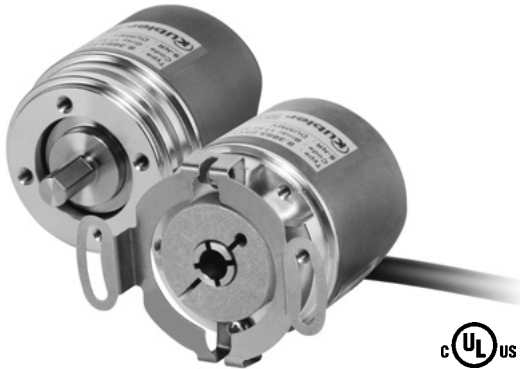


# Absolute encoders - singleturn

**Compact optical**

**Sendix F3653 / F3673 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

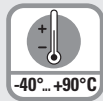


The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS interface boasts exceptional ruggedness and compact dimensions.

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



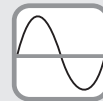
Magnetic field proof



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 insensitivity.

## Optimized performance

- High-precision with a data refresh rate of the position value ≤ 1µs.
- 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

**8.F3653**

Type

**.XXXX.XX12**

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"]
- 4 = ø 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</b>  | <b>.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>  | <b>g</b> <b>h</b> <b>i</b>   |  |   |
| <b>a Flange</b>               | 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>                              | <b>c Interface / power supply</b>  | 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 | <b>e Code</b>  | B = SSI, binary<br>C = BiSS, binary<br><u>G = SSI, gray</u>               |
| <b>b Through hollow shaft</b> | 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> | <b>d Type of connection</b>  | <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>  | <b>f Resolution</b>  | A = 10 bit<br>2 = 12 bit<br><u>3 = 13 bit</u><br>4 = 14 bit<br>7 = 17 bit |
|                               |  | *) 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) | <i>Optional on request</i><br>- surface protection<br>salt spray tested<br>- other resolutions   |  |   |

| Mounting accessory for shaft encoders   | Order no.                   |
|---|-----------------------------|
| <b>Coupling</b><br>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 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) | 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>              |
|  | or hollow shaft version                 | 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                                       |   |                                      |
| <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 ... +90°C [-40°F ... +194°F]      |                                      |
| Materials  |   |                                      |
| <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   |                                      |

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"].

# Absolute encoders - singleturn

|                        |  |                                 |
|------------------------|--|---------------------------------|
| <b>Compact optical</b> | <b>Sendix F3653 / F3673 (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 no. E224618                                      |
| <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</b>   | 10 ... 17 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>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</b>                 | 10 ... 17 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>          | ST resolution $\leq 14$ bit $\leq 1$ $\mu$ s<br>ST resolution 17 bit 2.4 $\mu$ s  |
| <b>Note:</b>                      | – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings<br>– CRC data verification |

| Incremental outputs (A/B)  |                                  |                                     |
|----------------------------|----------------------------------|-------------------------------------|
|                            | SinCos                           | RS422 TTL compatible                |
| <b>Max. frequency -3dB</b> | 400 kHz                          | 400 kHz                             |
| <b>Signal level</b>        | 1 V <sub>pp</sub> ( $\pm 20\%$ ) | HIGH: min. 2.5 V<br>LOW: max. 0.5 V |
| <b>Short circuit proof</b> | yes <sup>1)</sup>                | yes <sup>1)</sup>                   |
| <b>Pulse rate</b>          | 2048 ppr                         | 2048 ppr                            |

| Status output  |   |
|--|---|
| <b>Output driver</b>   | open collector, internal pull up resistor 22 k $\Omega$ m |
| <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 k $\Omega$ m).   |   |
| An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage 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</b>   | HIGH min. 60 % of +V, max: +V<br>(+V = power supply) 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 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.   |  |

<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 cores individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|-----------|--------------------|----------------------------|---|-----|----|----|----|----|----|---------------------|--------------------|---------------------|--------------------|--------|-----------|--------|
| 1, 2      | 1, 3, F            | SET, DIR, Status           | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | Stat                | ⊥                  |        |           |        |
|           |                    |                            | Core 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 cores individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | A                   | $\bar{A}$          | B      | $\bar{B}$ | ⊥      |
|           |                    |                            | Core 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 cores individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET                 | DIR                | 0 V <sub>sens</sub> | +V <sub>sens</sub> | ⊥      |           |        |
|           |                    |                            | Core color:   | WH  | BN | GN | YE | GY | PK | BU                  | RD                 | VT                  | RD-BU              |        | shield    |        |
| 6         | 1, 3, F            | 2048 SinCos, Sensor output | Cable (isolate unused cores 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      | $\bar{B}$ | ⊥      |
|           |                    |                            | Core 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 cores individually before initial start-up) |     |    |    |    |    |    |                     |                    |                     |                    |        |           |        |
|           |                    |                            | Signal:   | 0 V | +V | C+ | C- | D+ | D- | A                   | $\bar{A}$          | B                   | $\bar{B}$          | ⊥      |           |        |
|           |                    |                            | Core 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**

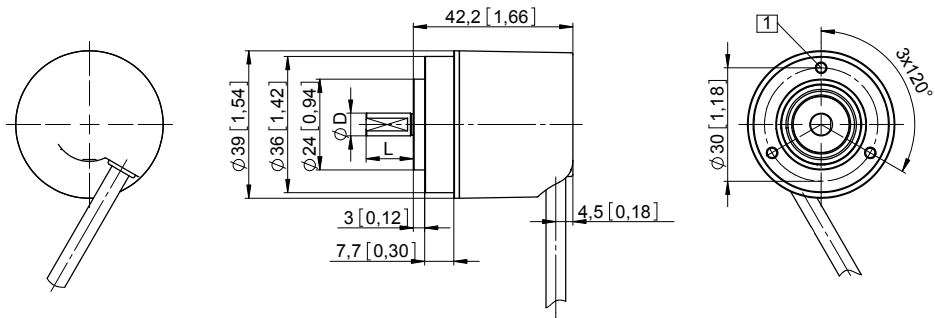
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep



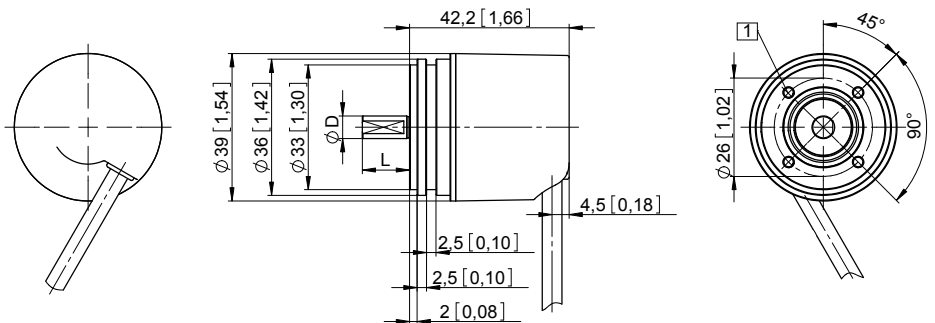
| D         | Fit | L           |
|-----------|-----|-------------|
| 6 [0.24]  | h7  | 12.5 [0.49] |
| 8 [0.32]  | h7  | 15 [0.59]   |
| 10 [0.39] | f7  | 20 [0.79]   |
| 1/4"      | h7  | 12.5 [0.49] |
| 3/8"      | h7  | 5/8"        |

### Synchro flange, $\varnothing$ 36 [1.42]

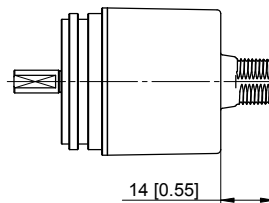
Flange type 2 and 4

(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

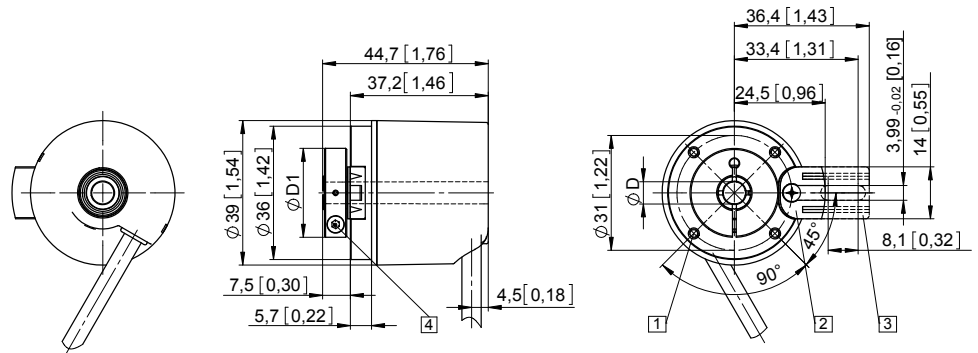
Dimensions in mm [inch]

