

Absolute encoders - singleturn

Standard, ATEX/IECEx – zone 1/21 SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos
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Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

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



Ex approval	Safety-Lock™	High rotational speed	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	Optical sensor	Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

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

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Order code 8.7053FS2 . 1 X 4 X . X X 2 1 . XXXX
Shaft version Type a b c d e f g h i 1)

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

b Shaft (ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply
4 = SSI, BiSS + 2048 ppr. 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'] preferred length see **i**, e. g.: 0100 = 10 m [32.81']

e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f Resolution 2)
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g Inputs / outputs 2)
2 = SET input

h Options
1 = no option

i Cable length in dm 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

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

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

V4A 8.7053FS2.1241.XX21.V4A
1.4404 8.7053FS2.124A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Accessories		
EMC shield terminal	for top-hat rail mounting	Order no. 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 .	
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 .	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .	

Further accessories can be found in the accessories section or in the accessories area of our website at: 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.

Technical data

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

Safety characteristics	
Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

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

EMC	
Relevant standards	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

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit ≤ 1 μs resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note: <ul style="list-style-type: none"> – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification 	

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±10 %)
Short circuit proof	yes ¹⁾
Pulse rate	2048 ppr

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	A	\bar{A}	B	\bar{B}	\perp
4	1, 2, A, B	SET	Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

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

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SIL2/PLd, optical**

Sendix SIL 7053FS2 (shaft)

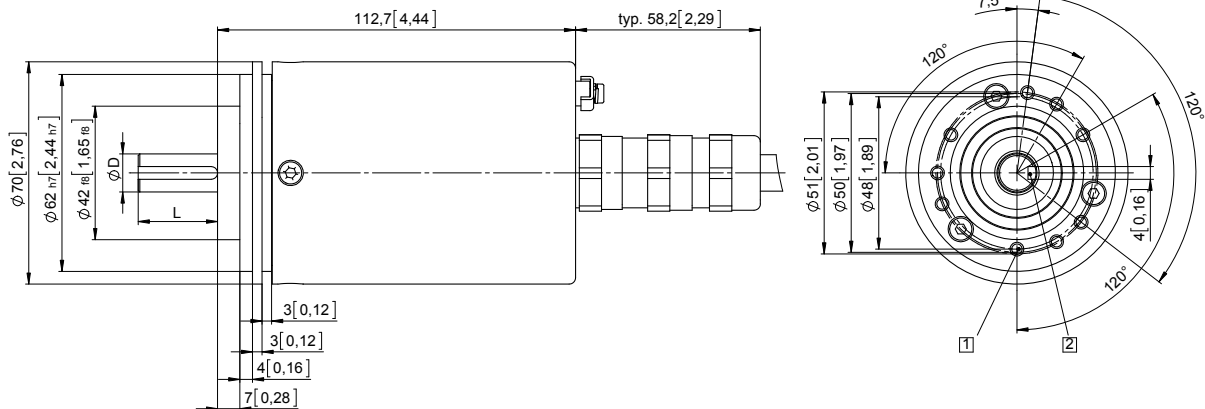
SSI/BiSS + SinCos

Dimensions

Dimensions in mm [inch]

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

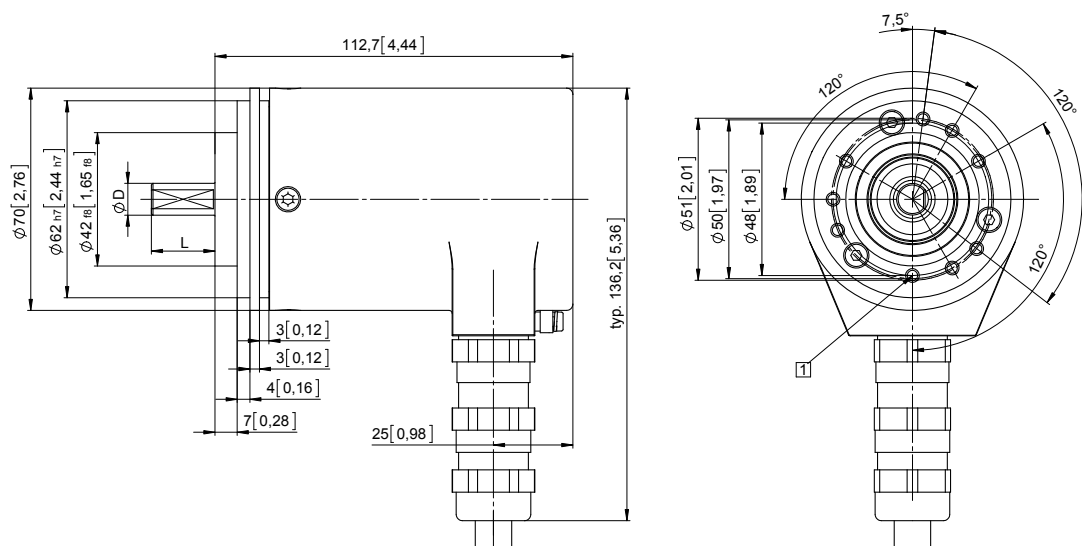
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



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

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

- 1 9 x M4, 10 [0.39] deep



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