Standard
ATEX, SIL2/PLd, optical

Sendix 7053FS2 (Shaft)

SSI / BiSS-C + SinCos

Ex protection and Functional Safety in one device.

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

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater-resistant aluminium.

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-resistant

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-C interface with incremental SinCos tracks with 2048 ppr
- Certified mechanical mounting + electronic

Explosion protection

- "Flameproof-enclosure" version
- ATEX with EC type examination certificate
- IECEx with Certificate of Conformity (CoC)

Order code Shaft version

8.7053 FS2	.	1	X	4	X	.	X	X	2	1	.	XXXX
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 or BiSS-C + 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-C, Binary
G = SSI, Gray

f *Resolution* [2]
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

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

Accessories safety control		Order No.
Safety-M, basic modules	Speed and position monitoring for 1 axis	**8.MSP1.000**
	Speed and position monitoring for 2 axes (analogue input optional)	**8.MSP2.XXX**

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
You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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

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Technical data

Explosion protection ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; 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

Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classifiction	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value [1]	$2.16 \times 10^{-8}\ h^{-1}$
Proof-test interval	20 years

Mechanical characteristics

Max. speed		continuous 6 000 min^{-1}
Starting torque – at 20°C [68°F]		< 0.05 Nm
Moment of inertia		$4.0 \times 10^{-6}\ kgm^2$
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Material	shaft	stainless steel
	flange / housing	seawater-resistant Al, type AlSiMgMn (EN AW-6082) (stainless steel on req.)
	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

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

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
Singleturn resolution		10…14 bit and 17 bit [3]
Number of revolutions		4096 (12 bit)
Code		Binary or Gray
SSI clock rate	resolution ≤ 14 bit	50 kHz ... 2 MHz
	resolution ≥ 15 bit	50 kHz ... 125 kHz
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Status and parity bit		on request

BiSS-C interface

Singleturn resolution	10 ... 14 bit and 17 bit [3]
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:
- Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (± 10%)
Short circuit proof	yes
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.

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

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Power-ON delay

After Power-ON, the device requires a time of approximately 150 ms before valid data can be read.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
4	1, 2, A, B	SET	Signal:	0 V	+V	C+	C-	D+	D-	SET	A	$\overline{A}$	B	$\overline{B}$	⏚	
			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. The current position becomes defined as position zero.

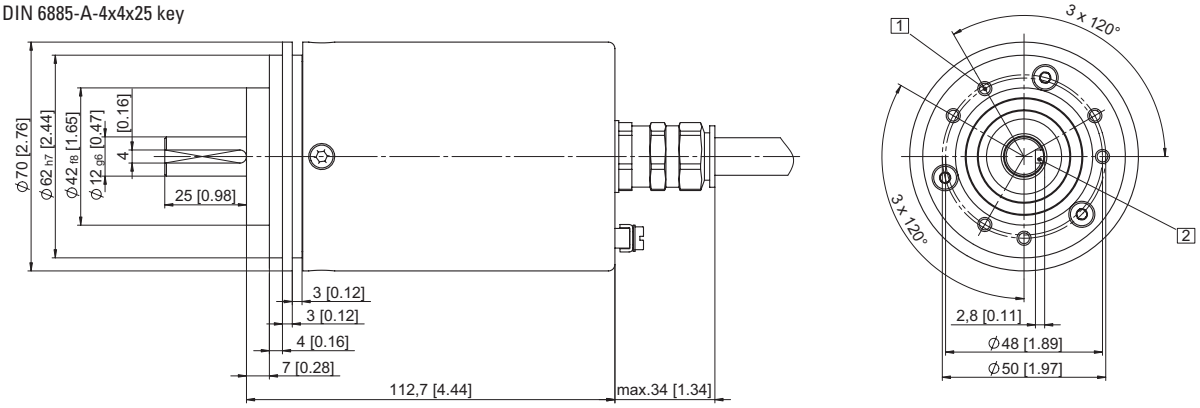
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

Dimensions

Dimensions in mm [inch]

Clamping-synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping-synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep