH<br>0.5 mm <sup>2</sup> | BN<br>0.5 mm <sup>2</sup> | PH <sup>2)</sup> |

|   |                            |               |
|---|----------------------------|---------------|
| standard cable length<br>(available from 1 piece) | cable length <sup>1)</sup> | 2 m [6.56']   |
|   |                            | 5 m [16.40']  |
|   |                            | 10 m [32.81'] |
|   |                            | 15 m [49.21'] |

other cable lengths  
(available from 1 piece)

**8.0000.6101.0002**  
**8.0000.6101.0005**  
**8.0000.6101.0010**  
**8.0000.6101.0015**

**8.0000.6101.00xx**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
2) Shield on housing.  
3) Connector color assignment is different from encoder color assignment.

# Connection technology



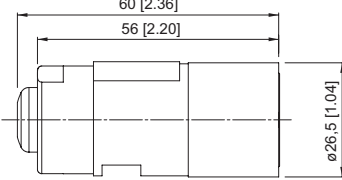
## M23 connection technology

## Cordsets, pre-assembled

**With connector, 12 pin** Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Female connector with coupling nut + single-ended** pin socket assignment cw

Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
Housing: metal, IP67

suitable for our series with SSI or analog output:

|               |                   |
|---------------|-------------------|
| 5850 / 5870   |                   |
| F5863 / F5883 | F5883M            |
| 5853 / 5873   | 5853FSx / 5873FSx |
| 5863 / 5883   | 5863FSx / 5883FSx |
| 9081          |                   |

**Terminal assignment**

|                      |    |    |    |    |    |    |    |    |    |    |       |       |                  |
|----------------------|----|----|----|----|----|----|----|----|----|----|-------|-------|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11    | 12    | PH <sup>2)</sup> |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY-PK | RD-BU | PH <sup>2)</sup> |



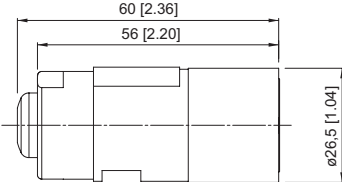
*cable length<sup>1)</sup>*

|   |               |   |                              |
|---|---------------|---|------------------------------|
| standard cable length                           | 2 m [6.56']   | <b>8.0000.6901.0002.0031</b>                      |                              |
| (available from 1 piece)                        | 5 m [16.40']  |   | <b>8.0000.6901.0005.0031</b> |
|   | 10 m [32.81'] |   | <b>8.0000.6901.0010.0031</b> |
|   | 15 m [49.21'] |   | <b>8.0000.6901.0015.0031</b> |
| other cable lengths<br>(available from 1 piece) |               | <b>8.0000.6901.00xx.0031</b>                      |                              |
|   |               | xx = length in meters:<br>1, 3, 8, 12, 20, 25, 30 |                              |

**With connector, 12 pin** Working temp. -40°C ... +135°C [-40°F ... +275°F] Order no.

**Female connector with coupling nut + single-ended** pin socket assignment cw

Cable: TPE, 5 x 2 x 0,14 mm<sup>2</sup> [AWG25]  
+ 2 x 0,5 mm<sup>2</sup> [AWG20]  
Housing: metal, IP67

suitable for our series with RS422 or SinCos output:

|                             |                           |
|-----------------------------|---------------------------|
| KIS50 / KIH50 <sup>3)</sup> | 5000 / 5020 <sup>3)</sup> |
| 5803 / 5823                 | 5804 / 5824               |
| 5805 / 5825                 |                           |
| 5814 / 5834 <sup>3)</sup>   | 5814FSx / 5834FSx         |
| A020 / A02H <sup>3)</sup>   | H120 <sup>3)</sup>        |

**Terminal assignment**

|                      |    |    |    |    |    |    |   |    |   |                           |    |                           |                  |
|----------------------|----|----|----|----|----|----|---|----|---|---------------------------|----|---------------------------|------------------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8  | 9 | 10                        | 11 | 12                        | PH <sup>2)</sup> |
| Wire color:          | PK | BN | BU | RD | GN | YE | - | GY | - | WH<br>0.5 mm <sup>2</sup> | WH | BN<br>0.5 mm <sup>2</sup> | PH <sup>2)</sup> |

*cable length<sup>1)</sup>*

|   |               |   |                         |
|---|---------------|---|-------------------------|
| standard cable length                           | 2 m [6.56']   | <b>8.0000.6E01.0002</b>                           |                         |
| (available from 1 piece)                        | 5 m [16.40']  |   | <b>8.0000.6E01.0005</b> |
|   | 10 m [32.81'] |   | <b>8.0000.6E01.0010</b> |
|   | 15 m [49.21'] |   | <b>8.0000.6E01.0015</b> |
| other cable lengths<br>(available from 1 piece) |               | <b>8.0000.6E01.00xx</b>                           |                         |
|   |               | xx = length in meters:<br>1, 3, 8, 12, 20, 25, 30 |                         |

1) Other cable lengths on request.  
2) Shield on housing.  
3) Connector color assignment is different from encoder color assignment.

# Connection technology

## M23 connection technology Cordsets, pre-assembled

With connector, 12 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

### Female connector with coupling nut + male connector with external thread

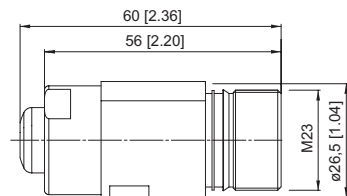
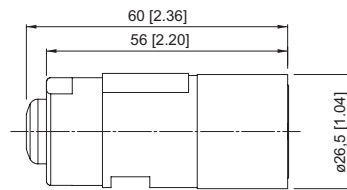
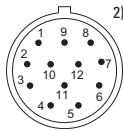
Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
Housing: metal, IP67



### pin socket assignment cw



### pin socket assignment ccw



suitable for our series:

- 5000 / 5020 5803 / 5823
- 5804 / 5824 5805 / 5825
- 5814 / 5834 5814FSx / 5834FSx
- A020 / A02H H120

*cable length*<sup>1)</sup>

- standard cable length 2 m [6.56']
- (available from 1 piece) 5 m [16.40']
- 10 m [32.81']
- 15 m [49.21']

other cable lengths  
(available from 1 piece)

- 8.0000.6905.0002**
- 8.0000.6905.0005**
- 8.0000.6905.0010**
- 8.0000.6905.0015**

**8.0000.6905.00xx**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

### Female connector with coupling nut + male connector with external thread

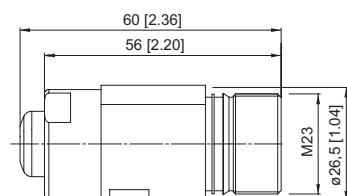
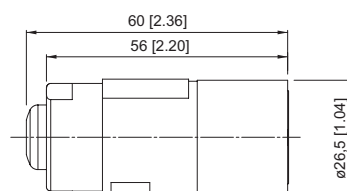
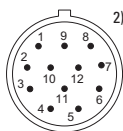
Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
Housing: metal, IP67



### pin socket assignment cw



### pin socket assignment ccw



suitable for our series:

- 5850 / 5870 F5863 / F5883
- 5853 / 5873 5853FSx / 5873FSx
- 5863 / 5883 5863FSx / 5883FSx
- 9081

*cable length*<sup>1)</sup>

- standard cable length 2 m [6.56']
- (available from 1 piece) 5 m [16.40']
- 10 m [32.81']
- 15 m [49.21']

other cable lengths  
(available from 1 piece)

- 8.0000.6905.0002.0.032**
- 8.0000.6905.0005.0.032**
- 8.0000.6905.0010.0.032**
- 8.0000.6905.0015.0.032**

**8.0000.6905.00xx.0032**  
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology

## M23 connection technology

## Cordsets, pre-assembled

With connector, 17 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

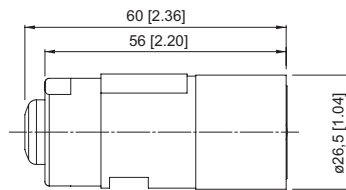
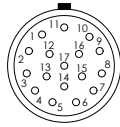
Order no.

**Female connector with coupling nut + single-ended**

Cable: PVC, 18 x 0.14 mm<sup>2</sup> [AWG25]  
Housing: metal, IP67



pin socket assignment ccw



suitable for our series:

5850 / 5870  
5852 / 5872

*cable length <sup>1)</sup>*

standard cable length    2 m [6.56']  
(available from 1 piece)    5 m [16.40']  
10 m [32.81']  
15 m [49.21']

other cable lengths  
(available from 1 piece)

**8.0000.6741.0002**  
**8.0000.6741.0005**  
**8.0000.6741.0010**  
**8.0000.6741.0015**

**8.0000.6741.00xx**


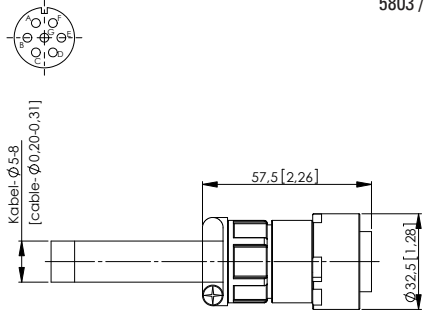

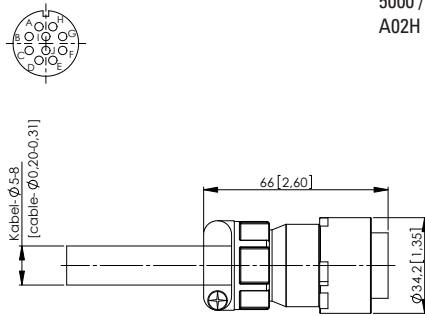
xx = length in meters:  
1, 3, 8, 12, 20, 25, 30

*Terminal assignment*

|                      |    |    |    |    |    |    |    |    |    |    |       |       |       |       |       |       |       |
|----------------------|----|----|----|----|----|----|----|----|----|----|-------|-------|-------|-------|-------|-------|-------|
| Pin female contacts: | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11    | 12    | 13    | 14    | 15    | 16    | 17    |
| Wire color:          | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY-PK | RD-BU | WH-GN | BN-GN | WH-YE | YE-BN | WH-GY |

1) Other cable lengths on request.

# Connection technology

| MIL connection technology  |   | Connectors, self-assembly   |  | Order no.               |
|--|---|---|--|-------------------------|
| <b>7 pin</b>   |   |   |  |                         |
| <b>Female connector with coupling nut</b><br><br>Housing: metal, IP67              | solder connections,<br>for cable $\varnothing$ 5 ... 8 mm [0.20 ... 0.32"]  | suitable for our series:<br><br>5803 / 5823                                       |  | <b>8.0000.5052.0000</b> |
|   |   |   |  |                         |
| <b>10 pin</b>  |   |   |  |                         |
| <b>Female connector with coupling nut</b><br><br>Housing: metal, IP67              | solder connections,<br>for cable $\varnothing$ 5 ... 8 mm [0.20 ... 0.32"]  | suitable for our series:<br><br>5000 / 5020    5803 / 5823<br>A02H            LM3 |  | <b>8.0000.5062.0000</b> |
|  |  |   |  |                         |

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

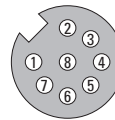
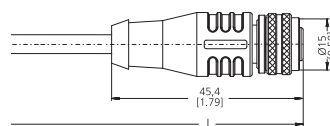
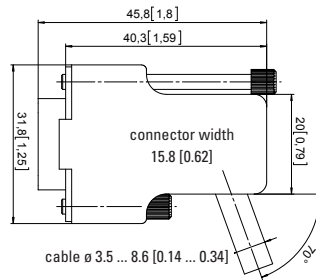
Order no.

**Sub-D male connector, 9 pin, cable outlet 70° + M12 female connector with coupling nut, 8 pin, A coded**

Cable: PVC, 3 x 2 x 0.25 mm<sup>2</sup> [AWG 23]  
 Housing Sub-D: ABS, metalized, IP20  
 Housing M12: metal / plastic, IP67

suitable for our series:

5000 / 5020    5006 / 5026  
 5814 / 5834    5814FSx / 5834FSx  
 5821  
 SMC1, SMC2



*Terminal assignment*

|   |   |   |   |   |   |   |       |
|---|---|---|---|---|---|---|-------|
| Pin Sub-D:  | 5 | 4 | 1 | 9 | 3 | 2 | PH 2) |
| Pin M12:  | 1 | 2 | 3 | 4 | 5 | 6 | PH 2) |
| pins arranged below each other are connected internally |   |   |   |   |   |   |       |

for terminal X6, X7  
 at SMC1, SMC2

*cable length 1)*

2 m [6.56']  
 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

**8.0000.6V00.0002.0084**  
**8.0000.6V00.0005.0084**  
**8.0000.6V00.0010.0084**  
**8.0000.6V00.0015.0084**

1) Other cable lengths on request.  
 2) Shield on housing.



# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

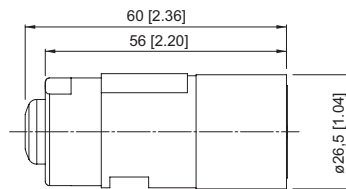
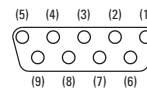
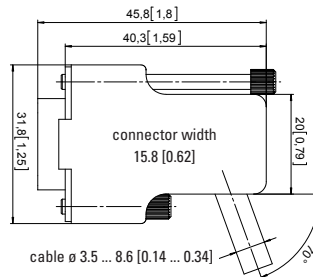
With Sub-D connector + M23 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Sub-D female connector, 9-pin, cable outlet 70°  
+ M23 female connector with coupling nut,  
12 pin**

Cable: PVC, 3 x 2 x 0.25 mm<sup>2</sup> [AWG 23]  
Housing Sub-D: ABS, metalized, IP20  
Housing M23: metal, IP67

suitable for our series:

5000 / 5020    5006 / 5026  
5814 / 5834    5814FSx / 5834FSx  
5821  
SMC1, SMC2



pin socket assignment cw

### Terminal assignment

|   |    |    |   |   |   |   |                  |
|---|----|----|---|---|---|---|------------------|
| Pin Sub-D:  | 5  | 4  | 1 | 9 | 3 | 2 | PH <sup>2)</sup> |
| Pin M23:  | 10 | 12 | 5 | 6 | 8 | 1 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |    |    |   |   |   |   |                  |

for terminal X6, X7  
at SMC1, SMC2

### cable length <sup>1)</sup>

2 m [6.56']  
5 m [16.40']  
10 m [32.81']  
15 m [49.21']

**8.0000.6V00.0002.0085**  
**8.0000.6V00.0005.0085**  
**8.0000.6V00.0010.0085**  
**8.0000.6V00.0015.0085**

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

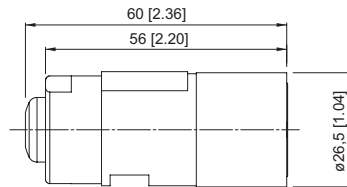
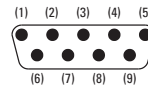
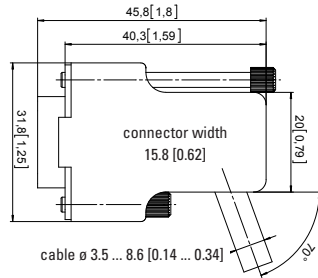
Order no.

**Sub-D male connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin**

Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
 Housing Sub-D: ABS, metalized, IP20  
 Housing M23: metal, IP67

suitable for our series:

5853 / 5873    5853FSx / 5873FSx  
 5863 / 5883    5863FSx / 5883FSx  
 F5863 / F5883



### Terminal assignment

|   |   |   |   |   |   |   |                  |
|---|---|---|---|---|---|---|------------------|
| Pin Sub-D:  | 2 | 9 | 8 | 4 | 5 | 6 | PH <sup>2)</sup> |
| Pin M23:  | 1 | 2 | 3 | 4 | 5 | 6 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |   |                  |

|   |   |   |   |   |   |   |                  |
|---|---|---|---|---|---|---|------------------|
| Pin Sub-D:  | 2 | 9 | 3 | 7 | 5 | 6 | PH <sup>2)</sup> |
| Pin M23:  | 1 | 2 | 3 | 4 | 5 | 6 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |   |                  |

### cable length<sup>1)</sup>

|               |                              |
|---------------|------------------------------|
| 2 m [6.56']   | <b>8.0000.6900.0002.0068</b> |
| 5 m [16.40']  | <b>8.0000.6900.0005.0068</b> |
| 10 m [32.81'] | <b>8.0000.6900.0010.0068</b> |
| 15 m [49.21'] | <b>8.0000.6900.0015.0068</b> |
| 2 m [6.56']   | <b>8.0000.6900.0002.0072</b> |
| 5 m [16.40']  | <b>8.0000.6900.0005.0072</b> |
| 10 m [32.81'] | <b>8.0000.6900.0010.0072</b> |
| 15 m [49.21'] | <b>8.0000.6900.0015.0072</b> |

1) Other cable lengths on request.  
 2) Shield on housing.