### Flange with spring element

#### Flange type 1 and 3

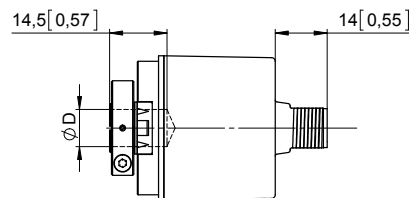
(drawing with spring element short, spring element long is shown dashed)

- 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"]

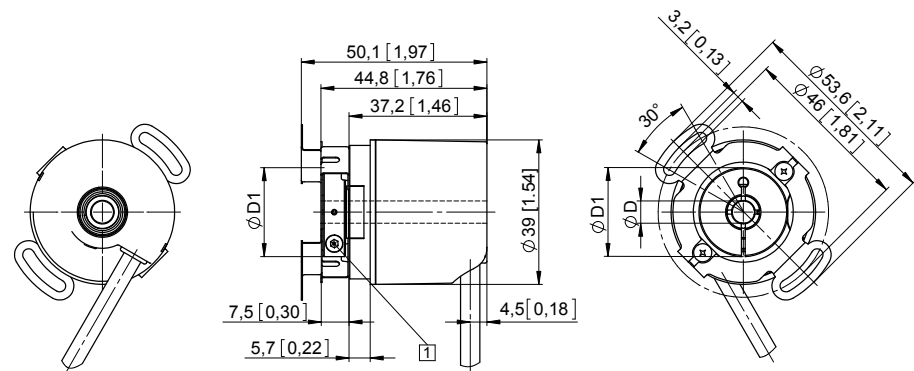


**Blind hollow shaft for D = 10**  
drawing with M12 connector and type of connection 8

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

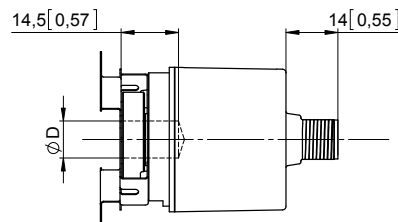
#### Flange type 2

- 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"]



**Blind hollow shaft for D = 10**  
drawing with M12 connector and type of connection 8





# Absolute encoders - singleturn

|                        |  |                |
|------------------------|--|----------------|
| <b>Compact optical</b> | <b>Sendix F3658 / F3678 (shaft / hollow shaft)</b> | <b>CANopen</b> |
|------------------------|--|----------------|

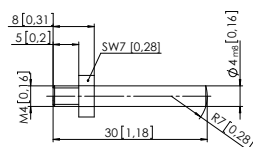
| Mounting accessory for shaft encoders |  | Order no. |
|---------------------------------------|--|-----------|
|---------------------------------------|--|-----------|

|                 |   |                         |
|-----------------|---|-------------------------|
| <b>Coupling</b> | bellows coupling $\varnothing$ 19 mm [0.75"] for shaft 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)



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<br>axial                                    | 40 N<br>20 N  |
| <b>Weight</b>   |  | approx. 0.2 kg [7.06 oz]  |
| <b>Protection acc. to EN 60529</b>                                    | housing side<br>shaft side                         | IP67<br>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<br>flange<br>housing<br>cable | stainless steel<br>aluminum<br>zinc die-cast<br>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 no. E224618                                      |
| <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,<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<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 cores individually before initial start-up) |    |     |         |       |       |
|-----------|--------------------|---|----|-----|---------|-------|-------|
|           |                    | Signal:   | +V | 0 V | CAN_GND | CAN_H | CAN_L |
| 2         | 1, 3, F            | Core color:   | BN | WH  | GY      | GN    | YE    |

# Absolute encoders - singleturn

**Compact optical**

**Sendix F3658 / F3678 (shaft / hollow shaft)**

**CANopen**

## Dimensions shaft version

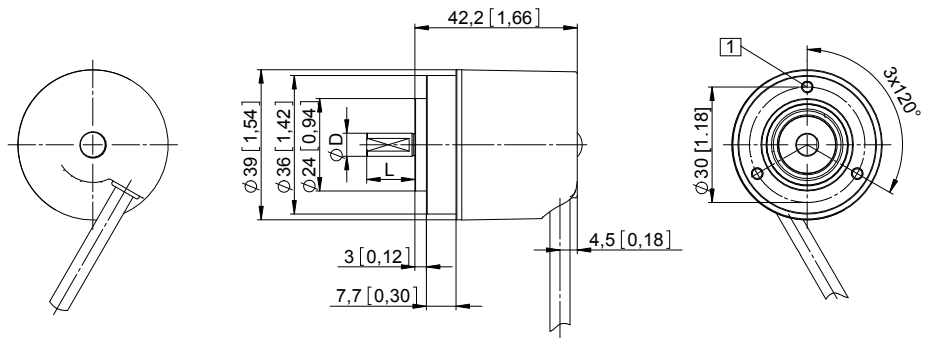
Dimensions in mm [inch]

### Clamping flange, $\varnothing$ 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

| 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"        |

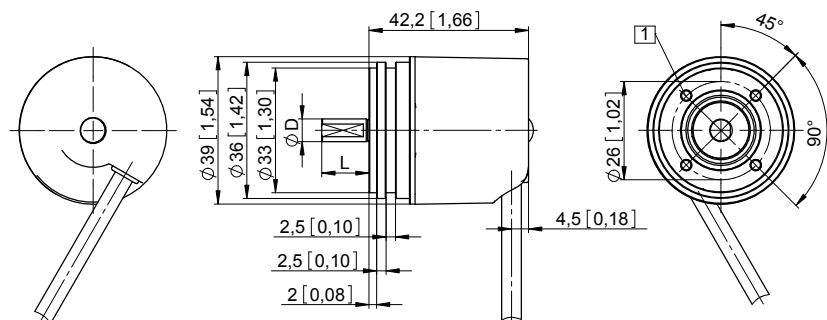


### Synchro flange, $\varnothing$ 36 [1.42]

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

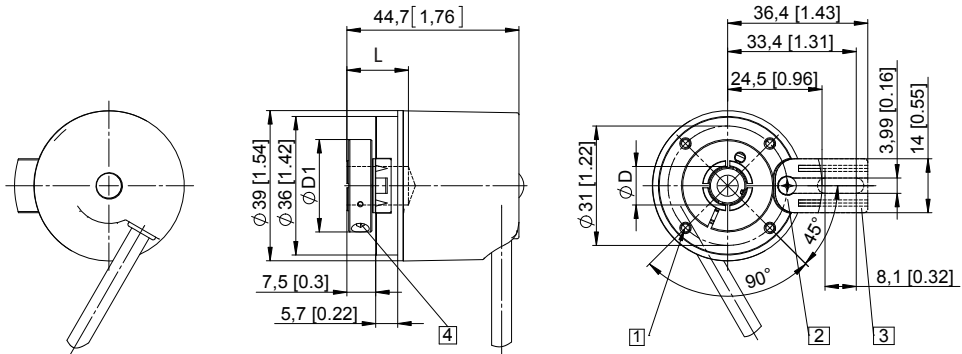
Dimensions in mm [inch]

### 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



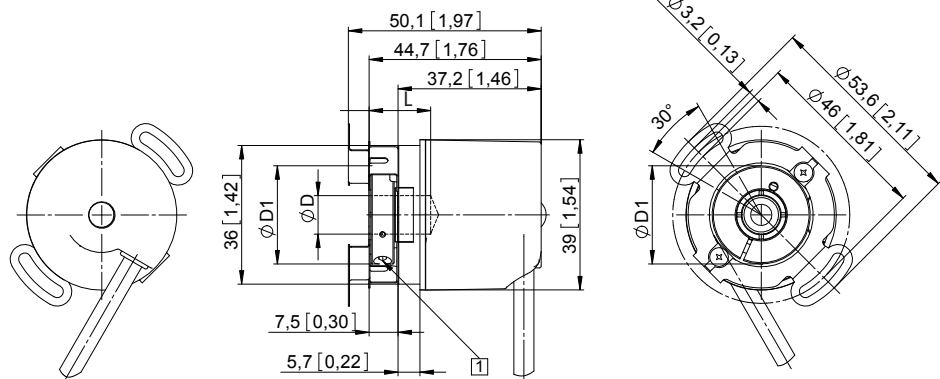
| D         | Fit | L           | D1          |
|-----------|-----|-------------|-------------|
| 6 [0.24]  | H7  | 14.5 [0.57] | 24 [0.94]   |
| 8 [0.32]  | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 10 [0.39] | H7  | 14.5 [0.57] | 25.5 [1.00] |
| 1/4"      | H7  | 14.5 [0.57] | 24 [0.94]   |

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>5852 / 5872 (shaft / hollow shaft)</b> | <b>Parallel, highspeed</b> |
|-------------------------|---|----------------------------|



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 | 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.

