

# Incremental encoders

Standard, ATEX/IECEx – zone 1/21  
SIL2/PLd, optical

Sendix SIL 7014FS2 (shaft)

SinCos



Ex protection and Functional Safety in one device.

The incremental encoders 7014FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



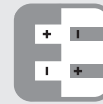
Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater durable

## Functional Safety

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

## Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

## Order code

### Shaft version

8.7014 FS2 . 1 XXXX . XXXX . XXXX  
Type a b c d e f

#### a Flange

- 1 = clamping / synchronous flange, IP67  
ø 70 mm [2.76"]

#### b Shaft (ø x L)

- 2 = 10 x 20 mm [0.39 x 0.79"], with flat
- 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

#### c Output circuit / power supply

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

#### d Type of connection

- 1 = axial cable, 2 m [6.56'] PUR
- 2 = radial cable, 2 m [6.56'] PUR
- A = axial cable, length > 2 m [6.56']
- B = radial cable, length > 2 m [6.56']

#### e Pulse rate

- 1024, 2048

#### f Cable length in dm <sup>1)</sup>

- 0050 = 5 m [16.40']
- 0100 = 10 m [32.81']
- 0150 = 15 m [49.21']

#### Optional on request

- special cable length
- seawater resistant (stainless steel V4A)

#### Stainless steel V4A as standard types (deliverable as from 1 unit)

- 8.7014FS2.22X1.XXXX-V4A
- 8.7014FS2.22XA.XXXX.XXXX-V4A



## Accessories

Order no.

### EMC shield terminal

for top-hat rail mounting

8.0000.4G06.0000

### Screw retention

Loctite 243, 5 ml

8.0000.4G05.0000

### Bellows coupling, safety-oriented

You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under [www.kuebler.com/accessories](http://www.kuebler.com/accessories).

### Safety modules Safety-M compact / modular

You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under [www.kuebler.com/safety](http://www.kuebler.com/safety).

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

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

1) Not applicable with connection types 1 and 2.

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## Technical data

Explosion protection	
<b>ATEX</b>	
<b>EC type-examination certificate</b>	PTB09 ATEX 1106 X
<b>Category (gas)</b>	II 2 G Ex d IIC T4 - T6 Gb
<b>Category (dust)</b>	II 2D Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b>	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
<b>IECEX</b>	
<b>Certificate of Conformity (CoC)</b>	IECEX PTB 13.0026 X
<b>Category (gas)</b>	Ex d IIC T4 - T6 Gb
<b>Category (dust)</b>	Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b>	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

**Notes regarding "Functional Safety"**

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Electrical characteristics	
<b>Power supply</b>	5 V DC (±5 %) or 10 ... 30 V DC
<b>Current consumption (no load)</b>	max. 45 mA
<b>Reverse polarity protection for power supply</b>	yes
<b>Short circuit proof outputs</b>	yes <sup>2)</sup>
<b>CE compliant acc. to</b>	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
<b>Relevant standards</b>	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Safety characteristics	
<b>Classification</b>	PLd / SIL2
<b>System structure</b>	2 channel (Cat. 3)
<b>PFH<sub>d</sub> value<sup>1)</sup></b>	2.16 x 10 <sup>-8</sup> h <sup>-1</sup>
<b>Mission time / Proof test interval</b>	20 years
<b>Relevant standards</b>	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Mechanical characteristics	
<b>Maximum speed</b>	6000 min <sup>-1</sup> (continuous)
<b>Starting torque – at 20°C [68°F]</b>	< 0.05 Nm
<b>Mass moment of inertia</b>	4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Load capacity of shaft</b>	radial 80 N axial 40 N
<b>Weight</b>	approx. 1.5 kg [52.91 oz]
<b>Protection acc. to EN 60529</b>	IP67
<b>Ambient temperature</b>	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
<b>Materials</b>	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
<b>Shock resistance acc. to EN 60068-2-27</b>	500 m/s <sup>2</sup> , 11 ms
<b>Vibration resistance acc. to EN 60068-2-6</b>	200 m/s <sup>2</sup> , 10 ... 150 Hz