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

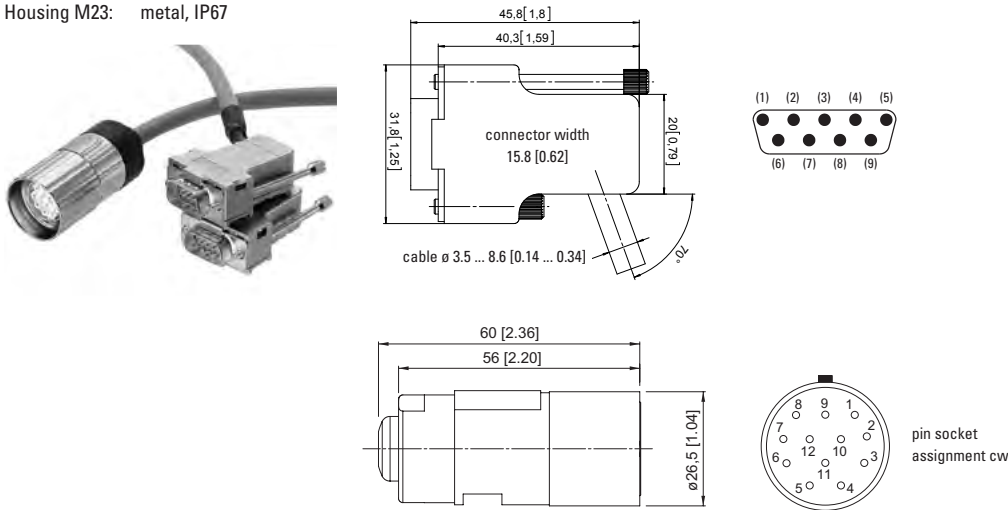
With Sub-D connector + M23 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**2 x Sub-D male connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin**

Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
 Housing Sub-D: ABS, metalized, IP20  
 Housing M23: metal, IP67

suitable for our series:

5853 / 5873    5853FSx / 5873FSx  
 5863 / 5883    5863FSx / 5883FSx



### Terminal assignment

|   |   |   |   |   |   |   |   |    |    |    |                  |
|---|---|---|---|---|---|---|---|----|----|----|------------------|
| Pin Sub-D 1:  | 2 | 9 | 3 | 7 | 5 | 6 | - | -  | -  | -  | PH <sup>2)</sup> |
| Pin Sub-D 2:  | - | - | - | - | - | - | 8 | 4  | 5  | 6  | PH <sup>2)</sup> |
| Pin M23:  | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 10 | 11 | 12 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |   |   |    |    |    |                  |

cable length<sup>1)</sup>

2 m [6.56']  
 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

**8.0000.6900.0002.0070**  
**8.0000.6900.0005.0070**  
**8.0000.6900.0010.0070**  
**8.0000.6900.0015.0070**

1) Other cable lengths on request.  
 2) Shield on housing.

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

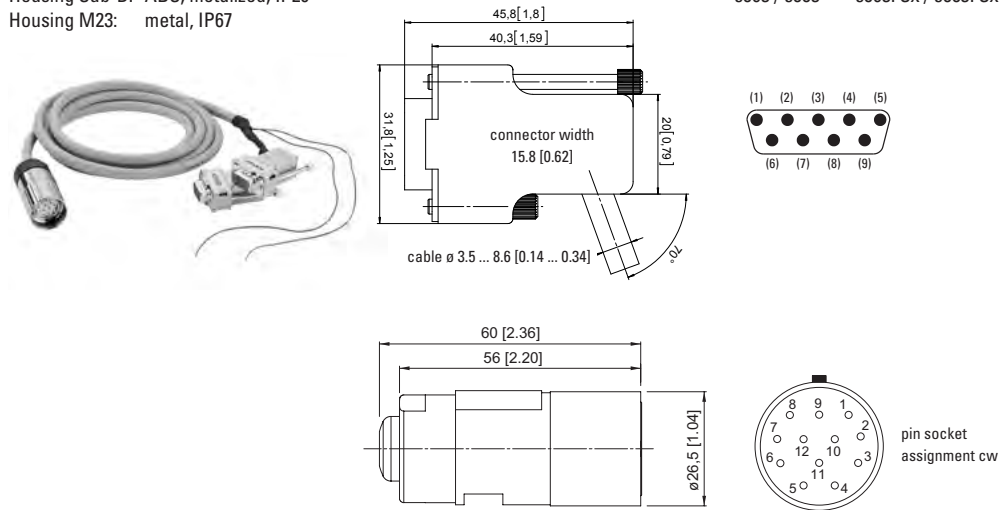
Order no.

2 x Sub-D male connector, 9-pin with SET and DIR, cable outlet 70° + M23 female connector with coupling nut, 12 pin

Cable: PVC, 6 x 2 x 0.14 mm<sup>2</sup> [AWG25]  
 Housing Sub-D: ABS, metalized, IP20  
 Housing M23: metal, IP67

suitable for our series:

5853 / 5873    5853FSx / 5873FSx  
 5863 / 5883    5863FSx / 5883FSx



### Terminal assignment

|   |   |   |   |   |   |   |           |           |   |    |    |                  |                  |
|---|---|---|---|---|---|---|-----------|-----------|---|----|----|------------------|------------------|
| Pin Sub-D 1:  | 2 | 9 | 3 | 7 | 5 | 6 | -         | -         | - | -  | -  | PH <sup>2)</sup> |                  |
| Pin Sub-D 2:  | - | - | - | - | - | - | -         | 8         | 4 | 5  | 6  | PH <sup>2)</sup> |                  |
| Pin M23:  | 1 | 2 | 3 | 4 | 5 | 6 | 7         | 8         | 9 | 10 | 11 | 12               | PH <sup>2)</sup> |
| Wire color:   |   |   |   |   |   |   | BU<br>SET | RD<br>DIR |   |    |    |                  |                  |
| pins arranged below each other are connected internally |   |   |   |   |   |   |           |           |   |    |    |                  |                  |

cable length <sup>1)</sup>

|               |                              |
|---------------|------------------------------|
| 2 m [6.56']   | <b>8.0000.6900.0002.0080</b> |
| 5 m [16.40']  | <b>8.0000.6900.0005.0080</b> |
| 10 m [32.81'] | <b>8.0000.6900.0010.0080</b> |
| 15 m [49.21'] | <b>8.0000.6900.0015.0080</b> |

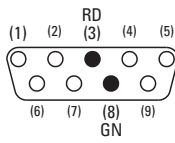
1) Other cable lengths on request.  
 2) Shield on housing.

## Sub-D connection technology Cordsets, pre-assembled

**With Sub-D connector** Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**Sub-D female connector, cable outlet 90° + single-ended**  
**Profibus master with terminating resistor**

Cable: PUR, 2 x 0.34 mm<sup>2</sup> [AWG22]  
 Housing: metal / plastic



suitable for our series:

5858 / 5878  
 5868 / 5888  
 9080  
 SMBU.031  
 SMBS.S31



*Terminal assignment*

|             |   |   |    |   |   |   |   |    |   |                  |
|-------------|---|---|----|---|---|---|---|----|---|------------------|
| Pin Sub-D:  | 1 | 2 | 3  | 4 | 5 | 6 | 7 | 8  | 9 | PH <sup>2)</sup> |
| Wire color: | - | - | RD | - | - | - | - | GN | - |                  |

*cable length<sup>1)</sup>*

|               |                             |
|---------------|-----------------------------|
| 2 m [6.56']   | <b>05.00.6011.5511.002M</b> |
| 5 m [16.40']  | <b>05.00.6011.5511.005M</b> |
| 10 m [32.81'] | <b>05.00.6011.5511.010M</b> |
| 15 m [49.21'] | <b>05.00.6011.5511.015M</b> |

1) Other cable lengths on request.  
 2) Shield on housing.

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

### With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

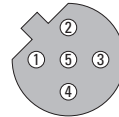
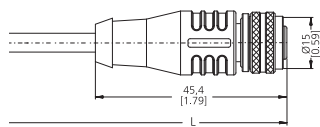
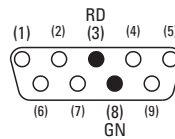
Order no.

**Sub-D male connector, 9 pin, cable outlet 90°** Bus in  
**Profibus master with terminating resistor +**  
**M12 female connector with coupling nut,**  
**5 pin, B coded**

Cable: PUR, 2 x 0.34 mm<sup>2</sup> [AWG22]  
 Housing Sub-D: ABS, metalized  
 Housing M12: metal / plastic

suitable for our series:

5858 / 5878  
 5868 / 5888  
 9080



*Terminal assignment*

|   |   |   |   |   |   |                  |
|---|---|---|---|---|---|------------------|
| Pin Sub-D:  |   | 3 |   | 8 |   | PH <sup>2)</sup> |
| Pin M12:  | 1 | 2 | 3 | 4 | 5 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |                  |

*cable length <sup>1)</sup>*

2 m [6.56']  
 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

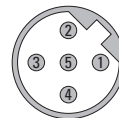
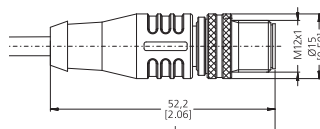
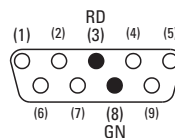
**05.00.6011.5532.002M**  
**05.00.6011.5532.005M**  
**05.00.6011.5532.010M**  
**05.00.6011.5532.015M**

**Sub-D male connector, 9 pin, cable outlet 90°** Bus out  
**Profibus master with terminating resistor +**  
**M12 male connector with external thread,**  
**5 pin, B coded**

Cable: PUR, 2 x 0.34 mm<sup>2</sup> [AWG22]  
 Housing Sub-D: ABS, metalized  
 Housing M12: metal / plastic

suitable for our series:

5858 / 5878  
 5868 / 5888  
 9080



*Terminal assignment*

|   |   |   |   |   |   |                  |
|---|---|---|---|---|---|------------------|
| Pin Sub-D:  |   | 8 |   | 3 |   | PH <sup>2)</sup> |
| Pin M12:  | 1 | 2 | 3 | 4 | 5 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |                  |

*cable length <sup>1)</sup>*

2 m [6.56']  
 5 m [16.40']  
 10 m [32.81']  
 15 m [49.21']

**05.00.6011.5534.002M**  
**05.00.6011.5534.005M**  
**05.00.6011.5534.010M**  
**05.00.6011.5534.015M**

1) Other cable lengths on request.  
 2) Shield on housing.

# Connection technology

## Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector + M12 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

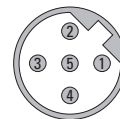
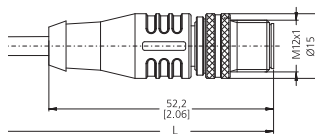
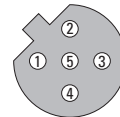
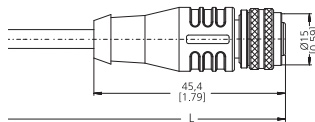
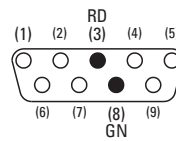
**Sub-D male connector, 9 pin, cable outlet 90°  
Profibus master with terminating resistor +  
M12 male connector with external thread and  
M12 female connector with coupling nut,  
5 pin, B coded**

Bus in, Bus out

suitable for our series:

Cable: PUR, 2 x 0.34 mm<sup>2</sup> [AWG22]  
Housing Sub-D: ABS, metalized  
Housing M12: metal / plastic

5858 / 5878  
5868 / 5888  
9080



### Terminal assignment

|   |   |   |   |   |   |                  |
|---|---|---|---|---|---|------------------|
| Pin Sub-D:  |   | 8 |   | 3 |   | PH <sup>2)</sup> |
| Pin M12 female contacts:                                | 1 | 2 | 3 | 4 | 5 | PH <sup>2)</sup> |
| Pin M12 male contacts:                                  | 1 | 2 | 3 | 4 | 5 | PH <sup>2)</sup> |
| pins arranged below each other are connected internally |   |   |   |   |   |                  |

### cable length<sup>1)</sup>

|                   |                             |
|-------------------|-----------------------------|
| 2 x 2 m [6.56']   | <b>05.00.6012.5536.002M</b> |
| 2 x 5 m [16.40']  | <b>05.00.6012.5536.005M</b> |
| 2 x 10 m [32.81'] | <b>05.00.6012.5536.010M</b> |
| 2 x 15 m [49.21'] | <b>05.00.6012.5536.015M</b> |

1) Other cable lengths on request.  
2) Shield on housing.

# Connection technology

## Optical fiber transmission modules

## Transmitter and receiver

## RS422/HTL

**eco plus**

Cost advantage compared to conventional wiring over 150 m length\*



The solution where signal transmission is difficult.

The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of a normal incremental encoder into a light signal for transmission by means of a glass fiber.

The receiving module converts the optical signal back into electrical signals. Up to 4 channels with inverted signals may be transmitted safely.

### Innovative

- Signal transmission via just a single glass fiber.
- Safe signal transmission up to 2000 m.
- Input frequency up to 400 kHz.
- Input level 10 ... 30 V or RS422.
- Inverted input signals.
- Resists extremely strong electromagnetic fields.

### Compact

- Can be installed even where space is tight.
- Minimal installation depth.
- Connections plug-in HD-Sub D15 or terminal clamp.

### Application areas

- Process control technology and automation technology.
- Applications sensitive to interference.
- High voltage plants.
- Plants with long transmission distances.
- Potential separation.
- Explosive areas.

### Order code

Optical fiber transmitter / receiver

6.LWL X . XX  
a b c

**a**  
 S = Optical fiber transmitter  
 E = Optical fiber receiver

**b** Input or output circuit / Power supply  
 1 = RS422 / 10 ... 30 V DC  
 2 = HTL, without inverted signals / 10 ... 30 V DC (only for optical fiber transmitter)  
 4 = RS422 / 5 V DC  
 5 = HTL / 10 ... 30 V DC, input

**c** Type of connection  
 0 = Terminal clamp  
 1 = Plug-in connector HD-Sub D15

Scope of delivery:  
 - Optical fiber module  
 - Multilingual operating manual

Optical fiber transmitter versions can be combined with any version of the optical fiber receivers.

### Accessories

**Simplex Patch cable  
 ST-ST - Multimode**



Connector:  
 2 x ST/PC, glass fiber:  
 1 x 50/125

Order no.  
**05.B09-B09-821-XXXX**  
  
 XXXX = Length in m  
 Standard lengths: 2 m, 5 m,  
 8 m, 10 m, 15 m, 20 m, ...  
 (in 5 m steps)

**ST Multimode coupling**



Barrel: ceramic, slotted

**05.LWLK.001**

\* Comparison of costs:  
 Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver.