|  |               |   |      |          |          |          |          |  |
|--|---------------|---|------|----------|----------|----------|----------|--|
| <b>Order code</b>  | <b>8.5852</b> | . <b>XX</b> <b>XX</b> . <b>XXX</b> <b>1</b> | Type | <b>a</b> | <b>b</b> | <b>c</b> | <b>d</b> |  |
| <b>Shaft version</b>                                       |               |   |      |          |          |          |          |  |
| <b>a</b> 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>b</b> Interface / power supply                          |               |   |      |          |          |          |          |  |
| 1 = parallel (CMOS-TTL) / 5 V DC                           |               |   |      |          |          |          |          |  |
| 3 = parallel / 10 ... 30 V DC                              |               |   |      |          |          |          |          |  |
| <b>c</b> 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 |               |   |      |          |          |          |          |  |
| <b>d</b> 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                                  |               |   |      |          |          |          |          |  |
| <i>Optional on request</i>                                 |               |   |      |          |          |          |          |  |
| - other code types   |               |   |      |          |          |          |          |  |
| - other divisions  |               |   |      |          |          |          |          |  |

|  |               |   |      |          |          |          |          |          |  |
|--|---------------|---|------|----------|----------|----------|----------|----------|--|
| <b>Order code</b>  | <b>8.5872</b> | . <b>X</b> <b>X</b> <b>X</b> <b>X</b> . <b>XXX</b> <b>1</b> | Type | <b>a</b> | <b>b</b> | <b>c</b> | <b>d</b> | <b>e</b> |  |
| <b>Hollow shaft</b>  |               |   |      |          |          |          |          |          |  |
| <b>a</b> Flange  |               |   |      |          |          |          |          |          |  |
| 1 = with spring element, short                             |               |   |      |          |          |          |          |          |  |
| 3 = with stator coupling, ø 65 mm [2.56"]                  |               |   |      |          |          |          |          |          |  |
| <b>b</b> Through hollow shaft                              |               |   |      |          |          |          |          |          |  |
| 6 = ø 10 mm [0.39"]  |               |   |      |          |          |          |          |          |  |
| 8 = ø 12 mm [0.47"]  |               |   |      |          |          |          |          |          |  |
| <b>c</b> Interface / power supply                          |               |   |      |          |          |          |          |          |  |
| 1 = parallel (CMOS-TTL) / 5 V DC                           |               |   |      |          |          |          |          |          |  |
| 3 = parallel / 10 ... 30 V DC                              |               |   |      |          |          |          |          |          |  |
| <b>d</b> Type of connection                                |               |   |      |          |          |          |          |          |  |
| 1 = radial cable, 1 m [3.28'] PVC                          |               |   |      |          |          |          |          |          |  |
| 2 = radial M23 connector, 17-pin, without mating connector |               |   |      |          |          |          |          |          |  |
| <b>e</b> 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                                  |               |   |      |          |          |          |          |          |  |
| <i>Optional on request</i>                                 |               |   |      |          |          |          |          |          |  |
| - other code types   |               |   |      |          |          |          |          |          |  |
| - other divisions  |               |   |      |          |          |          |          |          |  |

### Reverse count direction

(Only with output type 3 and up to 13 bit gray code available)

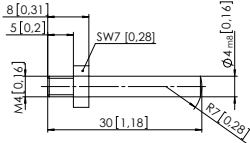
#### Normal operation:

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 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) | Dimensions in mm [inch]<br>with fixing thread<br> | <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 acc. to EN 60529</b>                     | shaft version   | IP65  |
|  | hollow shaft version                                  | IP66  |
| <b>Working temperature range</b>                       |   | -20°C ... +85°C 2)                              |
|  |   | [-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   |
|  | max.  | 75 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                                      |
|  | LOW   | max. 0.3 V                                      |
| <b>Rising edge time t<sub>r</sub></b> (without cable)  | max. 0.2 µs   | max. 1 µs                                       |
| <b>Falling edge time t<sub>f</sub></b> (without cable) | max. 0.2 µs   | max. 1 µs                                       |
| <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 no. E224618                                      |   |
| <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

|                         |   |                            |
|-------------------------|---|----------------------------|
| <b>Standard optical</b> | <b>5852 / 5872 (shaft / hollow shaft)</b> | <b>Parallel, highspeed</b> |
|-------------------------|---|----------------------------|

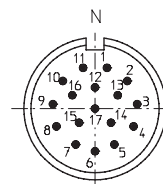
## Terminal assignment

| Interface | Type of connection | Cable (isolate unused cores individually before initial start-up) |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                        |
|-----------|--------------------|---|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|
|           |                    | Signal  | 0 V | +V | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 (V/R) <sup>4)</sup> |
| 1, 3      | 5852: 1, 2         | Core color:   | WH  | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY | RD | WH | BN | WH | YE                     |
|           | 5872: 1            |   |     |    |    |    |    |    |    |    |    |    | PK | BU | GN | GN | YE | BN                     |

| 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 | 14 (V/R) <sup>4)</sup> | 15 | 16 |
| 1, 3      | 5852: 3, 5         | Pin:                  | 1   | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16                     | 17 | PH |
|           | 5872: 2            |                       |     |    |   |   |   |   |   |   |   |    |    |    |    |    |    |                        |    |    |

- +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  $\perp$ : Plug connector housing (shield)

Top view of mating side, male contact base



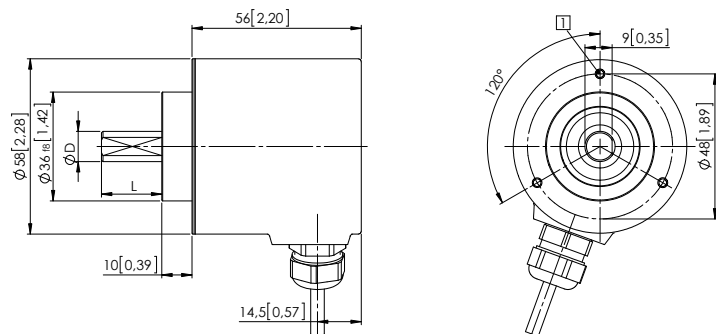
M23 connector, 17-pin (parallel)

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange,  $\varnothing$  58 [2.28]  
with shaft,  $\varnothing$  10 [0.39]  
Flange type 12**

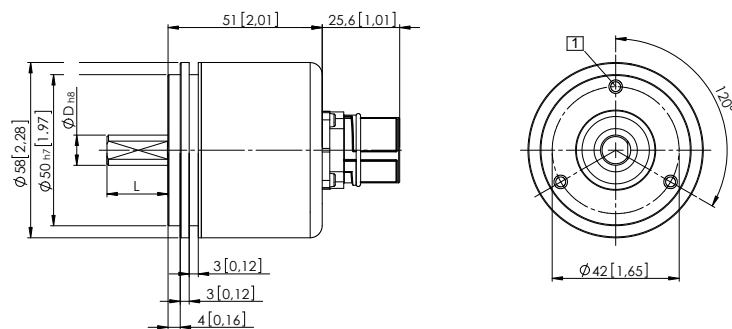
- 1) 3 x M3, 5 [0.20] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h8  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |

**Synchro flange,  $\varnothing$  58 [2.28]  
with shaft,  $\varnothing$  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>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

|   |  |   |  |  |   |   |   |   |   |  |  |
|---|--|---|--|--|---|---|---|---|---|--|--|
| <b>Order code</b>   | <b>8.5873</b>  | <b>.XXXX.XX2X</b>   | 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>Hollow shaft</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> <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>   | <ul style="list-style-type: none"> <li>1 = with spring element, long, IP65</li> <li>2 = with spring element, long, IP67</li> <li>3 = with stator coupling, IP65 ø 65 mm [2.56"]</li> <li>4 = with stator coupling, IP67 ø 65 mm [2.56"]</li> <li><b>5 = with stator coupling, IP65 ø 63 mm [2.48"]</b></li> <li>6 = with stator coupling, IP67 ø 63 mm [2.48"]</li> <li>E = with stator coupling, IP65 mounting without screws <sup>1)</sup></li> <li>F = with stator coupling, IP67 mounting without screws <sup>1)</sup></li> <li>G = with stator coupling, IP65 ø 72 mm [2.83"] <sup>1)</sup></li> <li>H = with expanding coupling, IP65 ø 65 mm [2.56"] <sup>1)</sup></li> </ul> | <ul style="list-style-type: none"> <li><b>c Interface / power supply</b></li> <li>1 = SSI, BiSS / 5 V DC</li> <li><b>2 = SSI, BiSS / 10 ... 30 V DC</b></li> <li>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC</li> <li>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</li> <li>5 = SSI, BiSS / 5 V DC, with sensor output</li> <li>6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output</li> <li>7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC</li> <li>8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC</li> <li>9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output</li> </ul> | <ul style="list-style-type: none"> <li><b>d Type of connection</b></li> <li>2 = radial cable, 1 m [3.28'] PVC</li> <li>B = radial cable, special length PVC *)</li> <li><b>E = tangential cable, 1 m [3.28'] PVC</b></li> <li>F = tangential cable, special length PVC *)</li> <li><b>4 = radial M23 connector, 12-pin</b></li> <li>6 = radial M12 connector, 8-pin <sup>2)</sup></li> </ul> | <ul style="list-style-type: none"> <li><b>e Code</b></li> <li>B = SSI, binary</li> <li>C = BiSS, binary</li> <li><b>G = SSI, gray</b></li> </ul> | <ul style="list-style-type: none"> <li><b>g Options (service)</b></li> <li>1 = no option</li> <li>2 = status LED</li> <li><b>3 = SET button and status LED</b></li> </ul> |   |   |   |   |  |  |
| <b>b Through hollow shaft</b>   | <ul style="list-style-type: none"> <li>3 = ø 10 mm [0.39"]</li> <li><b>4 = ø 12 mm [0.47"]</b></li> <li>5 = ø 14 mm [0.55"]</li> <li>6 = ø 15 mm [0.59"]</li> <li>8 = ø 3/8"</li> <li>9 = ø 1/2"</li> <li style="padding-left: 20px;">Tapered shaft</li> <li>K = ø 10 mm [0.39"]</li> </ul>  | <ul style="list-style-type: none"> <li><b>f Resolution <sup>3)</sup></b></li> <li>A = 10 bit</li> <li>1 = 11 bit</li> <li>2 = 12 bit</li> <li><b>3 = 13 bit</b></li> <li>4 = 14 bit</li> <li>7 = 17 bit</li> <li>C = 21 bit <sup>4)</sup></li> </ul>  | <ul style="list-style-type: none"> <li><b>Optional on request</b></li> <li>- Ex 2/22 (not with type of connection E or F) <sup>5)</sup></li> <li>- surface protection</li> <li>- salt spray tested</li> <li>- other resolutions</li> </ul>   |  |   |   |   |   |   |  |  |
| *) 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) |  |   |  |  |   |   |   |   |   |  |  |

