Functional Safety, optical | Sendix 5853 SIL / 5873 SIL (Shaft / Hollow shaft) | SSI / BiSS-C + SinCos

The absolute singleturn encoders Sendix 5853 SIL and 5873 SIL are perfectly suited for use in safety-related applications up to SIL3 according to DIN EN ISO 61800-5-2 or PLe to DIN EN ISO 13849.

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.

Safety-Lock™ | **High rotational speed** | **Temperature** -40° +90° | **High IP value** IP | **High shaft load capacity** | **Shock / vibration resistant** | **Magnetic field proof** | **Reverse polarity protection** | **SinCos** | **Optical sensor** | **Seawater-resistant version on request**

Certified Safety

- Certified by the BGIA - Institute for Occupational Safety and Health
- Suitable for SIL3 applications acc. to DIN EN ISO 61800-5-2
- Suitable for PLe applications acc. to DIN EN ISO 13849
- SSI or BiSS-C interface with incremental SinCos tracks

Flexible

- Shaft and Hollow shaft versions
- Cable and connector variants
- Various mounting options available

Order code Shaft version

8.5853SIL . 1XXX . XX2X
Type a b c d e f g h

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.

10 by 10

a *Flange*
1 = Clamping flange, ø 58 mm, IP65

b *Shaft (ø x L)*
2 = 10 x 20 mm, with flat
A = 10 x 20 mm, with feather key

c *Output circuit / Power supply*
3 = SSI/BiSS-C + 2048 ppr SinCos track / 5 V DC
4 = SSI/BiSS-C + 2048 ppr SinCos track / 10 ... 30 V DC

d *Type of connection*
1 = axial cable (1 m PVC)
2 = radial cable (1 m PVC)
3 = M23 connector, 12-pin, axial
4 = M23 connector, 12-pin, radial

e *Code*
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

f *Resolution [1]*
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 *Input / output [1]*
2 = SET, DIR inputs

h *Options (Service)*
1 = No Option
2 = Status LED
3 = SET button and Status LED

optional on request
- seawater-resistant
- special cable length

Order code Hollow shaft

8.5873SIL . XXXX . XX2X
Type a b c d e f g h

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.

10 by 10

a *Flange*
A = with torque stop set, IP65
B = with stator coupling, IP65

b *Hollow shaft*
3 = ø 10 mm
4 = ø 12 mm
5 = ø 14 mm
K = ø 10 mm, tapered shaft

c *Output circuit / Power supply*
3 = SSI/BiSS-C + 2048 ppr SinCos track / 5 V DC
4 = SSI/BiSS-C + 2048 ppr SinCos track / 10 ... 30 V DC

d *Type of connection*
2 = radial cable (1 m PVC)
4 = M23 connector, 12-pin, radial
E = tangential cable outlet cable length 1 m (PVC cable)

e *Code*
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

f *Resolution [1]*
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 *Input / output [1]*
2 = SET, DIR inputs

h *Options (Service)*
1 = No Option
2 = Status LED
3 = SET button and Status LED

optional on request
- seawater-resistant
- special cable length

[1] Resolution, preset value and count direction are factory-programmable

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Connection Technology

Connector, self-assembly (straight)	M23	8.0000.5012.0000
Cordset, pre-assembled with 2 m PVC cable	M23	8.0000.6901.0002.0031

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 under www.kuebler.com/safety

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 to DIN EN ISO 61800-5-2 and PLe to DIN EN ISO 13849 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.

Mechanical characteristics

Max. speed, shaft version

without shaft seal (IP65) up to 70°C	12 000 min⁻¹, 10 000 min⁻¹ (continuous)
without shaft seal (IP65) up to T_{max}	8 000 min⁻¹, 5 000 min⁻¹ (continuous)
with shaft seal (IP67) up to 70°C	11 000 min⁻¹, 9 000 min⁻¹ (continuous)
with shaft seal (IP67) up to T_{max}	8 000 min⁻¹, 5 000 min⁻¹ (continuous)

Max. speed, hollow shaft version

without shaft seal (IP65) up to 70°C	9 000 min⁻¹, 6 000 min⁻¹ (continuous)
without shaft seal (IP65) up to T_{max}	6 000 min⁻¹, 3 000 min⁻¹ (continuous)
with shaft seal (IP67) up to 70°C	8 000 min⁻¹, 4 000 min⁻¹ (continuous)
with shaft seal (IP67) up to T_{max}	4 000 min⁻¹, 2 000 min⁻¹ (continuous)