# Connection technology

## Optical fiber transmission modules Transmitter and receiver RS422/HTL

### Technical data

| General technical data   |   |
|--|---|
| Power supply   | 10 ... 30 DC V eg. 5 V DC ±5%   |
| Power consumption per module   | < 2 W   |
| Operating voltage reverse connection protection  | available   |
| Encoder inputs optical fiber transmitter channels  | A, $\bar{A}$ , B, $\bar{B}$ , 0, $\bar{0}$                                |
| Max. input frequency optical fiber transmitter and output frequency optical fiber receiver | 400 kHz   |
| Input level optical fiber transmitter  | 10 ... 30 V or RS 422   |
| Optical wavelength   | 850 nm  |
| Optical transmission rate  | 120 Mbit/s  |
| Optical fiber synchronization display  | LED on the receiver   |
| Optical fiber connection   | ST connector, $\varnothing$ 9 mm [0.35] on the bottom side of the housing |
| Glass fiber  | multimode fiber, 50/125 $\mu$ m, 62.5/125 $\mu$ m                         |

|                                     |                                    |  |
|-------------------------------------|------------------------------------|--|
| Input signals sampling rate         | 10 MSamples/s                      |  |
| Optical fiber transmission distance | max. 2000 m [6561']                |  |
| Dimensions (W x L x H)              | Terminal clamp                     | 22.5 x 110.8 x 88.4 mm [0.89 x 4.36 x 3.48"] |
|                                     | Plug-in connector                  | 19.0 x 110.8 x 88.4 mm [0.75 x 4.36 x 3.48"] |
| Protection acc. to EN 60529         | IP40, terminals IP20               |  |
| Terminals                           |                                    | protected against contact                    |
|                                     | max. conductor diameter            | 2.5 mm <sup>2</sup> [AWG 23]                 |
| Temperature range                   | -10°C ... +60°C [+14°F ... +140°F] |  |
| Weight                              | approx. 95 g [3.35 oz]             |  |

| EMC       |                          |                   |
|-----------|--------------------------|-------------------|
| Standards | Emitted interference     | EN 55011 class B1 |
|           | Immunity to interference | EN 61000-6-2      |

### Terminal assignment

| Type of connection | Terminal clamp, optical fiber transmitter and optical fiber receiver |           |           |                         |   |   |       |           |    |    |                       |        |
|--------------------|--|-----------|-----------|-------------------------|---|---|-------|-----------|----|----|-----------------------|--------|
| 0                  | Signal   | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ ( $\bar{C}$ ) | A | B | 0 (C) | $\bar{D}$ | D  | +V | 0 V linked internally | Shield |
|                    | Terminal   | 1         | 2         | 3                       | 4 | 5 | 6     | 7         | 10 | 8  | 9, 11, 12             | –      |

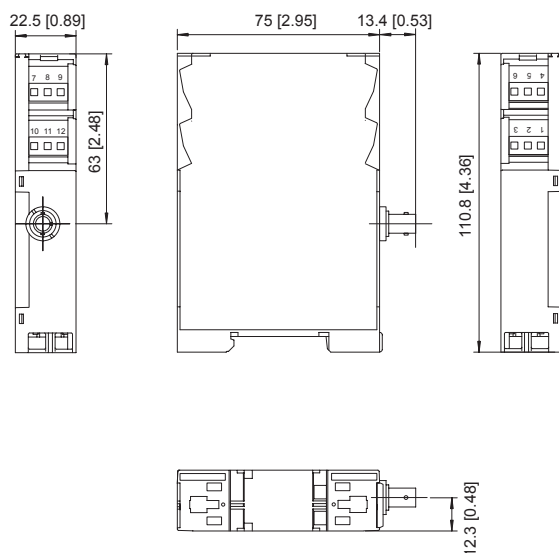
| Type of connection | HD-Sub D15, optical fiber transmitter |           |           |                         |   |   |       |           |   |                              |                       | Terminal |                       |   |
|--------------------|---------------------------------------|-----------|-----------|-------------------------|---|---|-------|-----------|---|------------------------------|-----------------------|----------|-----------------------|---|
| 1                  | Signal                                | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ ( $\bar{C}$ ) | A | B | 0 (C) | $\bar{D}$ | D | +V <sub>out</sub> to encoder | 0 V linked internally | Shield   | 0 V linked internally | +V <sub>out</sub> to encoder, linked internally |
|                    | Terminal                              | 8         | 6         | 3                       | 9 | 7 | 4     | 1         | 2 | 15                           | 11, 12                | 13       | 1                     | 2   |

| Type of connection | HD-Sub D15, optical fiber receiver |           |           |                         |   |   |       |           |   |                               |                       | Terminal |                       |  |
|--------------------|------------------------------------|-----------|-----------|-------------------------|---|---|-------|-----------|---|-------------------------------|-----------------------|----------|-----------------------|--|
| 1                  | Signal                             | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ ( $\bar{C}$ ) | A | B | 0 (C) | $\bar{D}$ | D | +V <sub>in</sub> power supply | 0 V linked internally | Shield   | 0 V linked internally | +V <sub>in</sub> power supply, linked internally |
|                    | Terminal                           | 8         | 6         | 3                       | 9 | 7 | 4     | 1         | 2 | 15                            | 11, 12                | 13       | 1                     | 2  |

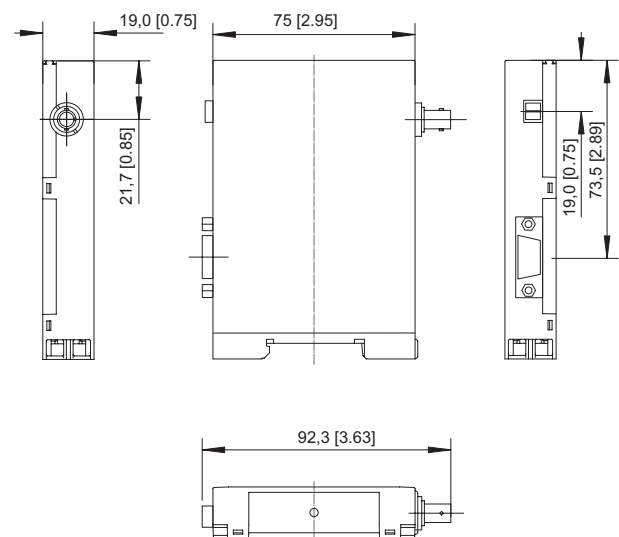
### Dimensions

Dimensions in mm [inch]

#### Terminal clamp



#### Plug-in connector, HD-Sub D15



# Connection technology

|   |                                 |            |
|---|---------------------------------|------------|
| <b>Optical fiber transmission modules</b> | <b>Transmitter and receiver</b> | <b>SSI</b> |
|---|---------------------------------|------------|

**eco plus**  
 Cost advantage compared to conventional wiring over 150 m length\*



### Optical fiber transmission system for SSI absolute encoders

The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of a normal absolute encoder with Synchronous Serial Interface (SSI) into a light signal for transmission by means of an optical fiber. The receiving module converts the optical signal back into electrical signals.

Absolute signals can be transmitted safely through one glass fiber over distances of up to 2000 m. A rotary switch on the front side of the module allows adjusting the SSI clock between 1 and 99 bits.

### Reliable transmission

- Safe signal transmission up to 2000 m.
- Resists extremely strong electro-magnetic fields.

### Easy installation

- Signal transmission via a single glass fiber.
- Clock of 1 ... 99 bit can be set via rotary switch.
- LED for monitoring of power supply and clock.
- DIN-rail mounting – requires min. installation space – only 19 mm wide.

### Application areas

- Process control technology and automation technology.
- Crane systems.
- High voltage plants.
- Heavy industry.
- Wind power plants.
- Drive technology.
- Rolling mills.

### Order code

Optical fiber transmitter / receiver

6.LWLA . XXX  
 a b c

|   |   |   |   |
|---|---|---|---|
| <b>a</b><br>S = Optical fiber transmitter<br>E = Optical fiber receiver | <b>b</b> Power supply<br>1 = 10 ... 30 V DC<br>4 = 5 V DC | <b>c</b> Type of connection<br>0 = Terminal clamp<br>1 = Plug-in connector Sub-D9 | <i>Scope of delivery:</i><br>- Optical fiber transmission module<br>- Operating manual, dual language, German and English |
|---|---|---|---|

| Accessories  | Order no.  |
|--|--|
| <b>Simplex Patch cable</b><br><b>ST-ST - Multimode</b><br> | Connector:<br>2 x ST/PC, glass fiber:<br>1 x 50/125<br><br>XXXX = Length in m<br>Standard lengths: 2 m, 5 m,<br>8 m, 10 m, 15 m, 20 m, ...<br>(in 5 m steps) |
| <b>ST Multimode coupling</b><br>                           | Barrel: ceramic, slotted<br><br><b>05.LWLK.001</b>   |

\* Comparison of costs:  
 Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver

# Connection technology

## Optical fiber transmission modules Transmitter and receiver SSI

### Technical data

| General technical data   |  |
|--|--|
| Power supply   | 10 ... 30 DC V eg. 5 V DC ±5 %   |
| Power consumption per module                                       | < 1 W  |
| Operating voltage reverse connection protection                    | available  |
| Electrical inputs / outputs (Optical fiber transmitter / receiver) | Clock C+ and C-, RS422<br>Data D+ and D-, RS422<br>NPN error input on transmitter<br>Open-Drain output on receiver |
| SSI clock rate   | max. 1 MHz   |
| Optical wavelength   | 850 nm (infrared)  |
| Optical fiber connection   | ST connector,<br>on the bottom side of the housing   |
| Glass fiber  | multimode fiber,<br>50/125 µm, 62.5/125 µm   |
| Optical fiber transmission distance                                | max. 2000 m [6561']  |

|                             |   |   |
|-----------------------------|---|---|
| Dimensions (W x L x H)      | 19.0 x 110.8 x 92.3 mm<br>[0.75 x 4.36 x 3.63"] |   |
| Protection acc. to EN 60529 | IP40, terminals IP20                            |   |
| Connection                  | terminal clamps                                 | 11-pin plug-in screw terminal, RM 3.5<br>Sub-D9<br>9-pin Sub-D female contacts<br>(for signals) |
|                             | power supply                                    | 2-pin plug-in screw terminal  |
| Temperature range           | -10°C ... +70°C [+14°F ... +158°F]              |   |
| Weight                      | appr. 70 g [2.47 oz]                            |   |

| EMC       |                          |                   |
|-----------|--------------------------|-------------------|
| Standards | Emitted interference     | EN 55011 class B1 |
|           | Immunity to interference | EN 61000-6-2      |

### Terminal assignment

#### Optical fiber transmitter

| Type of connection | Terminal clamp      |     |    |    |    |    |    |             |   |   |    |    |
|--------------------|---------------------|-----|----|----|----|----|----|-------------|---|---|----|----|
| 0                  | Signal:             | 0 V | +V | C+ | C- | D+ | D- | input/error | - | - | -  | ⊥  |
|                    | Pin female contact: | 1   | 2  | 3  | 4  | 5  | 6  | 7           | 8 | 9 | 10 | 11 |

| Type of connection | Plug-in connector, Sub-D9 |     |    |             |    |    |    |    |   |   |  |
|--------------------|---------------------------|-----|----|-------------|----|----|----|----|---|---|--|
| 1                  | Signal:                   | 0 V | +V | input/error | D- | D+ | C- | C+ | - | ⊥ |  |
|                    | Pin female contact:       | 1   | 2  | 3           | 4  | 5  | 6  | 7  | 8 | 9 |  |

#### Optical fiber receiver

| Type of connection | Terminal clamp      |     |    |    |    |    |    |              |   |   |    |    |
|--------------------|---------------------|-----|----|----|----|----|----|--------------|---|---|----|----|
| 0                  | Signal:             | 0 V | +V | C+ | C- | D+ | D- | output/error | - | - | -  | ⊥  |
|                    | Pin female contact: | 1   | 2  | 3  | 4  | 5  | 6  | 7            | 8 | 9 | 10 | 11 |

| Type of connection | Plug-in connector, Sub-D9 |     |    |              |    |    |    |    |   |   |  |
|--------------------|---------------------------|-----|----|--------------|----|----|----|----|---|---|--|
| 1                  | Signal:                   | 0 V | +V | output/error | D- | D+ | C- | C+ | - | ⊥ |  |
|                    | Pin female contact:       | 1   | 2  | 3            | 4  | 5  | 6  | 7  | 8 | 9 |  |

#### Power supply

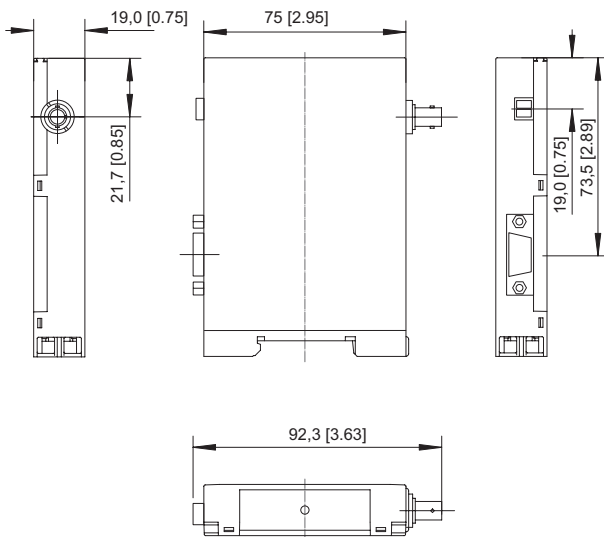
|  | Screw terminal, 2 pin |     |    |
|--|-----------------------|-----|----|
|  | Signal:               | 0 V | +V |
|  | Pin female contact:   | 1   | 2  |

Contacts 1/2 of the 2-pin plug-in screw terminal are connected to contacts 1/2 of the 11-pin plug-in screw terminal or with contacts 1/2 of the Sub-D connector.

- +V: Power supply +V DC
- 0 V: Power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ⊥: Shield

## Dimensions

Dimensions in mm [inch]







## Accessories




|  |                            |  | Page       |
|--|----------------------------|--|------------|
| <b>Fixing components for hollow shaft encoders</b> | For encoders up to ø 58 mm | Overview                               | <b>612</b> |
|  | For encoders > ø 58 mm     | Overview                               | <b>614</b> |
|  | For encoders up to ø 58 mm | Details                                | <b>615</b> |
|  | For encoders > ø 58 mm     | Details                                | <b>620</b> |
| <b>Fixing components for shaft encoders</b>        |                            | Overview                               | <b>624</b> |
|  |                            | Details                                | <b>625</b> |
| <b>Robust bearing unit</b>                         |                            | Suitable for Sendix 50xx and 58xx      | <b>630</b> |
| <b>Bearing box</b>                                 |                            |  | <b>631</b> |
| <b>Connection of motor and encoder</b>             | Couplings                  | Bellows- / spring washer-type coupling | <b>632</b> |
|  | Couplings                  | Bellows coupling (FS)                  | <b>634</b> |
|  | Flexible shaft coupling    | Double loop coupling                   | <b>635</b> |
| <b>General accessories</b>                         |                            |  | <b>636</b> |

| Fixing components for hollow shaft encoders | For encoders up to $\varnothing$ 58 mm | Overview |
|---|--|----------|
|---|--|----------|

| Figure  | Description  | Pitch circle diameter in mm [inch]  | Order no.  | Details s. page | Incremental encoders |              |                  | Absolute singleturn encoders    |  | Absolute multiturn encoders |                     |   |
|---|--|---|--|-----------------|----------------------|--------------|------------------|---------------------------------|--|-----------------------------|---------------------|---|
|   |  |   |  |                 | 3620, 3720           | 5020         | 5823, 5824, 5825 | 3670, 3671, M3678, F3673, F3678 | 5873, 5878, F5873 Motor-Line, 5870, 5872 | F3683, F3688                | M3681, M3683, M3688 | 5883, 5888, F5883, F5888, F5883M Motor-Line |
|    | <b>Spring element, short</b><br>For applications with limited axial play and low dynamics, and reduced mounting space            | 36XX 42 [1.65]<br>M36XX 42 [1.65]<br>F36XX 42 [1.65]<br>37XX 40 [1.57]<br>50XX 42 [1.65]<br>58XX 42 [1.65]<br>F58XX 42 [1.65] | <b>8.0010.4H00.0000</b><br><i>Connection to the application: cylindrical pin</i> | 615             | X                    | X            | X                | X                               | X  | X                           | X                   | X   |
|    | <b>Spring element, long</b><br>For applications with axial play and low dynamics   | 36XX 60 [2.36]<br>M36XX 60 [2.36]<br>F36XX 60 [2.36]<br>37XX 63 [2.48]<br>50XX 44 [1.73]<br>58XX 65 [2.56]<br>F58XX 65 [2.56] | <b>8.0010.4I00.0000</b><br><i>Connection to the application: cylindrical pin</i> | 615             | X                    | X            | X                | X                               | X  | X                           | X                   | X   |
|   | <b>Torque stop, short (flexible)</b><br>For applications with axial and radial play, low dynamics                                | 64.5 [2.54]   | <b>8.0010.40M0.0000</b><br><i>Connection to the application: 1 screw</i>         | 615             |                      | X            | X                |                                 | X  |                             | X                   | X   |
|  | <b>Torque stop, medium (flexible)</b><br>For applications with axial and radial play for constant rotary movements               | 65 ... 91.5 [2.56 ... 3.60]   | <b>8.0010.40E0.0000</b><br><i>Connection to the application: 1 screw</i>         | 615             |                      | X            | X                |                                 | X  |                             | X                   | X   |
|  | <b>Torque stop, long (flexible)</b><br>For applications with axial and radial play and low dynamics                              | 80 ... 170 [3.15 ... 6.69]  | <b>8.0010.4R00.0000</b><br><i>Connection to the application: 1 screw</i>         | 616             |                      | X            | X                |                                 | X  |                             | X                   | X   |
|  | <b>Stator coupling, double-winged</b><br>For applications with axial and radial play and high dynamics                           | 46 [1.81]   | <b>8.0010.4C00.0000</b><br><i>Connection to the application: 2 screws</i>        | 616             | X                    |              |                  | X                               |  |                             | X                   |   |
|  | <b>Stator coupling, double-winged</b><br>For applications with high demands for accuracy   | 63 [2.48]   | <b>8.0010.4D00.0000</b><br><i>Connection to the application: 2 screws</i>        | 616             |                      | flange C + D | X                |                                 | X  |                             | X                   | X   |
|  | <b>Stator coupling, for fixing to side of encoder</b><br>For standard applications with axial and radial play, and high dynamics | 65 [2.56]   | <b>8.0010.1602.0000</b><br><i>Connection to the application: 3 screws</i>        | 617             |                      | flange C + D | X                |                                 | X  |                             | X                   | X   |
|  | <b>Stator coupling, for fixing to front of encoder</b><br>For applications with axial and radial play and high dynamics          | 65 [2.56]   | <b>8.0010.40L0.0000</b><br><i>Connection to the application: 3 screws</i>        | 617             |                      | X            | X                |                                 | X  |                             | X                   | X   |
|  | <b>Spring tether element</b><br>For applications with low axial and radial play and low dynamics                                 | 42 ... 84.5 [1.65 ... 3.33]   | <b>8.0010.40W0.0000</b><br><i>Connection to the application: 1 screw</i>         | 617             |                      | X            | X                |                                 | X  |                             | X                   | X   |