|   |   |                              |
|---|---|------------------------------|
| <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>   | 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<br>(flange type 1 + 2) |   |                              |
| <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>8.0000.6901.0002.0031</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) 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 no. E224618                                       |            |  |
| <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>  |            |  |
| 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>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>   |            |  |
| ST resolution ≤ 14 bit   | ≤ 1 μs     |  |
| ST resolution 17 bit   | 2.4 μs     |  |
| ST resolution 21 bit   | 4 μs       |  |
| <b>Protocol</b>  |            |  |
| BiSS-C BP3 encoder profile   |            |  |
| <b>Note:</b>   |            |  |
| - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings |            |  |
| - CRC data verification  |            |  |
| - EDS (electronic data sheet)  |            |  |

| 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.  |       |  |

| Incremental outputs (A/B)  |                           |                                     |
|----------------------------|---------------------------|-------------------------------------|
|                            | SinCos                    | RS422<br>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>                   |
| <b>Pulse rate</b>          | 2048 ppr                  | 2048 ppr                            |

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

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

## Terminal assignment

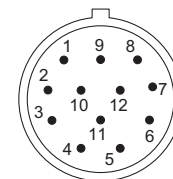
| Interface  | Type of connection | Features                               | Cable (isolate unused cores individually before initial start-up)        |
|------------|--------------------|--|--|
| 1, 2       | 1, 2, A, B, E, F   | SET, DIR, Status                       | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C $\perp$              |
|            |                    |  | Core color: WH BN GN YE GY PK BU RD BK - - - shield                      |
| 1, 2       | 3, 4               | SET, DIR, Status                       | M23 connector, 12-pin  |
|            |                    |  | 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                                       |
| 5          | 1, 2, A, B, E, F   | SET, DIR, Status<br>sensor output      | Cable (isolate unused cores individually before initial start-up)        |
|            |                    |  | Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens $\perp$        |
|            |                    |  | Core color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield              |
| 5          | 3, 4               | SET, DIR, Status<br>sensor output      | M23 connector, 12-pin  |
|            |                    |  | 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                                       |
| 3, 4, 7, 8 | 1, 2, A, B, E, F   | SET, DIR, SinCos<br>or incr. RS422     | Cable (isolate unused cores individually before initial start-up)        |
|            |                    |  | Signal: 0 V +V C+ C- D+ D- SET DIR A $\bar{A}$ B $\bar{B}$ $\perp$       |
|            |                    |  | Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield             |
| 3, 4, 7, 8 | 3, 4               | SET, DIR, SinCos<br>or incr. RS422     | M23 connector, 12-pin  |
|            |                    |  | 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                                       |
| 6, 9       | 1, 2, A, B, E, F   | SinCos o. incr. RS422<br>sensor output | Cable (isolate unused cores individually before initial start-up)        |
|            |                    |  | Signal: 0 V +V C+ C- D+ D- A $\bar{A}$ B $\bar{B}$ 0Vsens +Vsens $\perp$ |
|            |                    |  | Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield             |
| 6, 9       | 3, 4               | SinCos o. incr. RS422<br>sensor output | M23 connector, 12-pin  |
|            |                    |  | 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                                       |
| 1, 2       | 5, 6               | SET, DIR                               | M12 connector, 8-pin   |
|            |                    |  | 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

**Standard optical**

**Sendix 5853 / 5873 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

## Dimensions shaft version

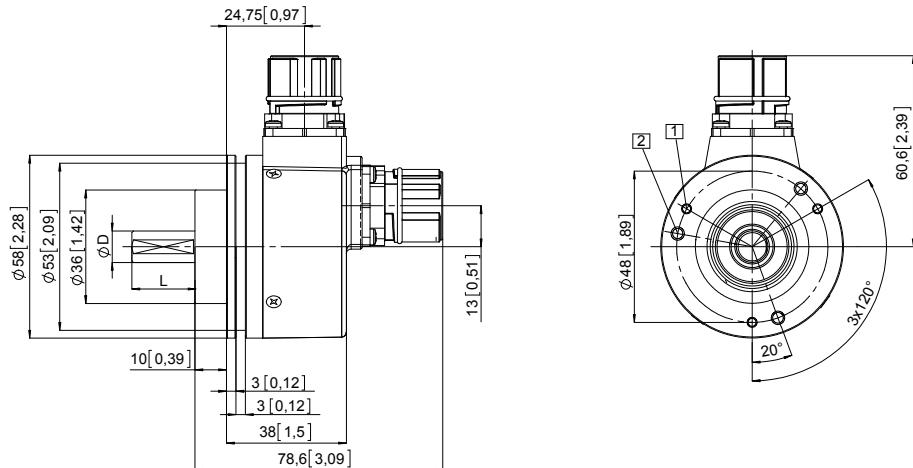
Dimensions in mm [inch]

### 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



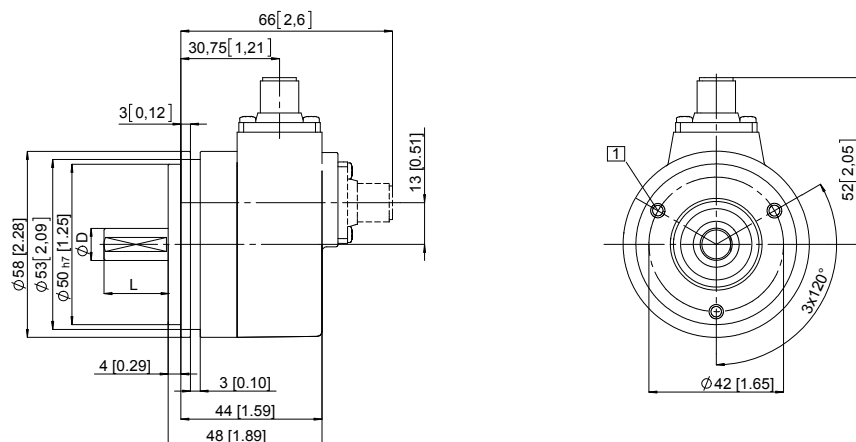
| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

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

#### Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

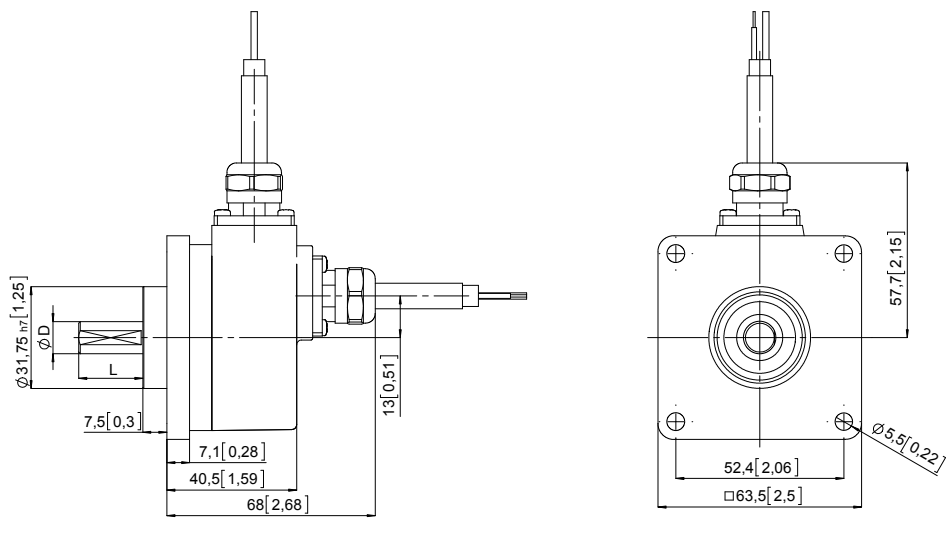


| D         | Fit | L         |
|-----------|-----|-----------|
| 6 [0.24]  | h7  | 10 [0.39] |
| 10 [0.39] | f7  | 20 [0.79] |
| 1/4"      | h8  | 7/8"      |
| 3/8"      | h8  | 7/8"      |