Starting torque, shaft version

without shaft seal (IP65)	< 0.01 Nm
with shaft seal (IP67)	< 0.05 Nm

Starting torque, hollow shaft version

without shaft seal (IP65)	< 0.03 Nm

Moment of inertia	
Shaft version	4.0×10^{-6} kgm²
Hollow shaft version	7.0×10^{-6} kgm²

Load capacity of shaft radial / axial	80 N / 40 N
Weight	approx. 0.45 kg

Protection EN 60 529	housing side	IP67
	shaft side	IP65, opt. IP67

Working temperature range	-40°C ... +90°C [1]

Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC

Shock resistance acc. EN 60068-2-27	2500 m/s², 6 ms
Vibration resistance acc. EN 60068-2-6	100 m/s², 55 ... 2000 Hz

Electrical characteristics

Supply voltage		5 V DC ± 5% or 10 ... 30 V DC
Current consumption	5 V DC	max. 70 mA
(w/o output load)	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply (U_B)		yes
UL certified		File 224618
Conforms to CE requirements acc. to		EN 61000-6-2, EN 61000-6-4, EN 61000-6-3
RoHS compliant acc. to		EU guideline 2002/95/EG

General Interface characteristics

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
Short circuit proof outputs		yes [2]

SSI Interface

Singleturn resolution		10…14 bit and 17 bit [3]
Code		Binary or Gray
SSI clock rate	≤ 14 bit	50 kHz ... 2 MHz
	≥ 15 bit	50 kHz ... 125 kHz
Monoflop time		≤ 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.

Data refresh rate	≤ 14 bit	< 1 µs
	15 ... 17 bit	4 µs
Status and Parity bit		optional 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

Output SinCos (A / B) 2048 ppr (Optional incremental track)

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (± 20%)
Short circuit proof	yes

DIR 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.

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[1] Cable version: -30°C ... +90°C
[2] Short circuit to 0V or to output, one channel at a time, supply voltage correctly applied
[3] Other options upon request

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SET input or SET button

Input		active high
Input type:		comparator
Signal level	high	min: 60 % of +V, max: +V
	low	max: 25 % of +V (Supply voltage)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms
Reaction Time (DIR input)		1 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.

Power-ON delay

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

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 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.

Terminal assignment

Interface	Type of connection	Features	Cable												
3, 4	1, 2, E	SET, DIR	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield

Interface	Type of connection	Features	M23 connector												
3, 4	3, 4	SET, DIR	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	PE
			M23 connector:	1	2	3	4	5	6	7	8	9	10	11	12	PH

+V: Encoder Power Supply +V DC
GND: Encoder Power Supply Ground (0V)
+C, -C: Clock signal
+D, -D: Data signal
SET: Set input. The current position is set to zero
DIR: Direction input: If this input is active, the output values are counted backwards (decrease) when the shaft is turning clockwise.
PE: Protective earth
PH: Plug connector housing (shield)
A, $\overline{A}$: Sine output (incremental)
B, $\overline{B}$: Cosine output (incremental)

Top view of mating side, male contact base
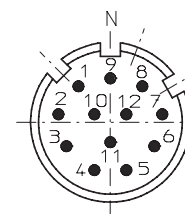
M23 connector, 12-pin

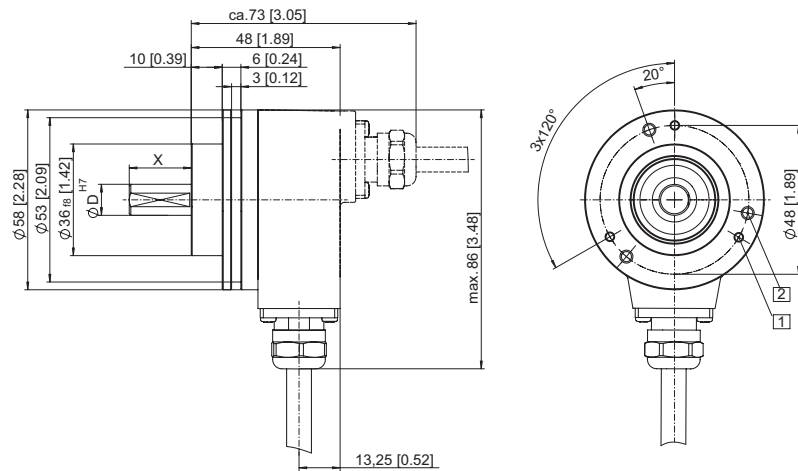| Functional Safety, optical | Sendix 5853 SIL / 5873 SIL (Shaft / Hollow shaft) | SSI / BiSS-C + SinCos |