# Accessories


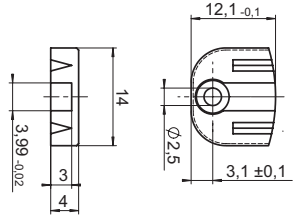

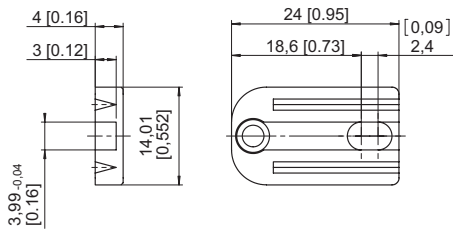

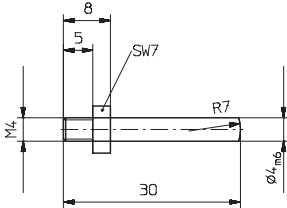
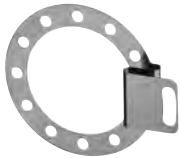
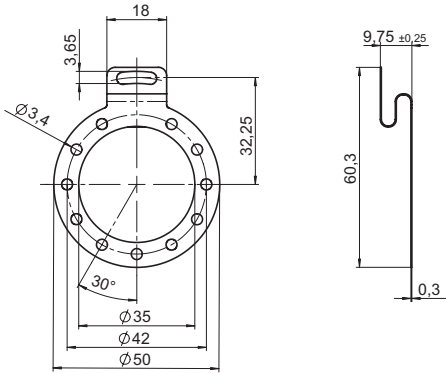

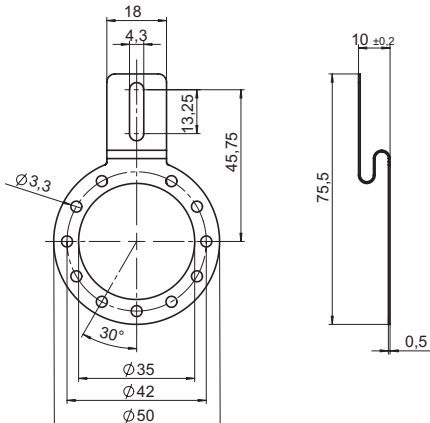
| Fixing components for hollow shaft encoders  |  |                                    |  | For encoders up to $\varnothing$ 58 mm |                      |      |                  | Overview                     |            |                             |                     |
|--|--|------------------------------------|--|--|----------------------|------|------------------|------------------------------|------------|-----------------------------|---------------------|
| Figure   | Description  | Pitch circle diameter in mm [inch] | Order no.  | Details s. page                        | Incremental encoders |      |                  | Absolute singleturn encoders |            | Absolute multiturn encoders |                     |
|  |  |                                    |  |  | 5834FSx              | 5020 | 5823, 5824, 5825 | 5873FSx                      | 5873, 5878 | 5883FSx                     | M3681, M3683, M3688 |
|   | <p><b>Stator coupling</b></p> <p>Designed for functional safety thanks to the 4-screw-principle.</p>   | 63 [2.48]                          | <p><b>8.0010.4048.00FS</b></p> <p><i>Connection to the application:</i><br/>4 screws</p> | 618                                    | X                    | X    | X                | X                            | X          | X                           | X                   |
|   | <p><b>Torque stop, flexible</b></p> <p>Designed for functional safety. For applications with axial and radial play and low dynamics.</p>           | 77 ... 278 [3.03 ... 10.94]        | <p><b>8.0010.4047.00FS</b></p> <p><i>Connection to the application:</i><br/>1 screw</p>  | 618                                    | X                    | X    | X                | X                            | X          | X                           | X                   |
|  | <p><b>Torque stop set, rigid</b></p> <p>Designed for functional safety. For applications with very low axial and radial play and low dynamics.</p> | 71 ... 281 [2.80 ... 11.06]        | <p><b>8.0010.4051.00FS</b></p> <p><i>Connection to the application:</i><br/>1 screw</p>  | 619                                    | X                    | X    | X                | X                            | X          | X                           | X                   |

# Accessories

## Fixing components for hollow shaft encoders For encoders > ø 58 mm Overview

| Figure  | Description   | Pitch circle diameter in mm [inch]   | Order no.   | Details s. page | A020, A02H | 9080, 9081 | H120 |
|---|---|--|---|-----------------|------------|------------|------|
|    | <b>Spring element, short</b><br>For applications with reduced mounting space  | 76 [2.99]  | <b>8.0010.4J00.0000</b><br><i>Connection to the application:</i><br>cylindrical pin   | 620             | X          | X          |      |
|    | <b>Spring element, long</b><br>For applications with high axial play  | 110 [4.33]   | <b>8.0010.4K00.0000</b><br><i>Connection to the application:</i><br>cylindrical pin   | 620             | X          | X          |      |
|   | <b>Tether square</b><br>For applications with axial and radial play with low dynamics for constant rotary movements | 9080: 120 [4.72]<br>9081: 120 [4.72]   | <b>8.0010.4G00.0000</b><br><i>Connection to the application:</i><br>1 screw   | 620             |            | X          |      |
|  | <b>Torque stop, short</b><br>For applications with axial play   | 149 [5.87]   | <b>8.0010.4T00.0000</b><br><i>Connection to the application:</i><br>s. details  | 620             | X          | X          |      |
|  | <b>Torque stop, long</b><br>For applications with fastening points located on variable pitch circle diameters       | 104 ... 206 [4.09 ... 8.11]  | <b>8.0010.4E00.0000</b><br><i>Connection to the application:</i><br>1 screw   | 621             | X          | X          |      |
|  | <b>Tether arm, long</b><br>For applications with low axial and radial play, flexible in use                         | Length = 70 [2.75]:<br>Length = 100 [3.94]:<br>Length = 150 [5.91]:<br>262 ... 422 [10.32 ... 16.61] | <b>8.0010.40S0.0000</b><br><b>8.0010.40T0.0000</b><br><b>8.0010.40U0.0000</b><br><i>Connection to the application:</i><br>1 screw | 621             | X          | X          | X    |
|  | <b>Tether arm, long</b><br>For applications with low axial and radial play, flexible in use                         | Length = 70 [2.75]:<br>Length = 100 [3.94]:<br>Length = 150 [5.91]:<br>262 ... 422 [10.32 ... 16.61] | <b>8.0010.40S1.0000</b><br><b>8.0010.40T1.0000</b><br><b>8.0010.40U1.0000</b><br><i>Connection to the application:</i><br>1 screw | 622             |            |            | X    |
|  | <b>Stator coupling</b><br>For applications with axial and radial play and high dynamics                             | 119 [4.69]   | <b>8.0010.40V0.0000</b><br><i>Connection to the application:</i><br>2 screws  | 622             | X          |            | X    |


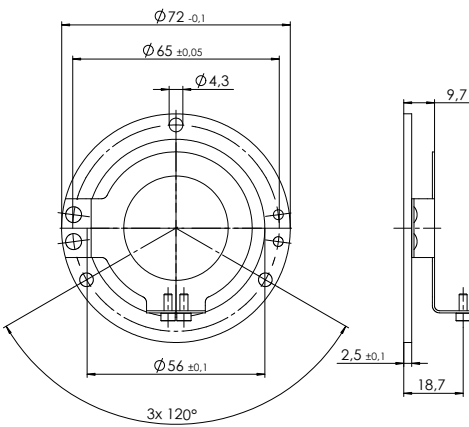

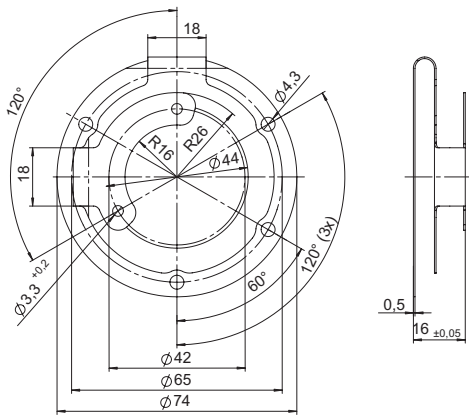


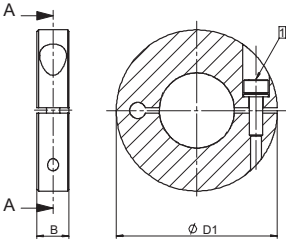
# Accessories

| Fixing components for hollow shaft encoders   |   | For encoders up to $\varnothing$ 58 mm   | Details                 |
|---|---|--|-------------------------|
| Dimensions / Details  | Dimensions in mm [inch]   |  | Order no.               |
| <b>Spring element, short</b><br>                         |    | <i>Scope of delivery:</i><br>- spring element (plastic)<br>- 1 screw for fixing to the encoder<br><br><i>Connection to application:</i><br>- cylindrical pin (8.0010.4700.0000) (not supplied) | <b>8.0010.4H00.0000</b> |
| <b>Spring element, long</b><br>                          |    | <i>Scope of delivery:</i><br>- spring element (plastic)<br>- 1 screw for fixing to the encoder<br><br><i>Connection to application:</i><br>- cylindrical pin (8.0010.4700.0000) (not supplied) | <b>8.0010.4I00.0000</b> |
| <b>Cylindrical pin, long with fastening thread</b><br> |   | suitable for spring element short (8.0010.4H00.0000) and long (8.0010.4I00.0000)   | <b>8.0010.4700.0000</b> |
| <b>Torque stop, short</b><br>                          |  | <i>Scope of delivery:</i><br>- Fastening arm (stainless steel)<br>- 3 screws for fixing to the encoder<br><br><i>Connection to application:</i><br>- 1 screw (not supplied)                    | <b>8.0010.40M0.0000</b> |
| <b>Torque stop, medium</b><br>                         |  | <i>Scope of delivery:</i><br>- Fastening arm (stainless steel)<br>- 3 screws for fixing to the encoder<br><br><i>Connection to application:</i><br>- 1 screw (not supplied)                    | <b>8.0010.40E0.0000</b> |


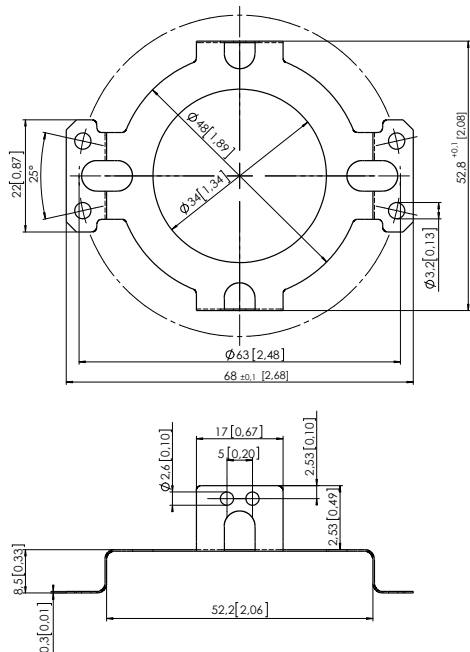

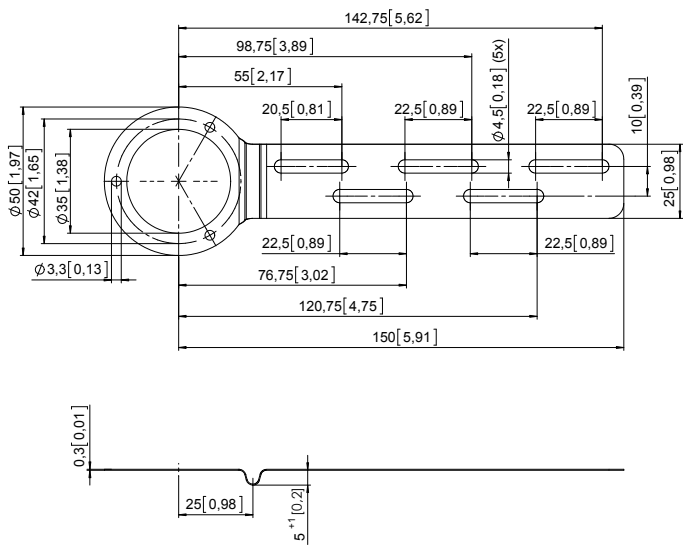
# Accessories

| Fixing components for hollow shaft encoders                                       |  | For encoders up to $\varnothing$ 58 mm | Details  |                         |
|---|--|--|--|-------------------------|
| Dimensions / Details  |  |  | Order no.  |                         |
| <b>Torque stop, long</b>  |  |  | <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> <li>- Fastening arm (stainless steel)</li> <li>- 3 screws for fixing to the encoder</li> </ul> <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> <li>- 1 screw (not supplied)</li> </ul>   | <b>8.0010.4R00.0000</b> |
| <b>Stator coupling, double-winged</b><br>for front fixing onto the encoder flange |  |  | <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> <li>- Stator coupling (stainless steel)</li> <li>- 2 screws for fixing to the encoder</li> </ul> <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> <li>- 2 screws (not supplied)</li> </ul>  | <b>8.0010.4C00.0000</b> |
| <b>Stator coupling, double-winged</b><br>for side fixing onto the encoder flange  |  |  | <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> <li>- Stator coupling (stainless steel)</li> <li>- 4 screws M2.5 x 6 [0.24] for fixing to the encoders</li> </ul> <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> <li>- 2 socket head screws M3 x 8 [0.32] with washer (supplied)</li> </ul> | <b>8.0010.4D00.0000</b> |