### 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

|                         |  |                                 |
|-------------------------|--|---------------------------------|
| <b>Standard optical</b> | <b>Sendix 5853 / 5873 (shaft / hollow shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------|--|---------------------------------|

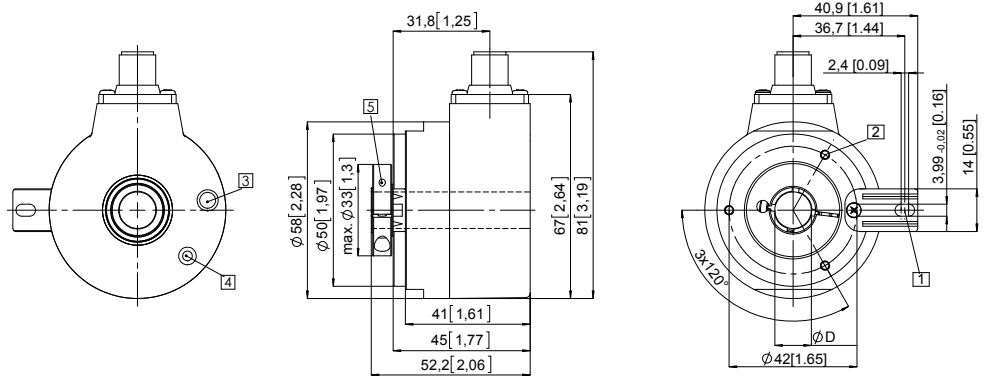
## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with 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  |

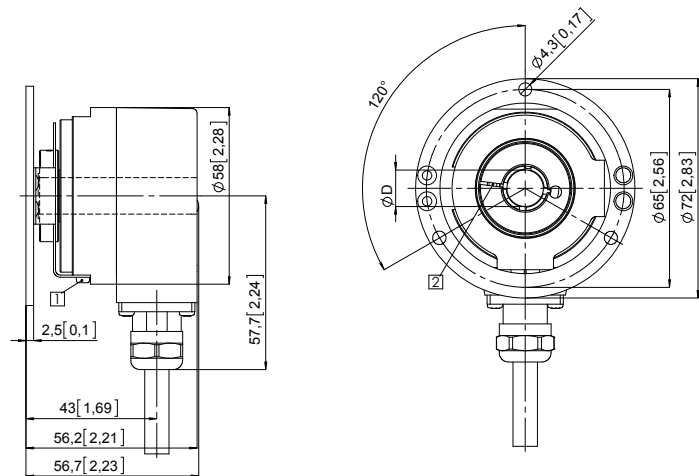
### Flange with stator coupling, $\varnothing 65$ [2.56]

#### 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  |

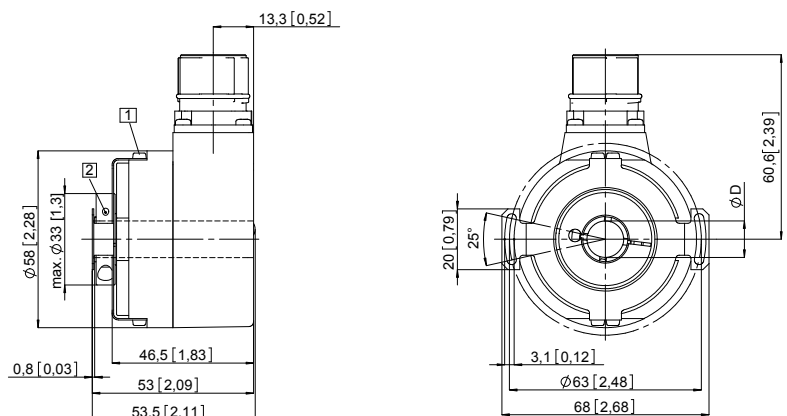
### Flange with stator coupling, $\varnothing 63$ [2.48]

#### 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

**Standard optical**

**Sendix 5853 / 5873 (shaft / hollow shaft)**

**SSI / BiSS + incremental**

## Dimensions hollow shaft version

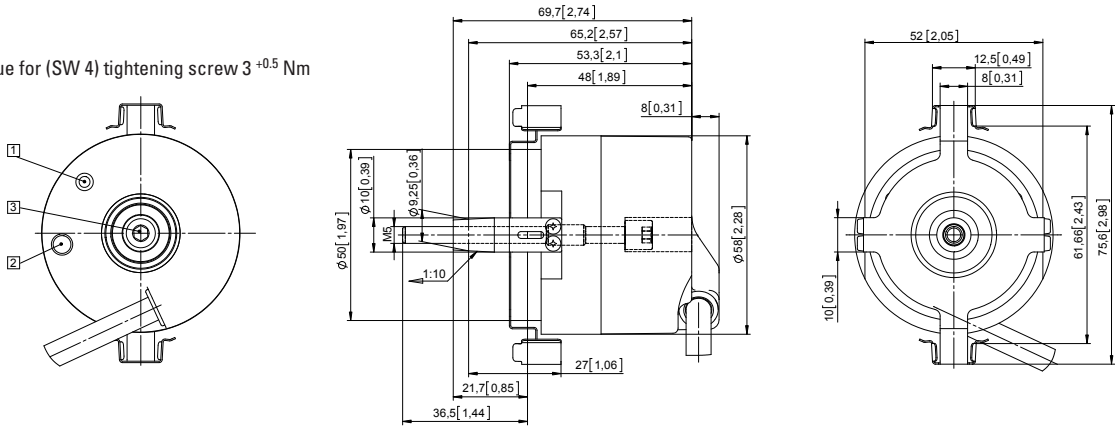
Dimensions in mm [inch]

### 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 <sup>+0.5</sup> Nm

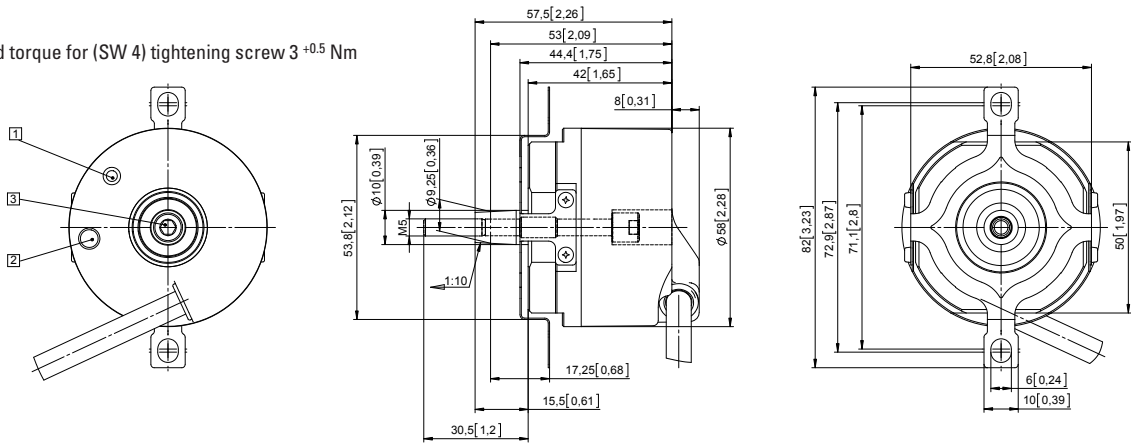


### Flange with stator coupling, ø 72 [2.83]

#### Flange type G

(with tapered shaft K and tangential cable)

