

# Incremental encoders

<b>Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, optical</b>	<b>Sendix SIL 7014FS2 (shaft)</b>	<b>SinCos</b>
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**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** 8.7014 FS2 . 1 XXX . XXXX . XXXX  
**Shaft version** Type a b c d e f

- a Flange**  
1 = clamping / synchronous flange, IP67  
ø 70 mm [2.76"]
- b Shaft (ø x L)**  
2 = 10 x 20 mm [0.39 x 0.79"], with flat  
1 = 12 x 25 mm [0.47 x 0.98"],  
with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c Output circuit / power supply**  
1 = SinCos / 5 V DC  
2 = SinCos / 10 ... 30 V DC

- d Type of connection**  
1 = axial cable, 2 m [6.56'] PUR  
2 = radial cable, 2 m [6.56'] PUR  
A = axial cable, length > 2 m [6.56']  
B = radial cable, length > 2 m [6.56']
- e Pulse rate**  
1024, 2048
- f Cable length in dm <sup>1)</sup>**  
0050 = 5 m [16.40']  
0100 = 10 m [32.81']  
0150 = 15 m [49.21']

*Optional on request*  
 - special cable length  
 - seawater resistant (stainless steel V4A)

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

**V4A**  
 1.4404  
 8.7014FS2.12X1.XXXX-V4A  
 8.7014FS2.12XA.XXXX.XXXX-V4A

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

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

1) Not applicable with connection types 1 and 2.

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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>	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 wires individually before initial start-up)							
		Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	$\perp$
1, 2	1, 2, A, B	Cable marking:	6	1	7	8	9	10	shield

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

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

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

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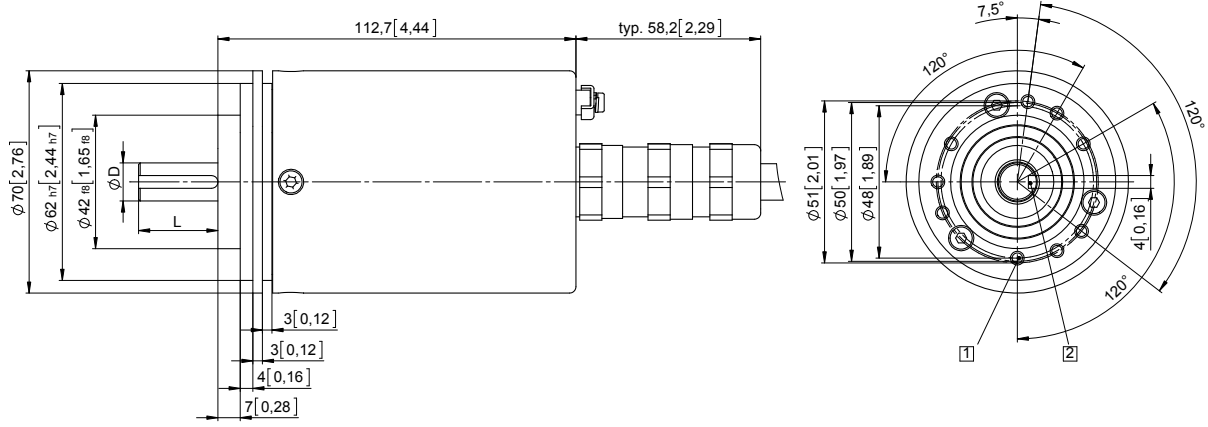
## Dimensions shaft version

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

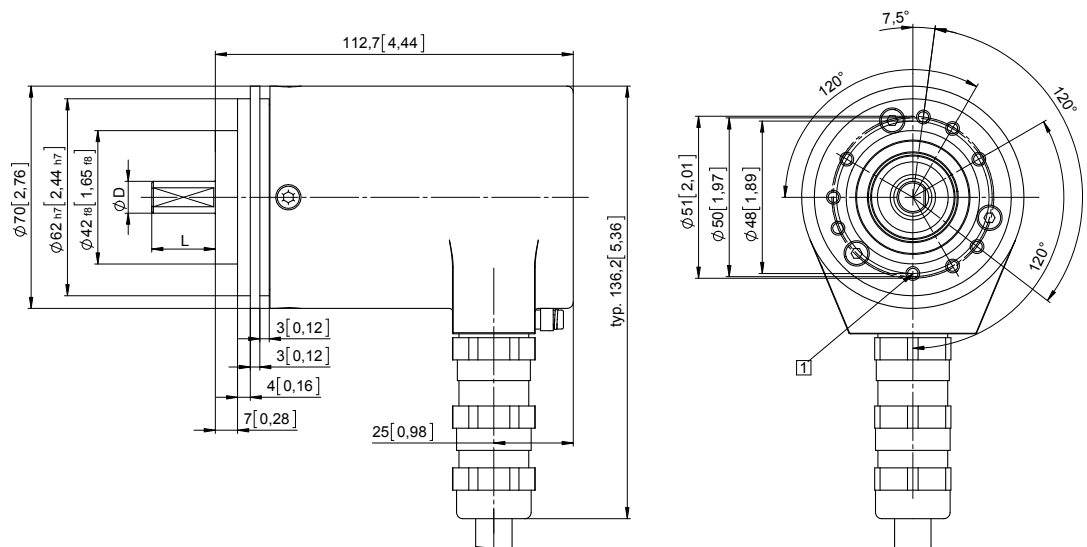


D	Fit	L
12 [0.47]	g6	25 [0.98]

### 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]

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