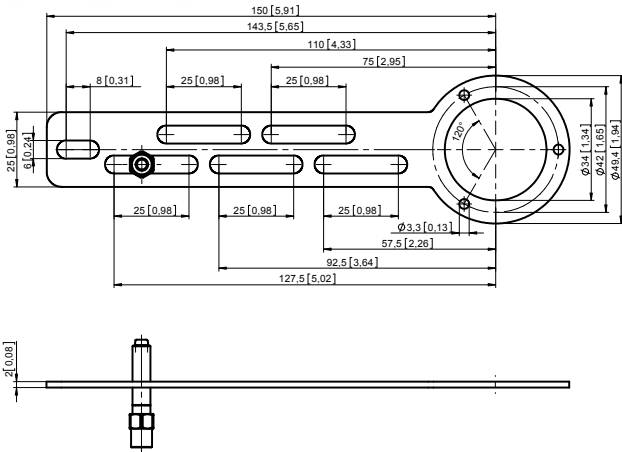

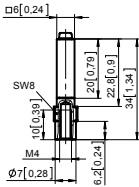
# Accessories

| Fixing components for hollow shaft encoders  |   | For encoders up to $\varnothing$ 58 mm  | Details                 |                                |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
|--|---|---|-------------------------|--------------------------------|-------------------------|----|--------------------------------|--|------|--|-----------|-----------|-----------|-------------------------|--|-------------|-----------|-----------|-------------------------|------|--|-------------|-----------|-----------|-------------------------|--|
| Dimensions / Details   | Dimensions in mm [inch]   |   | Order no.               |                                |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| <b>Stator coupling</b><br>for side fixing onto the encoder flange<br>     |    | <i>Scope of delivery:</i><br>- Stator coupling (stainless steel)<br>- 2 screws for fixing to the encoder<br><br><i>Connection to application:</i><br>- 3 screws (not supplied)  | <b>8.0010.1602.0000</b> |                                |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| <b>Stator coupling</b><br>for front fixing onto the encoder flange<br>   |   | <i>Scope of delivery:</i><br>- Stator coupling (stainless steel)<br>- 2 screws for fixing to the encoder<br><br><i>Connection to application:</i><br>- 3 screws (not supplied)  | <b>8.0010.40L0.0000</b> |                                |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| <b>Spring tether element</b><br>  |   | <i>Scope of delivery:</i><br>- spring tether element<br>- 1 screw for fixing to the encoder<br><br><i>Connection to application:</i><br>- 1 screw (not supplied)  | <b>8.0010.40W0.0000</b> |                                |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| <b>Clamping ring</b><br>Stainless steel, for high rotational speeds<br> |  | <table border="1"> <thead> <tr> <th></th> <th>for encoder</th> <th>B</th> <th>D1</th> <th>for hollow shaft <math>\varnothing</math></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">582X</td> <td></td> <td>6 [0.236]</td> <td>29 [1.14]</td> <td>10 [0.39]</td> <td><b>8.0000.4V00.0000</b></td> </tr> <tr> <td></td> <td>6.2 [0.244]</td> <td>30 [1.18]</td> <td>12 [0.47]</td> <td><b>8.0000.4W00.0000</b></td> </tr> <tr> <td>5020</td> <td></td> <td>6.2 [0.244]</td> <td>30 [1.18]</td> <td>12 [0.47]</td> <td><b>8.0010.4W01.0000</b></td> </tr> </tbody> </table><br>1 screw DIN 912 A2 M2.5, max. tightening torque 0.45 Nm |                         | for encoder                    | B                       | D1 | for hollow shaft $\varnothing$ |  | 582X |  | 6 [0.236] | 29 [1.14] | 10 [0.39] | <b>8.0000.4V00.0000</b> |  | 6.2 [0.244] | 30 [1.18] | 12 [0.47] | <b>8.0000.4W00.0000</b> | 5020 |  | 6.2 [0.244] | 30 [1.18] | 12 [0.47] | <b>8.0010.4W01.0000</b> |  |
|  | for encoder   | B   | D1                      | for hollow shaft $\varnothing$ |                         |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| 582X   |   | 6 [0.236]   | 29 [1.14]               | 10 [0.39]                      | <b>8.0000.4V00.0000</b> |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
|  |   | 6.2 [0.244]   | 30 [1.18]               | 12 [0.47]                      | <b>8.0000.4W00.0000</b> |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |
| 5020   |   | 6.2 [0.244]   | 30 [1.18]               | 12 [0.47]                      | <b>8.0010.4W01.0000</b> |    |                                |  |      |  |           |           |           |                         |  |             |           |           |                         |      |  |             |           |           |                         |  |


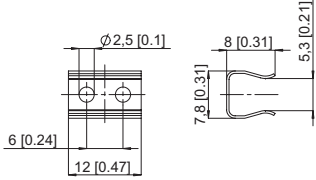

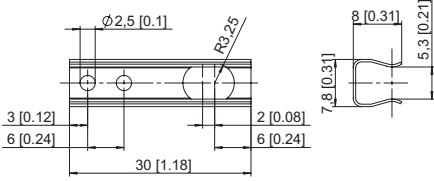

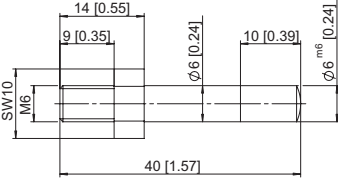

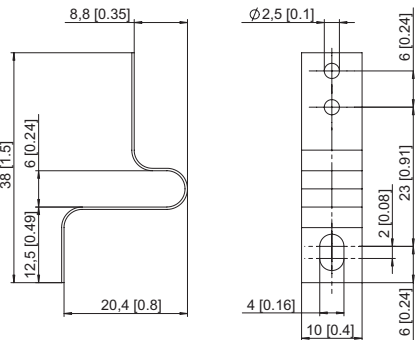

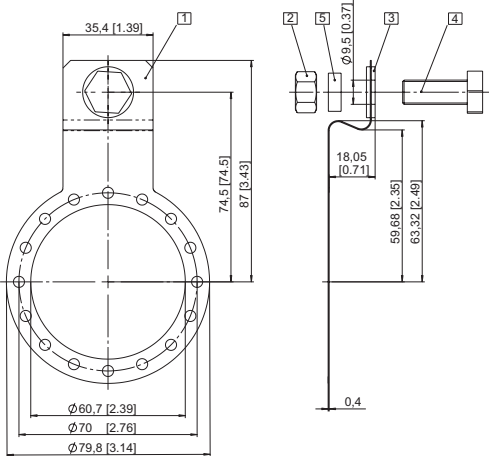
## Fixing components for hollow shaft encoders For encoders up to $\varnothing$ 58 mm Details

| Dimensions / Details  | Dimensions in mm [inch]  | Order no.   |
|---|--|---|
| <b>Stator coupling</b><br>         |  <p> <math>\varnothing 49</math> [1.97]<br/> <math>\varnothing 24</math> [0.94]<br/> <math>\varnothing 63</math> [2.48]<br/> <math>68 \pm 0.1</math> [2.68]<br/> <math>52.8 \pm 0.1</math> [2.08]<br/> <math>22</math> [0.87]<br/> <math>25^\circ</math><br/> <math>\varnothing 3.2</math> [0.13]<br/> <math>8.5</math> [0.33]<br/> <math>0.3</math> [0.01]<br/> <math>52.2</math> [2.06]<br/> <math>17</math> [0.67]<br/> <math>5</math> [0.20]<br/> <math>\varnothing 2.6</math> [0.10]<br/> <math>2.53</math> [0.10]<br/> <math>2.53</math> [0.49]         </p>   | <b>8.0010.4048.00FS</b><br><br><i>Scope of delivery:</i><br>- Stator coupling (stainless steel)<br>- 4 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder<br><br><i>Connection to application:</i><br>- 4 screws (not supplied)<br><br><i>Max. permissible shaft connection tolerances:</i><br>- Axial offset $< \pm 0.25$ mm<br>- Radial offset $< \pm 0.20$ mm<br>- Angular offset $< 1^\circ$ |
| <b>Torque stop, flexible</b><br> |  <p> <math>142.75</math> [5.62]<br/> <math>98.75</math> [3.89]<br/> <math>55</math> [2.17]<br/> <math>20.5</math> [0.81]<br/> <math>22.5</math> [0.89]<br/> <math>\varnothing 4.5</math> [0.18] (5x)<br/> <math>22.5</math> [0.89]<br/> <math>10</math> [0.39]<br/> <math>25</math> [0.98]<br/> <math>\varnothing 50</math> [1.97]<br/> <math>\varnothing 42</math> [1.65]<br/> <math>\varnothing 35</math> [1.38]<br/> <math>\varnothing 3.3</math> [0.13]<br/> <math>22.5</math> [0.89]<br/> <math>76.75</math> [3.02]<br/> <math>120.75</math> [4.75]<br/> <math>150</math> [5.91]<br/> <math>0.3</math> [0.01]<br/> <math>25</math> [0.98]<br/> <math>5^\circ</math> [0.2]         </p> | <b>8.0010.4047.00FS</b><br><br><i>Scope of delivery:</i><br>- Fastening arm (stainless steel)<br>- 3 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder<br><br><i>Connection to application:</i><br>- 1 screw (not supplied)<br><br><i>Max. permissible shaft connection tolerances:</i><br>- Axial offset $< \pm 0.25$ mm<br>- Radial offset $< \pm 0.20$ mm<br>- Angular offset $< 1^\circ$    |

## Accessories

| Fixing components for hollow shaft encoders   | For encoders up to $\varnothing$ 58 mm  | Details                        |
|---|---|--------------------------------|
| Dimensions / Details  | Dimensions in mm [inch]   | Order no.                      |
| <p><b>Torque stop set, rigid</b></p>             | <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> <li>- Fastening arm (stainless steel)</li> <li>- 3 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder</li> </ul> <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> <li>- 1 screw (not supplied)</li> </ul> <p><i>Max. permissible shaft connection tolerances:</i></p> <ul style="list-style-type: none"> <li>- Axial offset &lt;math&gt;\lt; \pm 0.25 \text{ mm}&lt;/math&gt;</li> <li>- Radial offset &lt;math&gt;\lt; \pm 0.20 \text{ mm}&lt;/math&gt;</li> <li>- Angular offset &lt;math&gt;\lt; 1^\circ&lt;/math&gt;</li> </ul> | <p><b>8.0010.4051.00FS</b></p> |
| <p><b>Cylindrical pin (replacement)</b></p>   | <p>suitable for:</p> <p>Fastening arm<br/>8.0010.4051.00FS</p>  | <p><b>8.0010.4049.0075</b></p> |

# Accessories

| Fixing components for hollow shaft encoders  |   | For encoders > ø 58 mm | Details   |
|--|---|------------------------|---|
| Dimensions / Details   | Dimensions in mm [inch]   |                        | Order no.   |
| <b>Spring element, short</b><br>                        |    |                        | <b>8.0010.4J00.0000</b><br><i>Scope of delivery:</i><br>- Spring element (stainless steel)<br>- 2 screws for fixing to the encoder<br><i>Connection to application:</i><br>- Cylindrical pin (8.0010.4700.0003) (not supplied)  |
| <b>Spring element, long</b><br>                         |    |                        | <b>8.0010.4K00.0000</b><br><i>Scope of delivery:</i><br>- Spring element (stainless steel)<br>- 2 screws for fixing to the encoder<br><i>Connection to application:</i><br>- Cylindrical pin (8.0010.4700.0003) (not supplied)  |
| <b>Cylindrical pin, long with fastening thread</b><br> |   |                        | <b>8.0010.4700.0003</b><br>suitable for spring element short (8.0010.4J00.0000) and long (8.0010.4K00.0000)   |
| <b>Tether square</b><br>                              |  |                        | <b>8.0010.4G00.0000</b><br><i>Scope of delivery:</i><br>- Tether square (stainless steel)<br>- 2 screws for fixing to the encoder<br><i>Connection to application:</i><br>- 1 screw (not supplied)  |
| <b>Torque stop, short</b><br>                         |  |                        | <b>8.0010.4T00.0000</b><br><i>Scope of delivery:</i><br>1 Fastening arm (stainless steel)<br>- 3 screws for fixing to the encoder<br><i>Connection to application:</i><br>2 Hexagonal nut 3/8 - 16 UNC<br>3 Washer (isolating)<br>4 Hexagonal screw 3/8 16 UNC x 1" (supplied)<br>5 Washer D10.4 x 15 x 15 (supplied) |

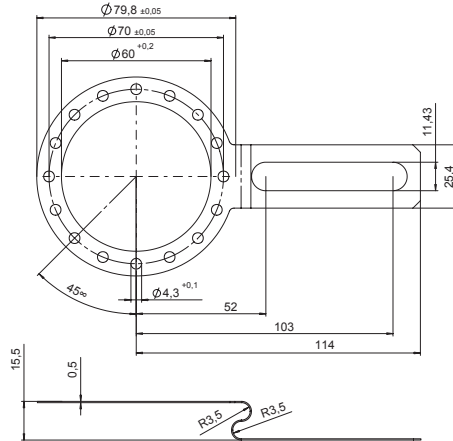


# Accessories

## Fixing components for hollow shaft encoders For encoders > ø 58 mm Details

### Dimensions / Details Dimensions in mm [inch] Order no.

#### Torque stop, short



#### Scope of delivery:

- Fastening arm (stainless-steel)
- 3 screws for fixing to the encoder

#### Connection to application:

- 1 screw (not supplied)

8.0010.4E00.0000

#### Tether arm, long



| Tether arm    | L1                          | L2                          |                  |
|---------------|-----------------------------|-----------------------------|------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   | 8.0010.40S0.0000 |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] | 8.0010.40T0.0000 |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] | 8.0010.40U0.0000 |

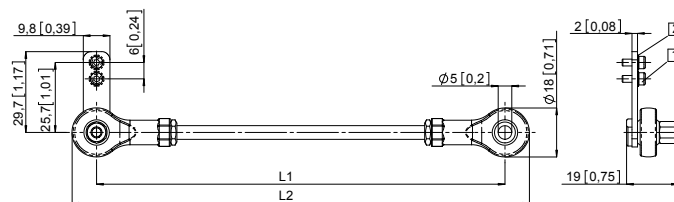
#### Scope of delivery:

- Tether arm
- For fixing to the encoder:

- 1 2 cap screws  
M2.5 x 6 [0.24]
- 2 2 lock washers

#### Connection to application:

- 1 screw (not supplied)



# Accessories

## Fixing components for hollow shaft encoders      For encoders > Ø 58 mm      Overview

| Dimensions / Details | Dimensions in mm [inch] |  |  | Order no. |
|----------------------|-------------------------|--|--|-----------|
|----------------------|-------------------------|--|--|-----------|



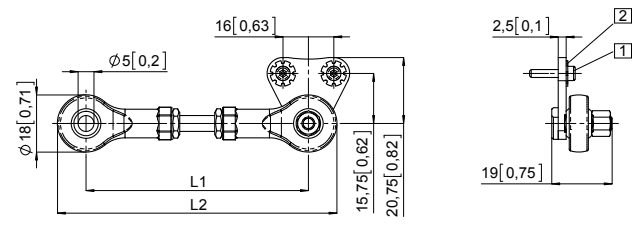
| Tether arm    | L1                          | L2                          |                         |
|---------------|-----------------------------|-----------------------------|-------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   | <b>8.0010.40S1.0000</b> |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] | <b>8.0010.40T1.0000</b> |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] | <b>8.0010.40U1.0000</b> |

**Scope of delivery:**

- Tether arm
- For fixing to the encoder:
  - 1 2 cap screws M2,5 x 12 [0.47]
  - 2 2 lock washers

**Connection to application:**

- 1 screw (not supplied)



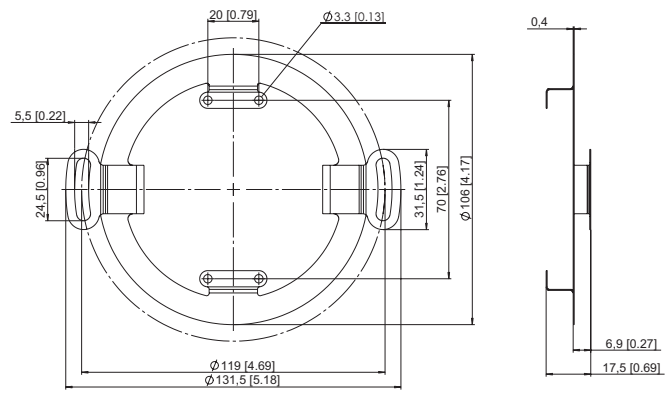
**Scope of delivery:**

- Stator coupling (stainless steel)
- 4 screws for fixing to the encoder




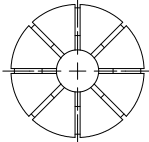
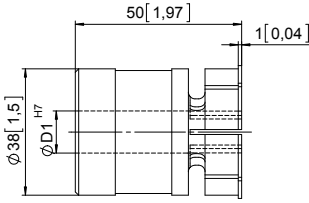
**Connection to application:**






- 2 screws (not supplied)