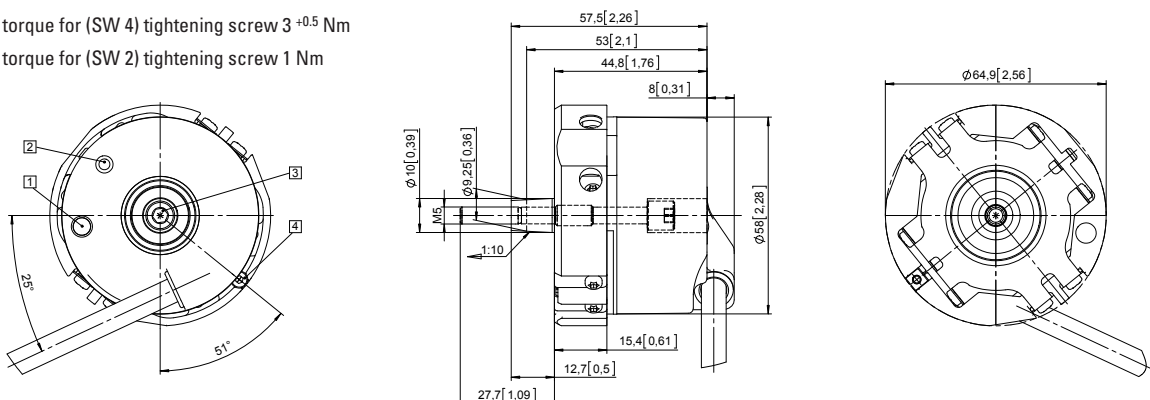
- 1 Status LED
- 2 SET Button
- 3 Recommended torque for (SW 4) tightening screw 3 <sup>+0.5</sup> Nm



### 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 <sup>+0.5</sup> Nm
- 4 Recommended torque for (SW 2) tightening screw 1 Nm



# Absolute encoders - singleturn

|                                     |                                    |                                 |
|-------------------------------------|------------------------------------|---------------------------------|
| <b>Standard Motor-Line, optical</b> | <b>Sendix 5873 (tapered shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------------------|------------------------------------|---------------------------------|



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 | High protection level | 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  $\leq 1 \mu s$ .
- 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 | . | X | K | X | X | . | X | X | 2 | X |
| Type   |   | a | b | c | d |   | e | f |   | g |

### 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>
- L = with PCB connector<sup>3)</sup>  
(without cable, including sealing cap for tangential cable outlet)

\*) 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>4)</sup>

- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- 3 = 13 bit
- 4 = 14 bit
- 7 = 17 bit
- C = 21 bit<sup>5)</sup>

### g 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) IP40, only available without SET button and status LED, not available with interface 9, see the Accessories for the suitable connection cable.  
4) Resolution, preset value and counting direction factory-programmable.  
5) 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> |
|-------------------------------------|------------------------------------|---------------------------------|

| Connection technology  |   | Order no.               |
|--|---|-------------------------|
| <b>Cordset, pre-assembled</b><br>(suitable for type of connection L) | PCB connector (female contacts), 12-pin single-ended,<br>2 m [6.56'] PVC cable  | <b>8.0000.6D91.0002</b> |
|  | PCB connector (female contacts), 12-pin single-ended,<br>8 m [26.25'] PVC cable | <b>8.0000.6D91.0008</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

| Mechanical characteristics                    |                             |  |
|---|-----------------------------|--|
| <b>Maximum speed</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)                           |
| <b>Starting torque at 20°C [68°F]</b>         |                             | < 0.01 Nm  |
| <b>Mass moment of inertia</b>                 |                             | 3.0 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>            |                             | 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 %)<br>4.5 ... 5.5 V DC<br>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 no. E224618                                       |
| <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>  | 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>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>          | ST resolution ≤ 14 bit   | ≤ 1 μs   |
|                                   | ST resolution 17 bit   | 2.4 μs   |
|                                   | ST resolution 21 bit   | 4 μs   |
| <b>Protocol</b>                   |  | BiSS-C BP3 encoder profile                             |
| <b>Note:</b>                      |  |  |
|                                   | – Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings |  |
|                                   | – CRC data verification  |  |
|                                   | – EDS (electronic data sheet)  |  |

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> |
|-------------------------------------|------------------------------------|---------------------------------|

| 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<br>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 multeturn (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.  |   |

| Incremental outputs (A/B)  | SinCos                     |                                     | RS422 TTL compatible |                   |
|----------------------------|----------------------------|-------------------------------------|----------------------|-------------------|
|                            | <b>Max. frequency -3dB</b> | 400 kHz                             | 400 kHz              | 400 kHz           |
| <b>Signal level</b>        | 1 Vpp (±20 %)              | HIGH: min. 2.5 V<br>LOW: max. 0.5 V | yes <sup>1)</sup>    | yes <sup>1)</sup> |
| <b>Short circuit proof</b> | yes <sup>1)</sup>          | yes <sup>1)</sup>                   | yes <sup>1)</sup>    | yes <sup>1)</sup> |
| <b>Pulse rate</b>          | 2048 ppr                   | 2048 ppr                            | 2048 ppr             | 2048 ppr          |

| 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.

Note: In case of use of the BiSS interface, the SET function is carried out through BiSS.

| 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.   |  |

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

# Absolute encoders - singleturn

**Standard  
Motor-Line, optical**

**Sendix 5873 (tapered shaft)**

**SSI / BiSS + incremental**

## Terminal assignment

| Interface | Type of connection | Features                            | Cable (isolate unused cores 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 $\perp$   |
|           |                    |                                     | Core 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 $\perp$   |
|           |                    |                                     | Core 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 $\bar{B}$ $\perp$  |
|           |                    |                                     | Core 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 $\perp$  |
|           |                    |                                     | Core 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      |
| 6, E      | L                  | SinCos sensor output                | PCB connector (male contact), 12-pin  |
|           |                    |                                     | Signal: D- +V A C+ 0Vsens $\bar{B}$ B 0 V C- $\bar{A}$ +Vsens D+<br>Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b                    |
| 1, 2      | L                  | SET, DIR                            | PCB connector (male contact), 12-pin  |
|           |                    |                                     | Signal: D- +V - C+ DIR - - 0 V C- - SET D+<br>Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b  |
| 3, 4      | L                  | SET, DIR, SinCos                    | PCB connector (male contact), 12-pin  |
|           |                    |                                     | Signal: D- +V A C+ DIR $\bar{B}$ B 0 V C- $\bar{A}$ SET D+<br>Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b                          |
| 5         | L                  | sensor output                       | PCB connector (male contact), 12-pin  |
|           |                    |                                     | Signal: D- +V - C+ 0Vsens - - 0 V C- - +Vsens D+<br>Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b                                    |

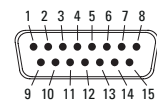
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel 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

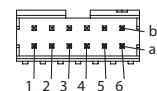
Type of connection H  
Phoenix Contact connector  
(MC1.5/16-STF-3.81), 16-pin



Type of connection G  
Sub-D connector (male contact),  
double-row, 15-pin



Type of connection L  
FCI Minitek connector (male contact),  
double-row, 12-pin (98424-F52-12-LF)



## Terminal assignment cordset 8.0000.6D91.0002 or 8.0000.6D91.0008

| PCB connector (female contacts), 12-pin / single-ended |    |    |    |    |       |    |    |    |    |    |       |    |
|--|----|----|----|----|-------|----|----|----|----|----|-------|----|
| Pin:   | 1a | 1b | 2a | 2b | 3a    | 3b | 4a | 4b | 5a | 5b | 6a    | 6b |
| Core color:  | PK | BN | BU | GN | GY-PK | VT | BK | WH | YE | RD | RD-BU | GY |

# Absolute encoders - singleturn

|                                     |                                    |                                 |
|-------------------------------------|------------------------------------|---------------------------------|
| <b>Standard Motor-Line, optical</b> | <b>Sendix 5873 (tapered shaft)</b> | <b>SSI / BiSS + incremental</b> |
|-------------------------------------|------------------------------------|---------------------------------|

## Dimensions tapered shaft version

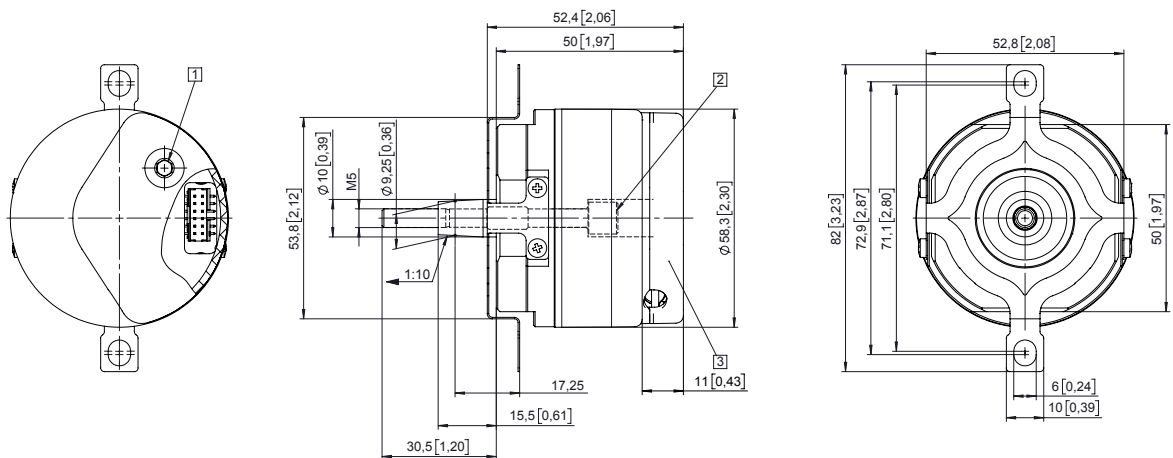
Dimensions in mm [inch]