Dimensions shaft version

Clamping flange
Flange type 1 with shaft type 2
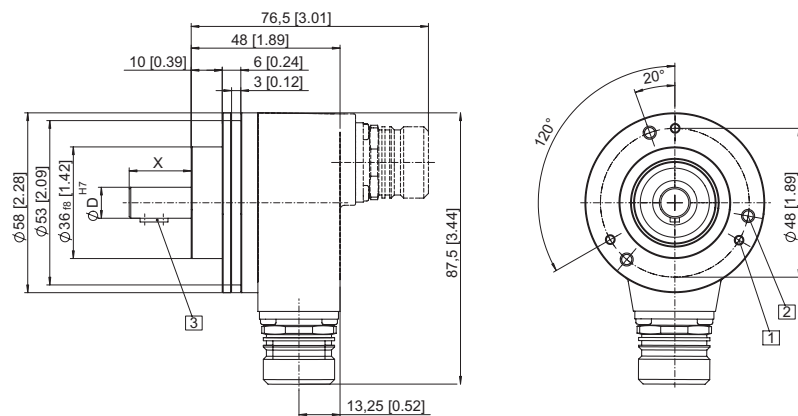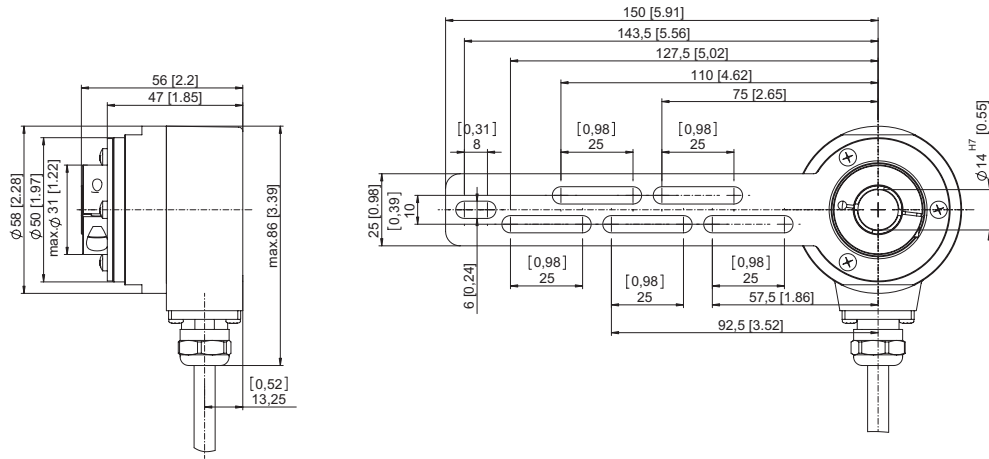(Drawing with cable)

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

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

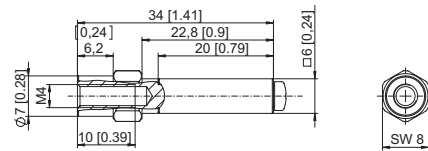| Functional Safety, optical	Sendix 5853 SIL / 5873 SIL (Shaft / Hollow shaft)	SSI / BiSS-C + SinCos

Dimensions hollow shaft version

With torque stop set

Flange type A

(Drawing with cable)

Torque pin with rectangular sleeve
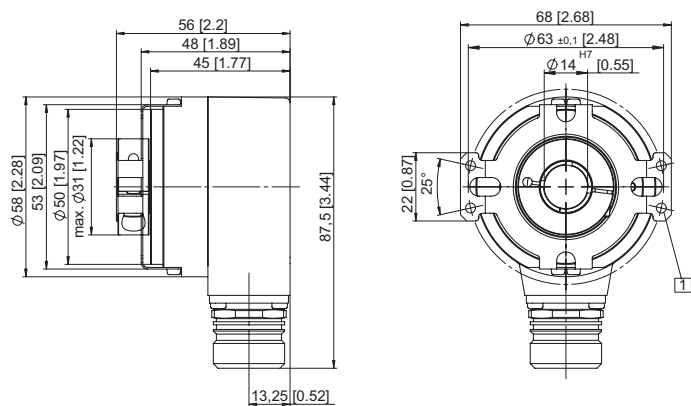with M4 thread, 10 mm deep

Flange with stator coupling and hollow shaft

Flange type B

(Drawing with M23 connector)

1 for (4x) M3 screw

Flange with stator coupling and tapered shaft

Flange type B

(Drawing with tangential cable outlet)

1 for (4x) M3 screw

2 Status LED

3 SET button