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

## Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
1, 2	1, 2, A, B	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	$\perp$
		Core marking:	6	1	7	8	9	10	shield

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

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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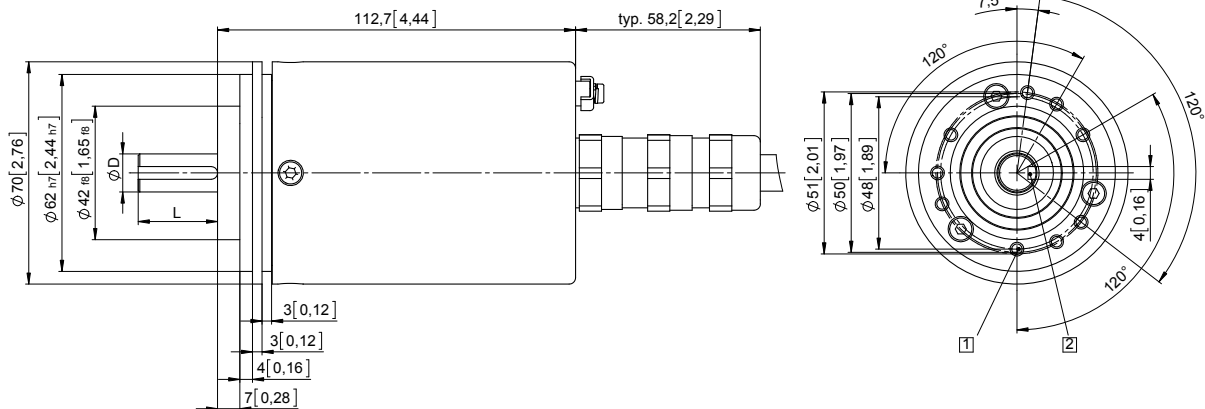
**SinCos**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

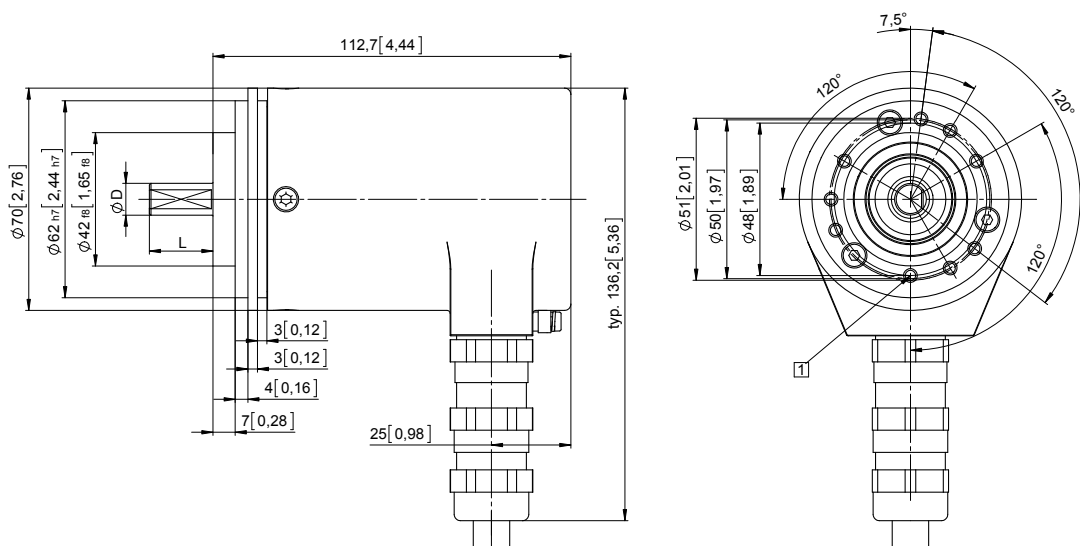
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



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