### Flange with stator coupling, $\varnothing$ 72 [2.83]

#### Flange type G

(with tapered shaft K and PCB connector)

- 1 Recommended torque for screw M6 (SW 4) 2.0 <sup>+0.5</sup> Nm
- 2 Recommended torque for tightening screw M6 (SW 4) 3.0 <sup>+0.5</sup> Nm
- 3 Sealing cap for tangential cable outlet

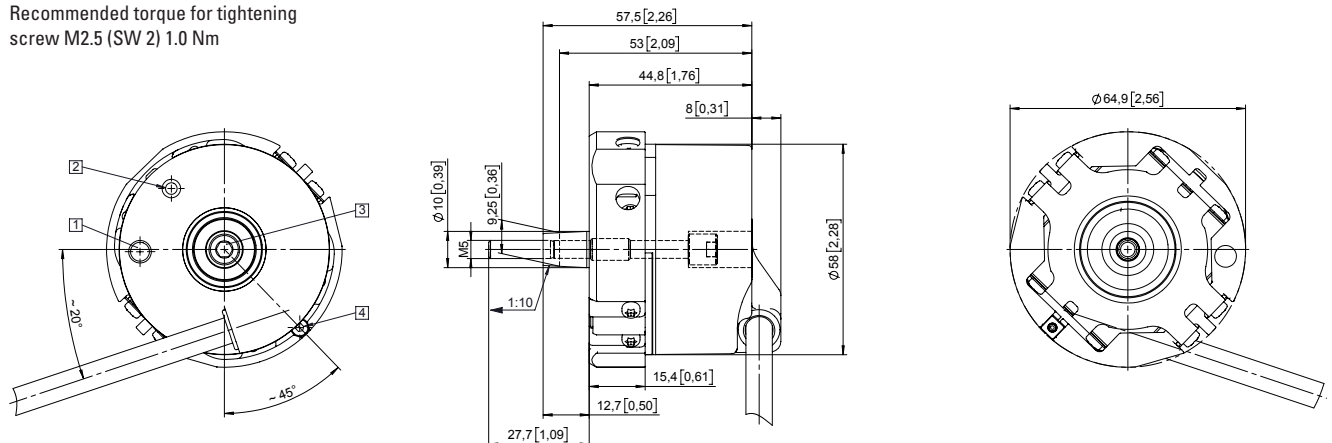


### Flange with expanding coupling, $\varnothing$ 65 [2.56"]

#### Flange type H

(with tapered shaft K and tangential cable)

- 1 Status-LED
- 2 SET button
- 3 Recommended torque for tightening screw M6 (SW 4) 3.0 <sup>+0.5</sup> Nm
- 4 Recommended torque for tightening screw M2.5 (SW 2) 1.0 Nm



# 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



High protection level



High shaft load capacity



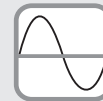
Shock / vibration resistant



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  
Shaft version**

**8.5853FS2 . 1XXX . XX2X**  
Type

**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** 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<br/>Hollow shaft</b> | <b>8.5873FS2</b><br><small>Type</small> | . <b>X</b> <b>X</b> <b>X</b> <b>X</b> . <b>X</b> <b>X</b> <b>2</b> <b>X</b>  |
|                                    |   | <small>a</small> <small>b</small> <small>c</small> <small>d</small> <small>e</small> <small>f</small> <small>g</small> |

|   |   |  |
|---|---|--|
| <p><b>a</b> <i>Flange</i><br/>9 = with torque stop, flexible, IP65<br/>A = with torque stop set, rigid, IP65<br/>B = with stator coupling, IP65, ø 63 mm [2.48"]</p> <p><b>b</b> <i>Through hollow shaft</i><br/>3 = ø 10 mm [0.39"]<br/>4 = ø 12 mm [0.47"]<br/>5 = ø 14 mm [0.55"]<br/><i>Tapered shaft</i><br/>K = ø 10 mm [0.39"]</p> <p><b>c</b> <i>Interface / power supply</i><br/>3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br/>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</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/>E = tangential cable, 1 m [3.28'] PVC<br/>F = tangential cable, special length PVC *)<br/>4 = radial M23 connector, 12-pin<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)</p> <p><b>e</b> <i>Code</i><br/>B = SSI, binary<br/>C = BiSS, binary<br/>G = SSI, gray</p> | <p><b>f</b> <i>Resolution <sup>1)</sup></i><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> <i>Options (service)</i><br/>1 = no option<br/>2 = status LED<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 resolutions</p> |
|---|---|--|

| 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>SIL2/PLd, optical | <b>Sendix SIL 5853FS2 / 5873FS2 (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> | $2.16 \times 10^{-8} \text{ h}^{-1}$                            |
| <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 |

| Electrical characteristics                             |   |
|--|---|
| <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 no. E224618  |
| <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 $4.0 \times 10^{-6} \text{ kgm}^2$<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   |

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.

| 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>          | ST resolution ≤ 14 bit ≤ 1 μs<br>ST 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<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  |
| <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>          | ST resolution ≤ 14 bit ≤ 1 μs<br>ST resolution 17 bit 2.4 μs  |
| <b>Note:</b>                      | - bidirectional, factory programmable parameters are: 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> ( $\pm 10\%$ ) |
| <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/>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.   |  |

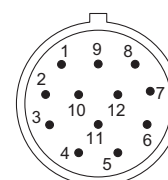
## Terminal assignment

| Interface | Type of connection | Cable (isolate unused cores 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     | $\bar{B}$ | $\perp$ |
|           |                    | Core 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

**Standard  
SIL2/PLd, optical**

**Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)**

**SSI/BiSS + SinCos**

## Dimensions shaft version

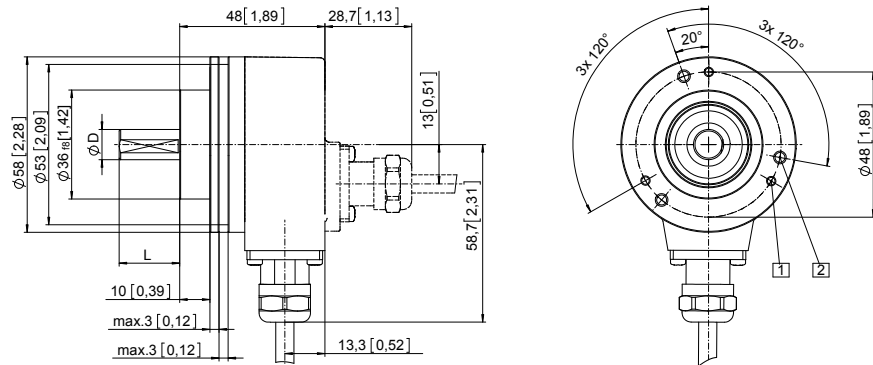
Dimensions in mm [inch]

### 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



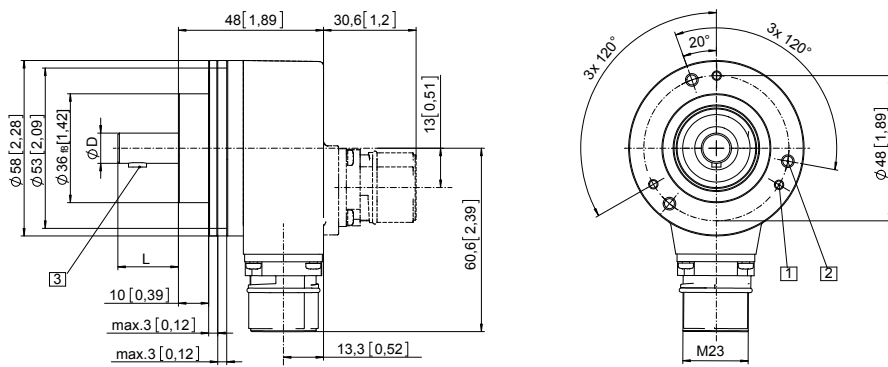
| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