**8.0010.40V0.0000**



# Accessories

| Fixing components for hollow shaft encoders  |                         | For encoders > ø 58 mm  | Overview   |
|--|-------------------------|---|--|
| Dimensions / Details   | Dimensions in mm [inch] |   | Order no.  |
| <b>Protective cover</b><br>   |                         | For applications with a very high degree of pollution, Kübler now offers a protective cover for <ul style="list-style-type: none"> <li>Improved reliability</li> <li>Extension of the service life of the encoder</li> </ul> Scope of delivery: <ul style="list-style-type: none"> <li>Protective cover</li> <li>Fastening arm (8.0010.4T00.0000)</li> <li>3 screws for fixing to the encoder</li> </ul>                                      | <b>8.0010.40Y0.0001</b>  |
| <b>Tapered shaft mounting kit</b><br>for A02H with hollow shaft, ø 38 mm [1.50"]   |                         | For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling. An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.           Included in the set: <ul style="list-style-type: none"> <li>Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length</li> <li>Isolation insert</li> <li>Allen screw for central fixing</li> </ul> | <b>8.0010.4028.0000</b>  |
| <b>Isolation insert for hollow shaft, ø 38 mm [1.50"]</b><br>Temperature range -40°C ... +115°C [-40°F ... +239°F]    |                         | ø D1:<br>12 mm [0.47"]<br>14 mm [0.55"]<br>15 mm [0.59"]<br>16 mm [0.63"]<br>18 mm [0.71"]<br>20 mm [0.79"]<br>25 mm [0.98"]<br>30 mm [1.18"]<br>32 mm [1.26"]<br>1/2"<br>5/8"<br>3/4"<br>1"<br>1 1/4"  | <b>8.0010.4091.0000</b><br><b>8.0010.4027.0000</b><br><b>8.0010.4038.0000</b><br><b>8.0010.4019.0000</b><br><b>8.0010.4080.0000</b><br><b>8.0010.4011.0000</b><br><b>8.0010.4012.0000</b><br><b>8.0010.4016.0000</b><br><b>8.0010.4015.0000</b><br><b>8.0010.4013.0000</b><br><b>8.0010.4070.0000</b><br><b>8.0010.4090.0000</b><br><b>8.0010.4050.0000</b><br><b>8.0010.4060.0000</b> |
| <b>Isolation insert for hollow shaft, ø 42 mm [1.65"]</b>  |                         | external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"]<br>external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]  | <b>8.0010.4017.0000</b><br><b>8.0010.4029.0000</b>   |

| Fixing components for shaft encoders  |   |  |                          | Overview               |            |                          |            |                         |                          |                     |
|---|---|--|--------------------------|------------------------|------------|--------------------------|------------|-------------------------|--------------------------|---------------------|
| Figure  | Description   | Order no.  | Details s.page           | Incremental encoders   |            | Abs. singleturn encoders |            | Abs. multiturn encoders |                          |                     |
|   |   |  |                          | 5000, 5803, 5804, 5805 | 7000, 7100 | 5853, 5858               | 5850, 5852 | 7053, 7058, 7153, 7158  | 5863, 5868, F5863, F5868 | M5881, M5883, M5888 |
|    | <b>Flange, square</b><br>Suitable for shaft encoders with clamping flange<br>□ 58.0 [2.28"], 4 [0.16"] thick<br>□ 63.5 [2.5"], 3 [0.12"] thick<br>□ 70.0 [2.76"], 10 [0.39"] thick<br>□ 80.0 [3.15"], 4 [0.16"] thick | <b>8.0010.2100.0000</b><br><b>8.0010.2120.0000</b><br><b>8.0010.2600.0000</b><br><b>8.0010.2800.0000</b> | 625<br>625<br>625<br>625 | X                      |            | X                        |            | X                       | X                        |                     |
|   | <b>Flange ø 65 mm [2.56"]</b><br><br>With this adapter flange, Kübler encoders with size 58 mm [2.28"] can replace encoders with diameter 65 mm [2.56"] and pitch circle diameter 48 mm [1.89"]                       | <b>8.0010.2230.0000</b>  | 626                      | X                      |            | X                        |            | X                       | X                        |                     |
|   | <b>Flange, ø 115 mm [4.53"]</b><br><b>Euroflange</b>  | <b>8.0010.2160.0000</b><br><b>8.0010.2170.0000</b>   | 626                      | X                      | X          |                          | X          |                         | X                        | X                   |
|   | <b>Flange, ø 58 mm [2.28"]</b><br><br>Converts encoders with a clamping flange into synchro flange.   | <b>8.0010.2180.0000</b>  | 626                      | X                      |            | X                        |            | X                       | X                        |                     |
|   | <b>Flange, ø 90 mm [3.54"]</b><br><br>Mechanically compatible with former encoder Type 9000   | <b>8.0010.2270.0000</b>  | 627                      | X                      |            | X                        |            | X                       | X                        |                     |
|  | <b>Angular flange</b><br><br>80 mm x 80 mm x 40 mm<br>[3.15" x 3.15" x 1.57"]   | <b>8.0010.2300.0000</b>  | 627                      | X                      |            | X                        |            |                         | X                        |                     |
|  | <b>Assembly bell</b><br><br>Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling – supplied as complete set   | <b>8.0010.4D00.0000</b>  | 628                      | X                      |            | X                        |            | X                       | X                        |                     |
|  | <b>Fastening eccentrics</b><br><br>For shaft encoders with synchronous flange. Use at least three fastening eccentrics to mount the encoder.  | <b>8.0010.4200.0000</b><br><b>8.0010.4100.0000</b>   | 629                      | see table page 629     |            |                          |            |                         |                          |                     |

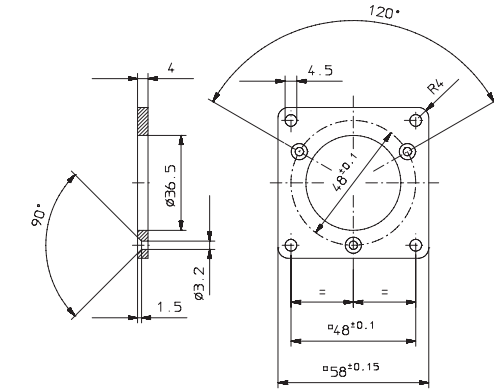
## Fixing components for shaft encoders

| Dimensions / Details | Dimensions in mm [inch] | Order no. |
|----------------------|-------------------------|-----------|
|----------------------|-------------------------|-----------|

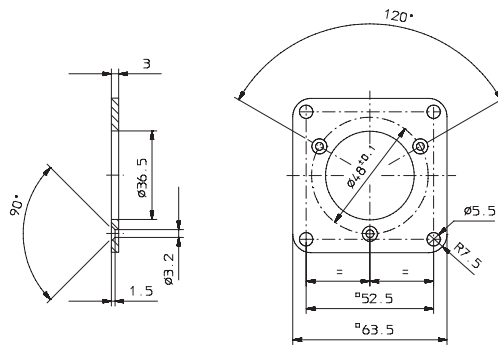
### Flange, square



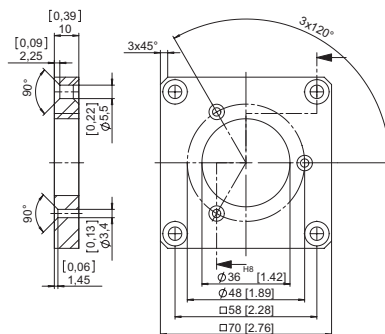
- Scope of delivery:**
- flange (aluminum)
  - 3 screws for fixing to the encoder
- Connection to application:**
- 4 screws (not supplied)



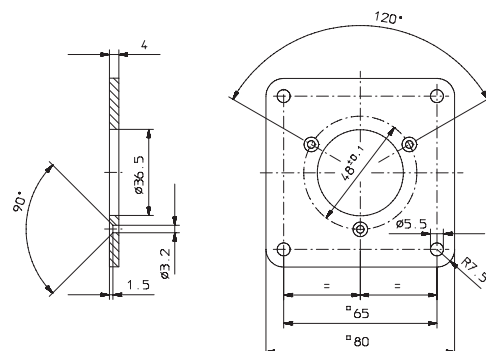
8.0010.2100.0000



8.0010.2120.0000



8.0010.2600.0000



8.0010.2800.0000

# Accessories

## Fixing components for shaft encoders

## Details

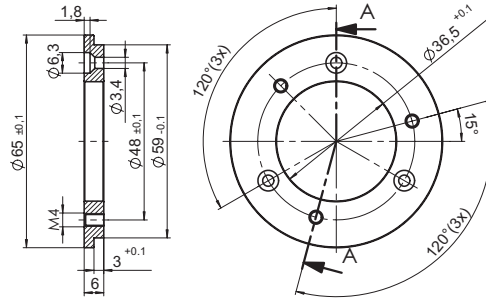
### Dimensions / Details

Dimensions in mm [inch]

Order no.

#### Flange, $\varnothing$ 65 [2.56]

With this adapter flange, Kübler encoders with size 58 [2.28] can replace encoders with diameter 65 [2.56] and pitch circle diameter 48 [1.89].



#### Scope of delivery:

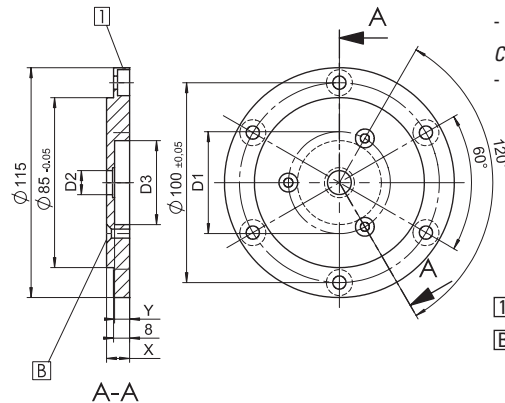
- flange (aluminum)
- 3 screws for fixing to the encoder

#### Connection to application:

- 3 screws (not supplied)

**8.0010.2230.0000**

#### Flange, $\varnothing$ 115 [4.53], Euroflange (Euro REO 444)



#### Scope of delivery:

- flange (aluminum)
- 3 screws for encoder mounting

#### Connection to application:

- 6 screws (not supplied)

1 Countersunk DIN 74-Hm6

B See table

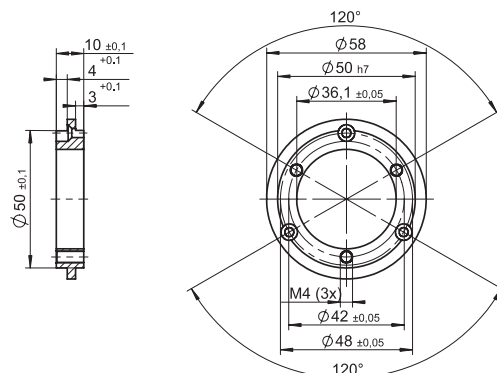
| encoder type | D1        | D2        | D3        | X           | Y          | B          |
|--------------|-----------|-----------|-----------|-------------|------------|------------|
| 580X/5000    | 48 [1.89] | 36 [1.42] | 58 [2.28] | 11 [0.43]   | 1 [0.039]  | DIN 74-BM3 |
| 70XX         | 51 [2.01] | 12 [0.47] | 42 [1.65] | 11.5 [0.45] | 7.5 [0.30] | DIN 74-BM4 |

**8.0010.2160.0000**

**8.0010.2170.0000**

#### Flange, $\varnothing$ 58 [2.28]

Converts encoders with a clamping flange into synchro flange.



#### Scope of delivery:

- flange (aluminum)
- 3 screws for encoder mounting

#### Connection to application:

- 3 screws (not supplied)

**8.0010.2180.0000**

# Accessories

## Fixing components for shaft encoders

### Details

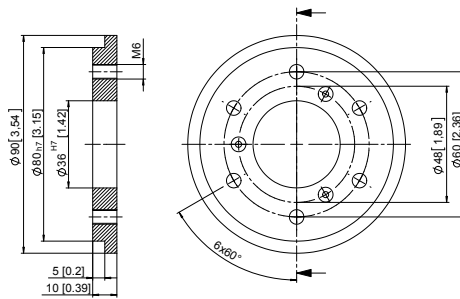
#### Dimensions / Details

Dimensions in mm [inch]

Order no.

#### Flange, $\varnothing 90$ [3.54]

Mechanically compatible with former encoder type 9000



#### Scope of delivery:

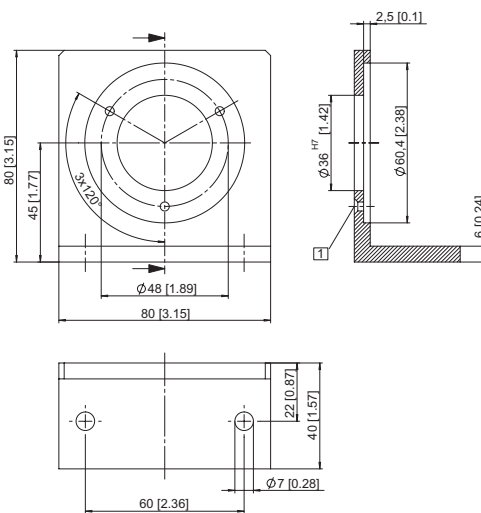
- flange
- 3 screws for encoder mounting

#### Connection to application:

- 6 screws (not supplied)

8.0010.2270.0000

#### Angular flange



#### Scope of delivery:

- angular flange (aluminum)
- 3 screws for encoder mounting

#### Connection to application:

- 2 screws (not supplied)

8.0010.2300.0000

1 Countersunk DIN 74-Hm6

## Fixing components for shaft encoders

## Details

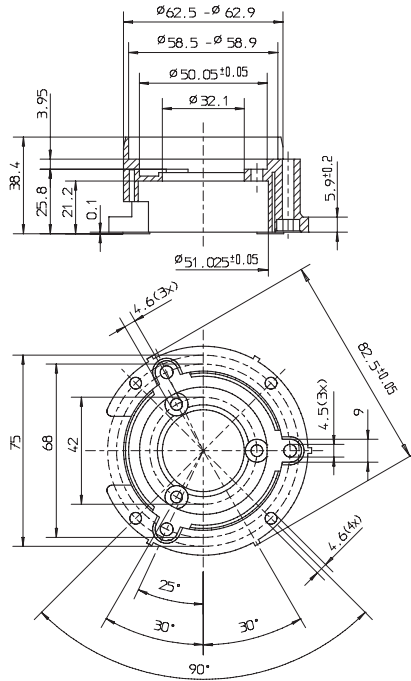
### Dimensions / Details

Dimensions in mm [inch]

Order no.

#### Assembly bell

- Easy and quick encoder mounting
- Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling
- Supplied as complete set

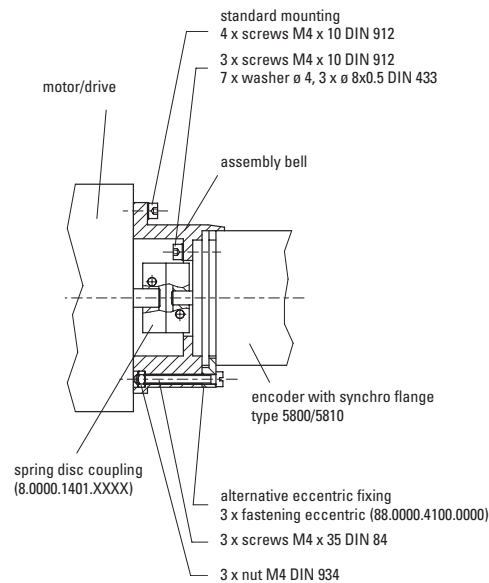


#### Scope of delivery:

- Assembly bell
- Spring washer type coupling (8.0000.1401.XXXX)
- 4 hexagon socket head cap screws DIN 912 M4 x 12 [0.47]
- 3 hexagon socket head cap screws DIN 912 M4 x 10 [0.39]
- 7 washers DIN 433  $\varnothing$  4 [0.16]
- 3 fastening eccentrics (8.0000.4B00.0000)
- 3 hexagon head screws DIN 84 M 4 x 35 [0.16 x 1.38]
- 3 hexagon nuts DIN 934 - M4

**8.0000.4500.XXYY**



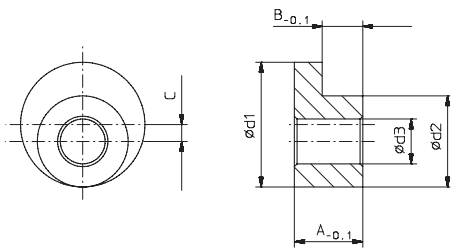
XX = Coupling diameter  
d1 in mm  
YY = Coupling diameter  
d2 in mm





# Accessories

## Fixing components for shaft encoders Details

| Dimensions / Details   | Dimensions in mm [inch]   |               |               |               |               |                |                | Order no.               |
|--|---|---------------|---------------|---------------|---------------|----------------|----------------|-------------------------|
| <b>Fastening eccentrics for encoders with synchro flange</b><br>- Suitable for Kübler encoders with synchro flange<br>- Material ACu Zn 39 Pb 3<br>- Surface finish: galvanized Ni | <i>encoder type</i>   | <i>D1</i>     | <i>D2</i>     | <i>D3</i>     | <i>A</i>      | <i>B</i>       | <i>C</i>       |                         |
| <br><br>        | 3610<br>3651<br>M3658<br>F3653 / F3658<br>F3663 / F3668   | 6.8<br>[0.27] | 5<br>[0.20]   | 2.8<br>[0.11] | 3.5<br>[0.14] | 2.25<br>[0.09] | 0.9<br>[0.035] | <b>8.0010.4200.0000</b> |
|  | 5000<br>5803 / 5804 / 5805<br>5853 / 5858<br>5863 / 5868<br>F5863 / F5868<br>5850 / 5852<br>7053 / 7058<br>7063 / 7068      | 9.6<br>[0.38] | 6.5<br>[0.26] | 3.2<br>[0.13] | 5.6<br>[0.22] | 2.9<br>[0.11]  | 1.55<br>[0.06] | <b>8.0010.4100.0000</b> |
|    | <i>Scope of delivery:</i><br>- 3 eccentrics<br>- 3 screws<br>(Use at least three fastening eccentrics to mount the encoder) |               |               |               |               |                |                |                         |

# Accessories

## Robust bearing unit

Suitable for Sendix 50xx and 58xx



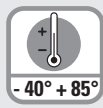
### Quick and simple – more protection

Separating the bearing load and the sensor technology affords the encoder greater protection in harsh environments.

Retrofitting to all encoders with a 58 mm clamping flange is very easy and quick.



Shock / vibration resistant



Temperature



High IP value



High shaft load capacity

Order no.

**8.0010.8200.000C**

### Robust bearing unit

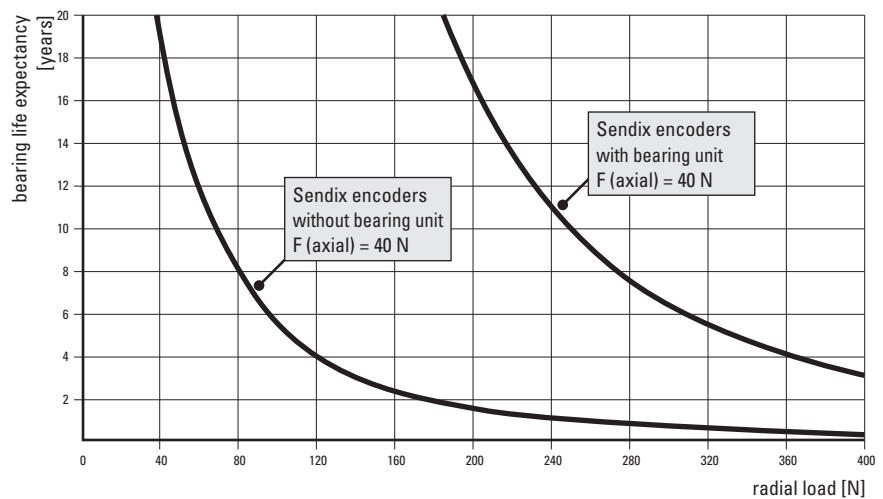
matching shaft encoders with clamping flange and shaft 10 mm [0.39"]

#### Technical data

|                      |   |
|----------------------|---|
| <b>Maximum speed</b> | 6000 min <sup>-1</sup>  |
| <b>Weight</b>        | approx. 560 g [19.75 oz]  |
| <b>Protection</b>    | IP67  |
| <b>Material</b>      | housing aluminum<br>optional: seawater resistant<br>shaft stainless steel |

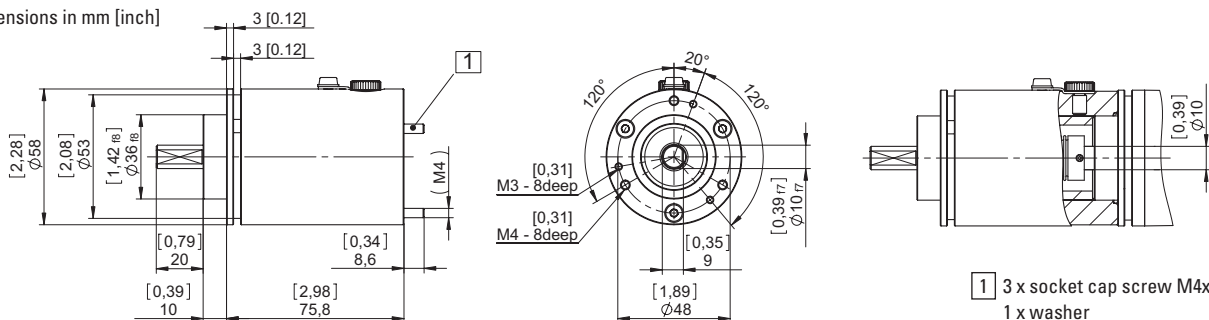
#### Bearing life expectancy L10

at 3000 revolutions/min with continuous operation



#### Dimensions

Dimensions in mm [inch]



1 3 x socket cap screw M4x25 (SW3)  
1 x washer  
included as mounting set

# Accessories

## Bearing box



In applications where the encoder is driven by use of gears, chains, belts etc. and the permitted axial and radial shaft loads are exceeded, we recommend the use of the special designed bearing box which has stronger bearings.

This can be combined with all encoders with a 58 mm clamping flange and shaft  $\varnothing 10 \times 20$  mm.

**Order no.** 8.0010.8200.0004

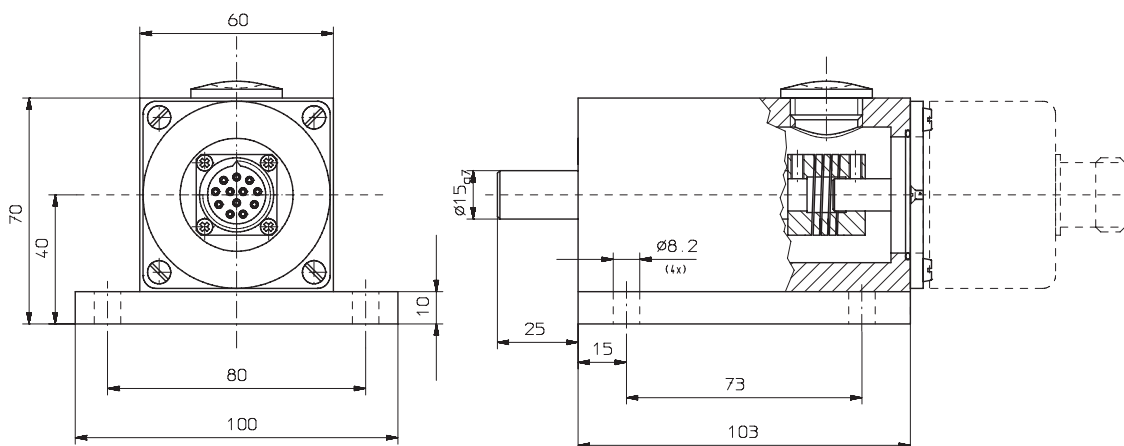
**Scope of delivery**

- Bearing box with lock cover and sealing
- Coupling for shaft  $\varnothing 10$  mm
- Flange adapter 8.0010.2100.0000
- 3 x countersunk head screws DIN 63 M 3 x 8
- 4 x slotted cheese head screws DIN 84 M 4 x 8

| Technical data                     |        |                        |
|------------------------------------|--------|------------------------|
| <b>Shaft load</b>                  | axial  | 150 N                  |
|                                    | radial | 250 N                  |
| <b>Lifetime of bearings</b>        |        | 50000 h                |
| <b>Protection acc. to EN 60529</b> |        | IP65                   |
| <b>Max. speed</b>                  |        | 4000 min <sup>-1</sup> |

**Dimensions**

Dimensions in mm



# Accessories

|                                 |           |                                     |
|---------------------------------|-----------|-------------------------------------|
| Connection of motor and encoder | Couplings | Bellows and spring washer couplings |
|---------------------------------|-----------|-------------------------------------|



**Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.**

**Spring washer couplings are used with high speeds.**

|   |  |  |
|---|--|--|
| <b>Order code</b>   | <b>Couplings</b>   | 8.0000 . 1 XXX . XX XX   |
|   |  | Type      a      b      c  |
| <b>a</b> Type of coupling   | <b>b</b> Bore diameter d1 (see technical data)                   | Example: d1 = 10 mm [0.39"] and d2 = 12 mm [0.47"]<br>Order no. = 8.0000.1X0X.1012 |
| 102 = Bellows-type ø 19 mm [0.75"]                                | Note:<br>for the bore diameter<br>d1 = 1/4" please enter Code A2 |  |
| 202 = Bellows-type ø 15 mm [0.59"]                                |  |  |
| 301 = Spring washer type,<br>ø 30 mm [1.18"], one-part            |  |  |
| 401 = Spring washer type,<br>ø 30 mm [1.18"], three part, plug-in |  |  |
| 502 = Bellows-type ø 25 mm [0.98"]                                | <b>c</b> Bore diameter d2 (see technical data)                   |  |

| Technical data                   |  |  | 8.0000.1102.XXXX                       | 8.0000.1202.XXXX                       | 8.0000.1301.XXXX                      | 8.0000.1401.XXXX                       | 8.0000.1502.XXXX |
|----------------------------------|--|--|--|--|---------------------------------------|--|------------------|
| <b>Type</b>                      |  |  |  |  |                                       |  |                  |
| <b>Maximum speed</b>             | min <sup>-1</sup>                        | 10000                                  | 10000                                  | 12000                                  | 12000                                 | 10000                                  |                  |
| <b>Maximum torque</b>            | Ncm                                      | 120                                    | 40                                     | 80                                     | 60                                    | 200                                    |                  |
| <b>Maximum displacement</b>      | radial                                   | mm ± 0.3                               | ± 0.25                                 | ± 0.4                                  | ± 0.3                                 | ± 0.35                                 |                  |
|                                  | axial                                    | mm ± 0.5                               | ± 0.45                                 | ± 0.4                                  | ± 0.4                                 | ± 0.54                                 |                  |
|                                  | angular                                  | - ± 4°                                 | ± 4°                                   | ± 3°                                   | ± 2.5°                                | ± 4°                                   |                  |
| <b>Torsion spring stiffness</b>  | Nm/rad                                   | 150                                    | 85                                     | 150                                    | 30                                    | 183                                    |                  |
| <b>Radial spring stiffness</b>   | N/mm                                     | 10                                     | 20                                     | 6                                      | 40                                    | 17.8                                   |                  |
| <b>Moment of inertia</b>         | gcm <sup>2</sup>                         | 9.5                                    | 2.1                                    | 19                                     | 35                                    | 20                                     |                  |
| <b>Max. tightening torque</b>    | Ncm                                      | 150                                    | 70                                     | 80                                     | 80                                    | 120                                    |                  |
| <b>Working temperature</b>       |  | -30°C ... +120°C<br>[-22°F ... +248°F] | -30°C ... +120°C<br>[-22°F ... +248°F] | -30°C ... +120°C<br>[-22°F ... +248°F] | -10°C ... +80°C<br>[+14°F ... +176°F] | -30°C ... +120°C<br>[-22°F ... +248°F] |                  |
| <b>Weight approx.</b>            |  | 16 g [0.56 oz]                         | 6.5 g [0.23 oz]                        | 16 g [0.56 oz]                         | 30 g [1.06 oz]                        | 24 g [0.85 oz]                         |                  |
| <b>Material</b>                  | flange<br>bellow or spring washer/casing | Al, anodized<br>stainless steel        | Al, anodized<br>stainless steel        | Al, anodized<br>stainless steel        | Al, anodized<br>PA 6.6 gf.            | Al, anodized<br>stainless steel        |                  |
| <b>Diameter d/d1 from ... to</b> | mm [inch]                                | 3 ... 12 [0.12 ... 0.47]               | 3 ... 9 [0.12 ... 0.35]                | 3 ... 8 [0.12 ... 0.32]                | 4 ... 16 [0.16 ... 0.47]              | 3 ... 16 [0.12 ... 0.63]               |                  |
| <b>Standard bore diameter</b>    | (d1 / d2) mm [inch]                      | 12 / 12 [0.47 ... 0.47]                | 08 / 06 [0.32 ... 0.24]                | 06 / 06 [0.24 ... 0.24]                | 12 / 12 [0.47 ... 0.47]               | 15 / 12 [0.59 ... 0.47]                |                  |
|                                  |  | 12 / 10 [0.47 ... 0.39]                | 06 / 06 [0.24 ... 0.24]                |  | 12 / 10 [0.47 ... 0.39]               | 14 / 12 [0.55 ... 0.47]                |                  |
|                                  |  | 10 / 10 [0.39 ... 0.39]                | 06 / 04 [0.24 ... 0.16]                |  | 10 / 10 [0.39 ... 0.39]               | 14 / 10 [0.55 ... 0.39]                |                  |
|                                  |  | 10 / 08 [0.39 ... 0.32]                | 04 / 04 [0.16 ... 0.16]                |  | 10 / 06 [0.39 ... 0.24]               | 10 / 10 [0.39 ... 0.39]                |                  |
|                                  |  | 10 / 06 [0.39 ... 0.24]                |  |  | 06 / 06 [0.24 ... 0.24]               | 06 / 06 [0.24 ... 0.24]                |                  |
|                                  |  | 08 / 08 [0.32 ... 0.32]                |  |  | 1/4" / 10                             |  |                  |
|                                  |  | 06 / 06 [0.24 ... 0.24]                |  |  | 1/4" / 06                             |  |                  |

## Description and applications

Manufacturing and installation tolerances as well as the effects of temperature cause alignment errors between shafts in drive engineering which can sometimes lead to extreme overload on the bearings.

This may result in increased wear of the bearings and may lead to premature failure of the encoder. By using couplings, these alignment errors can be compensated, thereby reducing the load on the bearings to a minimum. A distinction should be made between three different kinds of alignment error: radial, angular and axial displacement.

Whilst with torsion-free but flexible shaft couplings, axial shaft displacements produce only static forces in the coupling, radial and angular displacements produce alternating stresses, restoring forces and moments which may have an impact on adjoining components (shaft bearings).

Depending on the type of coupling, particular attention should be paid to radial shaft displacement which should be kept to a minimum.

# Accessories

**Connection of motor and encoder**      **Couplings**      **Bellows and spring washer couplings**

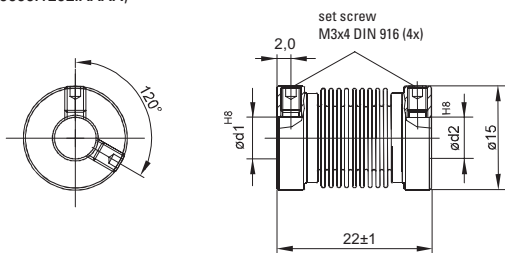
### Metal bellows-type couplings (.1102, .1202 und .1502)

Metal bellows-type couplings are recommended as an inexpensive type of coupling. They are also suitable for compensating larger angle displacements.