### 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 - 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]

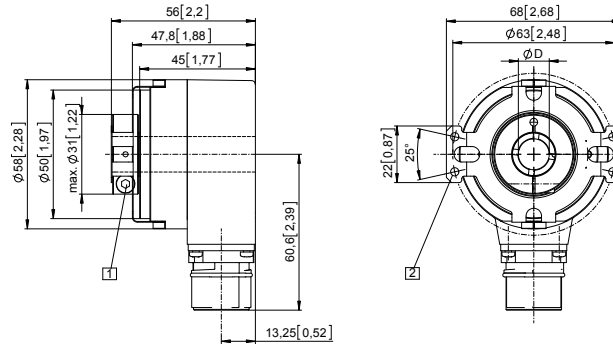
#### Flange type B

#### 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

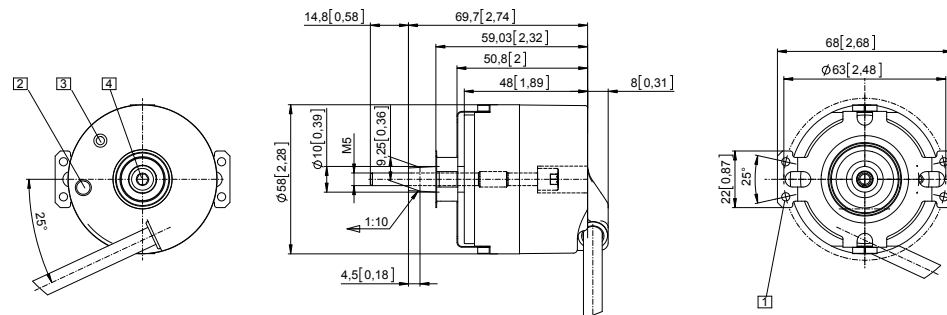
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

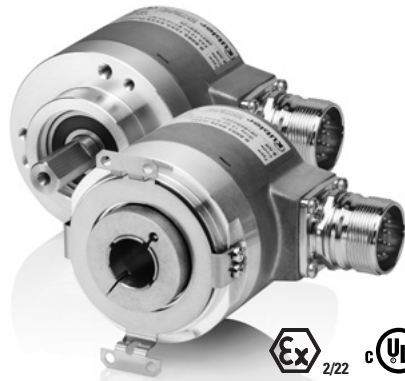
- 3 SET button

- 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



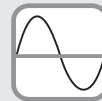
Shock / vibration resistant



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**      **8.5853FS3** . **1**X**X**X . **X**X**2**X  
**Shaft version**      Type      **a** **b** **c** **d** **e** **f** **g**

### **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** 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><small>Type</small>  | <table border="1" style="border-collapse: collapse; text-align: center; width: 100%;"> <tr> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">.</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> <td style="width: 25px; height: 25px; border: 1px solid black;">2</td> <td style="width: 25px; height: 25px; border: 1px solid black;">X</td> </tr> <tr style="font-size: 8px;"> <td>a</td> <td>b</td> <td>c</td> <td>d</td> <td></td> <td>e</td> <td>f</td> <td>g</td> <td></td> </tr> </table> | X | X | X | X | . | X | X | 2 | X | a | b | c | d |  | e | f | g |  |
| X  | X  | X   | X | . | X | X | 2 | X |   |   |   |   |   |   |   |  |   |   |   |  |
| a  | b  | c   | d |   | e | f | g |   |   |   |   |   |   |   |   |  |   |   |   |  |
| <b>a Flange</b>  | <b>d Type of connection</b>  | <b>f Resolution <sup>1)</sup></b>   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |
| 9 = with torque stop, flexible, IP65<br>A = with torque stop set, rigid, IP65<br>B = with stator coupling, IP65, ø 63 mm [2.48"] | 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>4 = radial M23 connector, 12-pin<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) | A = 10 bit<br>1 = 11 bit<br>2 = 12 bit<br>3 = 13 bit<br>4 = 14 bit<br>7 = 17 bit  |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |
| <b>b Through hollow shaft</b>  | <b>e Code</b>  | <b>g Options (service)</b>  |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |
| 3 = ø 10 mm [0.39"]<br>4 = ø 12 mm [0.47"]<br>5 = ø 14 mm [0.55"]<br><b>Tapered shaft</b><br>K = ø 10 mm [0.39"]                 | B = SSI, binary<br>C = BiSS, binary<br>G = SSI, gray   | 1 = no option<br>2 = status LED<br>3 = SET button and status LED<br><br><i>Optional on request</i><br>- Ex 2/22 (not for type of connection E, F) <sup>2)</sup><br>- other resolutions  |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |
| <b>c Interface / power supply</b>  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |
| 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC<br>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC                                   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |   |  |

| Accessories                                      | Order no.   |
|--|---|
| <b>EMC shield terminal</b>                       | for top-hat rail mounting <span style="float: right;"><b>8.0000.4G06.0000</b></span>  |
| <b>Screw retention</b>                           | Loctite 243, 5 ml <span style="float: right;"><b>8.0000.4G05.0000</b></span>  |
| <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>              | <div style="display: flex; justify-content: space-between;"> <div style="width: 70%;"> <p>M23 female connector with coupling nut, 12-pin single-ended,<br/>2 m [6.56'] PVC cable <sup>3)</sup></p> <p>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></p> </div> <div style="width: 25%; text-align: right;"> <p><b>8.0000.6901.0002.0031</b></p> <p><b>8.0000.6905.0002.0032</b></p> </div> </div> |
| <b>Connector, self-assembly (straight)</b> | M23 female connector with coupling nut, 12-pin <span style="float: right;"><b>8.0000.5012.0000</b></span>  |

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<br>(no load)   | max. 70 mA<br>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 no. E224618  |                          |
| <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) |
|  | 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>3)</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>    | 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 |
|                                   | 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>          | ST resolution ≤ 14 bit           | ≤ 1 μs     |
|                                   | ST 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 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>          | ST resolution ≤ 14 bit                                 | ≤ 1 μs     |
|                                   | ST resolution 17 bit                                   | 2.4 μs     |

**Note:**

- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- 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 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   |

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.   |  |

## Terminal assignment

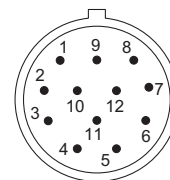
| Interface | Type of connection | Cable (isolate unused cores individually before initial start-up) |     |    |    |    |    |    |     |     |    |           |       |           |         |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| 3, 4      | 1, 2, A, B, E, F   | Signal:   | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A  | $\bar{A}$ | B     | $\bar{B}$ | $\perp$ |
|           |                    | Core 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

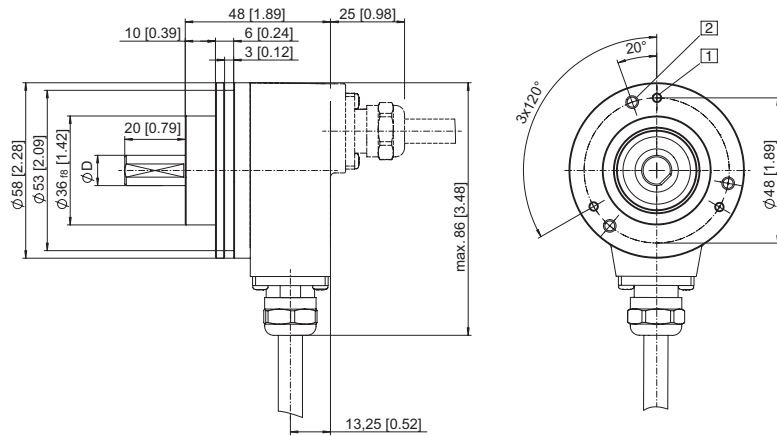
|                                       |  |                          |
|---------------------------------------|--|--------------------------|
| <b>Standard<br/>SIL3/PLe, optical</b> | <b>Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)</b> | <b>SSI/BiSS + SinCos</b> |
|---------------------------------------|--|--------------------------|

## Dimensions shaft version

Dimensions in mm [inch]

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

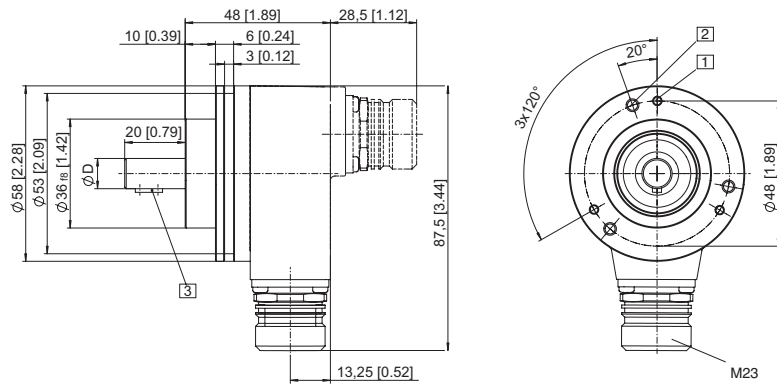
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



| 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]

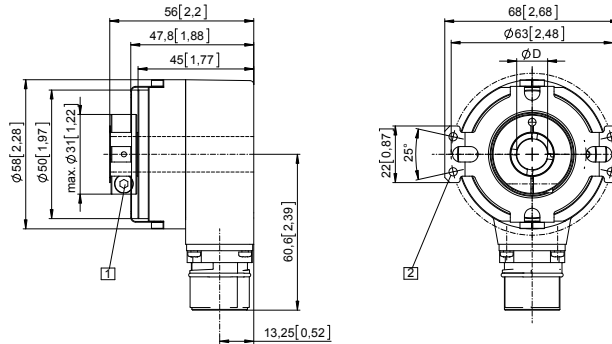
#### Flange type B

#### 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