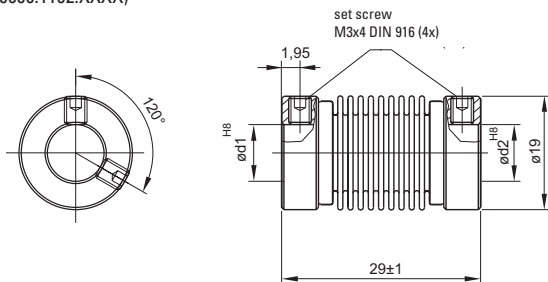
#### Dimensions

Dimensions in mm

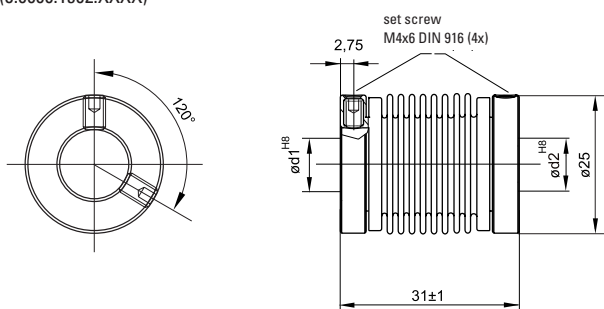
Bellows-type coupling  $\varnothing 15$  [0.59]  
(8.0000.1202.XXXX)



Bellows-type coupling  $\varnothing 19$  [0.75]  
(8.0000.1102.XXXX)



Bellows-type coupling  $\varnothing 25$  [0.98]  
(8.0000.1502.XXXX)



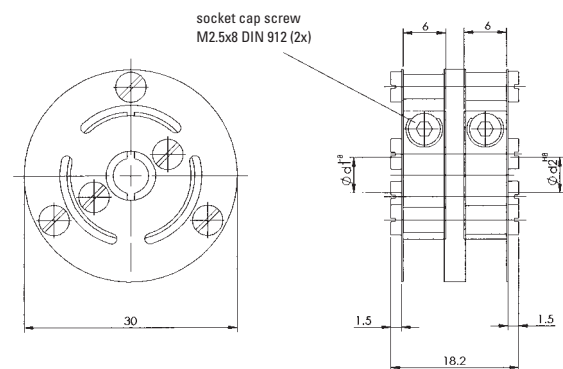
#### Installation instructions

1. Check shaft for displacement; see technical data for details.
2. Align and adjust coupling on shafts.
3. Tighten locking screws carefully. Avoid overtightening.
4. During installation protect the coupling from damage and from overbending.

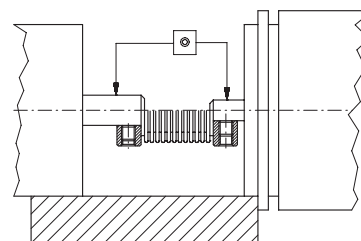
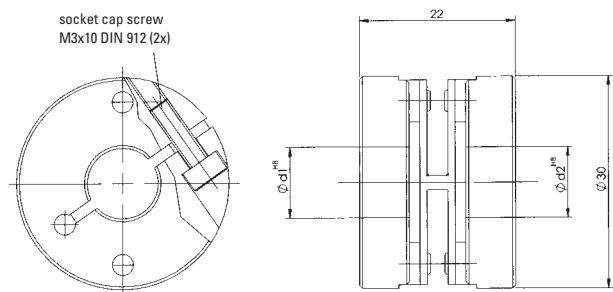
### Spring washer-type couplings (.1301 und .1401)

Spring washer couplings are used primarily where high speeds and minimal axial errors occur. For applications requiring potential separation between the encoder and the drive, use the electrically isolating spring washer coupling.

Spring washer-type coupling, one-part  
(8.0000.1301.XXXX)



Spring washer-type coupling, three part, plug-in  
(8.0000.1401.XXXX)



# Accessories

**Connection of motor and encoder**      **Couplings**      **Bellows couplings (FS)**



Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.

These bellows couplings (FS) are used for safe connection of applications and Sendix SIL encoders.

The safety-oriented bellows coupling has, in addition to the metallic bellows, internal claws that ensure the driving of the encoder in case of breakage of the bellows connection.

|                           |                                      |                           |                      |                           |   |           |
|---------------------------|--------------------------------------|---------------------------|----------------------|---------------------------|---|-----------|
| <b>Order code</b>         | <b>8.0000</b>                        | <b>. 1</b>                | <b>X</b>             | <b>FS</b>                 | <b>. XX</b>   | <b>XX</b> |
| <b>Couplings</b>          | Type                                 | a                         | b                    | c                         |   |           |
| <b>a</b> Type of coupling | 5 = bellows coupling ø 25 mm [0.98"] | <b>b</b> Bore diameter d1 | (see technical data) | <b>c</b> Bore diameter d2 | (see technical data)                                      |           |
|                           |                                      |                           |                      | Example:                  | d1 = 10 mm and d2 = 12 mm<br>order no. = 8.0000.15FS.1012 |           |

|                        |                   |                         |
|------------------------|-------------------|-------------------------|
| <b>Accessory</b>       | Loctite 243, 5 ml | Order no.               |
| <b>Screw retention</b> |                   | <b>8.0000.4G05.0000</b> |

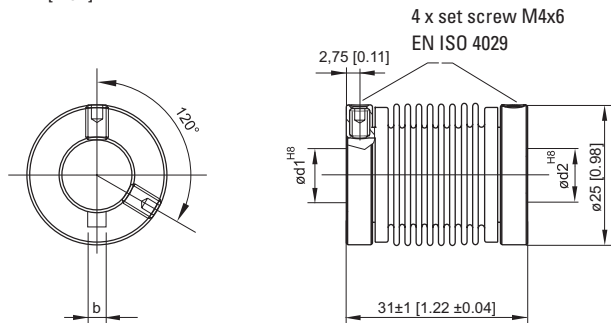
**Technical data**

| Mechanical characteristics                  |  |
|---|--|
| <b>Max. speed</b>                           | 10000 min <sup>-1</sup>                            |
| <b>Max. torque</b>                          | 200 Ncm  |
| <b>Max. shaft offset</b>                    | radial ± 0.3 mm<br>axial ± 0.45 mm<br>angular ± 3° |
| <b>Torsion spring stiffness</b>             | 183 Nm/rad   |
| <b>Radial spring stiffness</b>              | 17.8 N/mm  |
| <b>Moment of inertia</b>                    | 9.1 gcm <sup>2</sup>                               |
| <b>Headless set screw tightening torque</b> | min. 80 Ncm<br>max. 100 Ncm                        |

|                                  |                                   |   |
|----------------------------------|-----------------------------------|---|
| <b>Working temperature range</b> | -30°C ... +120°C [-22 ... +248°F] |   |
| <b>Weight approx.</b>            | 54 g                              |   |
| <b>Material</b>                  | flange                            | stainless steel 1.4104  |
|                                  | bellows                           | stainless steel 1.4571  |
| <b>Standard bore diameter</b>    | (d1 / d2)                         | 10 / 10 mm [0.39 / 0.39"]<br>10 / 12 mm [0.39 / 0.47"]<br>12 / 12 mm [0.47 / 0.47"] |
| <b>Insertion depth</b>           | min.                              | 6 mm [0.24"]  |
|                                  | max.                              | 11 mm [0.43"]   |

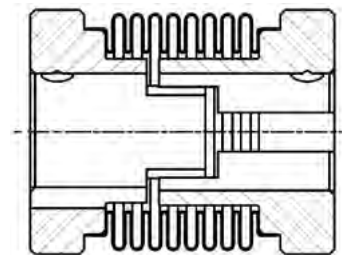
**Dimensions**

Dimensions in mm [inch]



Nut DIN 6885

| nut width b | d1 / d2   |
|-------------|-----------|
| 3 [0.12]    | 10 [0.39] |
| 4 [0.16]    | 12 [0.47] |



# Accessories

**Connection of motor and encoder**      **Flexible shaft coupling**      **Double loop coupling**



The safe, uncomplicated and economical solution, if drive shafts with angular, radial and/or axial displacement are to be friction-locked together.

**Order no. size 1**

Bore diameter both sides 6 mm [0.24"]      **8.0000.1J01.0606**

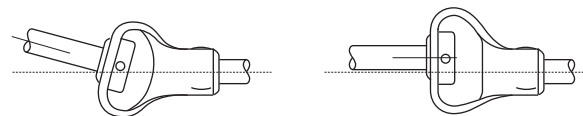
**Order no. size 2**

Bore diameter both sides 10 mm [0.39"]      **8.0000.1K01.1010**  
 Bore diameter 11 mm [0.43"] and 12 mm [0.47"] with keyway      **8.0000.1L01.1112**

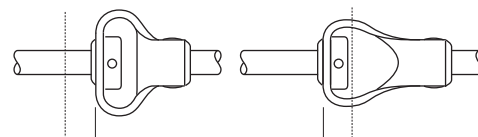
| Technical data                  |  |                                  |
|---------------------------------|--|----------------------------------|
|                                 | Size 1   | Size 2                           |
| <b>Max. speed</b>               | 3000 min <sup>-1</sup>                         | 3000 min <sup>-1</sup>           |
| <b>Max. torque</b>              | 0.5 Nm   | 2.0 Nm                           |
| <b>Max. offset of shafts</b>    | radial ± 2 mm<br>axial ± 2 mm<br>angular ± 10° | ± 3 mm<br>± 4 mm<br>± 12°        |
| <b>Torsion spring stiffness</b> | 13 Nm/rad                                      | 28 Nm/rad                        |
| <b>Radial spring stiffness</b>  | 13 N/mm  | 7 N/mm                           |
| <b>Moment of inertia</b>        | 41 gcm <sup>2</sup>                            | 106 gcm <sup>2</sup>             |
| <b>Max. clamping torque</b>     | 100 Ncm  | 100 Ncm                          |
| <b>Weight, approx.</b>          | 33 g [1.16 oz]                                 | 85 g [3.35 oz]                   |
| <b>Temperature range</b>        | -30°C ... + 80°C [-22°F ... +176°F]            |                                  |
| <b>Material</b>                 | flange<br>connecting element                   | steel galvanized<br>Polyurethane |

### Functional principle

Compensation of an angular misalignment      Compensation of a radial misalignment



Compensation of a axial misalignment

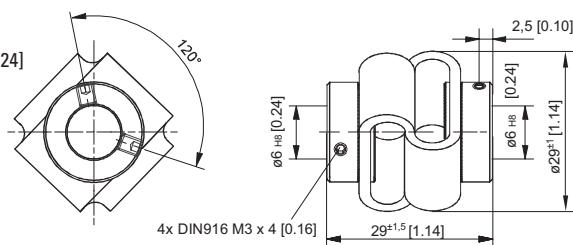


### Dimensions

Dimensions in mm

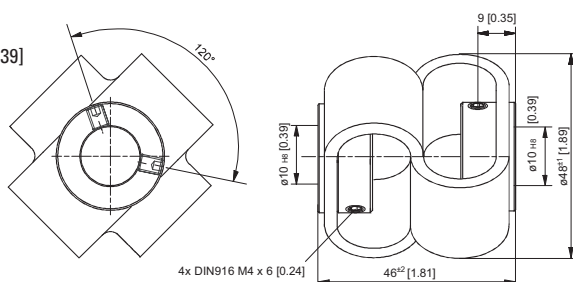
Size 1

6 / 6  
[0.24 / 0.24]



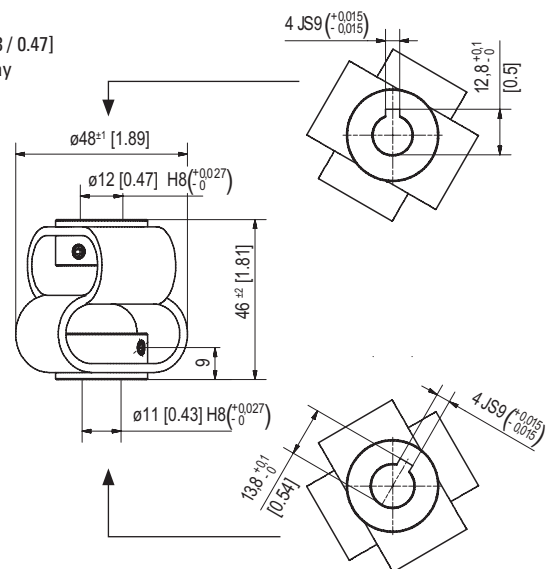
Size 2

10 / 10  
[0.39 / 0.39]



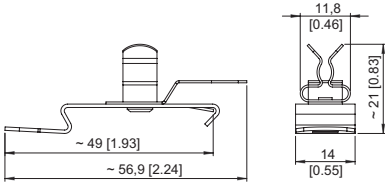

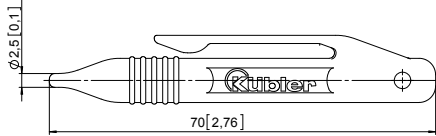


Size 2

11 / 12 [0.43 / 0.47]  
with keyway



# Accessories

| General accessories  |   |   |                         |
|--|---|---|-------------------------|
| Dimensions / Details   | Dimensions in mm [inch]   |   | Order no.               |
| <p><b>Screw retention Loctite 243 (5 ml)</b></p>  |   | <p>Chemical basis: dimethacrylate ester<br/>           Components: single-component (no mixing required)<br/>           Viscosity: medium, thixotrope<br/>           Cure: anaerobic<br/>           Secondary cure: activator<br/>           Use: screw retention<br/>           Strength: medium</p> | <b>8.0000.4G05.0000</b> |
| <p><b>EMC shield terminal</b></p>                |   | <p>For an EMC-compliant installation of the encoder cable,<br/>           top-hat rail mounting,<br/>           Shield diameter 3.0 ... 6.0 mm,<br/>           Clamp (spring steel, galvanized)<br/>           Foot (spring steel)</p>  | <b>8.0000.4G06.0000</b> |
| <p><b>Stylus for the set key</b></p>            |  | <p>For easy operation of the set key on the encoder<br/>           Material POM (HKS8 orange)</p>   | <b>8.0010.4052.0000</b> |







# Addresses

|                                    | Page       |
|------------------------------------|------------|
| <b>Kübler worldwide</b>            | <b>640</b> |
| <b>Contact partners in Germany</b> | <b>642</b> |



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**22149 Hamburg**  
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Techn. Vertretungen  
Rahlstedter Str. 16  
Phone +49 40 675085-0  
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info@seidel-gmbh.de  
www.seidel-gmbh.de

**42499 Hückeswagen**  
Fuhrmeister + Co. GmbH  
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Phone +49 2192 851122  
Fax +49 2192 851127  
info@fuhrmeister-gmbh.de  
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**66287 Göttelborn**  
Herbert Neundorfer  
GmbH & Co. KG  
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Am Campus 5  
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Fax +49 8178-8676-50  
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www.bachmann-electronic.de

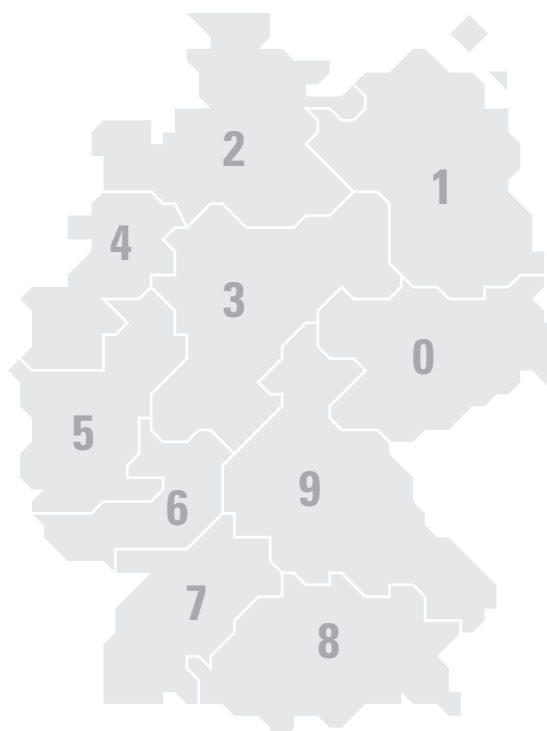
### Catalogue distributors (Germany):

**28359 Bremen**  
Distrelec Schuricht GmbH  
Lise Meitner-Str. 4  
Phone +49 1805 2234-35  
Fax +49 1805 2234-36  
scc@distrelec.de  
www.distrelec.de

**64546 Mörfelden-Walldorf**  
RS Components GmbH  
Hessenring 13 b  
Phone +49 6105 401234  
Fax +49 6105 401100  
www.rs-components.de

**85609 Aschheim**  
Farnell GmbH  
Karl-Hammerschmidt-Straße 38  
Phone +49 89 61303-0  
www.farnell.de

**92240 Hirschau**  
Conrad Electronic SE  
Klaus-Conrad-Straße 1  
92240 Hirschau  
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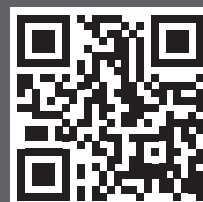




Kübler



Position and Motion  
Sensors



Functional Safety



Transmission  
Technology



Counters and Process  
Devices