



# Encoders for Functional Safety

## Absolute Multiturn Encoders    Sendix absolute    5863 SIL / 5883 SIL (Shaft / Hollow shaft)    Functional 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

<b>Max. speed, shaft version</b>		
without shaft seal (IP 65) up to 70°C		12 000 min <sup>-1</sup> , 10 000 min <sup>-1</sup> (continuous)
without shaft seal (IP 65) up to T <sub>max</sub>		8 000 min <sup>-1</sup> , 5 000 min <sup>-1</sup> (continuous)
with shaft seal (IP 67) up to 70°C		11 000 min <sup>-1</sup> , 9 000 min <sup>-1</sup> (continuous)
with shaft seal (IP 67) up to T <sub>max</sub>		8 000 min <sup>-1</sup> , 5 000 min <sup>-1</sup> (continuous)
<b>Max. speed, hollow shaft version</b>		
without shaft seal (IP 65) up to 70°C		9 000 min <sup>-1</sup> , 6 000 min <sup>-1</sup> (continuous)
without shaft seal (IP 65) up to T <sub>max</sub>		6 000 min <sup>-1</sup> , 3 000 min <sup>-1</sup> (continuous)
with shaft seal (IP 67) up to 70°C		8 000 min <sup>-1</sup> , 4 000 min <sup>-1</sup> (continuous)
with shaft seal (IP 67) up to T <sub>max</sub>		4 000 min <sup>-1</sup> , 2 000 min <sup>-1</sup> (continuous)
<b>Starting torque, shaft version</b>		
without shaft seal (IP65)		< 0,01 Nm
with shaft seal (IP67)		< 0,05 Nm
<b>Starting torque, hollow shaft version</b>		
without shaft seal (IP65)		< 0,03 Nm
<b>Moment of inertia</b>		
Shaft version		4,0 x 10 <sup>-6</sup> kgm <sup>2</sup>
Hollow shaft version		7,0 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Load capacity of shaft</b>	radial / axial	80 N / 40 N
<b>Weight</b>		approx. 0,45 kg
<b>Protection EN 60 529</b>	housing side shaft side	IP 67 IP 65, opt. IP 67
<b>Working temperature range</b>		-40°C ... +90°C <sup>1)</sup>
<b>Materials</b>	shaft/hollow shaft flange housing cable	stainless steel aluminium zinc die-cast housing PVC
<b>Shock resistance acc. DIN-IEC 68-2-27</b>		> 2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance acc. DIN-IEC 68-2-6</b>		> 100 m/s <sup>2</sup> , 55 ... 2000 Hz

### Electrical characteristics

<b>Supply voltage</b>		5 V DC ± 5% or 10 ... 30 V DC
<b>Current consumption</b>	5 V DC (w/o output load) 24 V DC	max. 80 mA max. 50 mA
<b>Reverse polarity protection of the power supply (U<sub>b</sub>)</b>		yes
<b>Conforms to CE requirements acc. to</b>		EN 61000-6-2, EN 61000-6-4, EN 61000-6-3
<b>RoHS compliant acc. to</b>		EG-Richtlinie 2002/95/EG

### General Interface characteristics

<b>Output driver</b>		RS 485 transceiver type
<b>Permissible load / channel</b>		max. ± 20 mA
<b>Signal level</b>	high low at I <sub>load</sub> = 20 mA	typ 3,8 V typ 1,3 V
<b>Short circuit proof outputs</b>		yes <sup>2)</sup>

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

### SSI-Schnittstelle

<b>Singleturn resolution</b>	10 ... 14 bits and 17 bit <sup>3)</sup>	
<b>Number of revolutions:</b>	4096 (12 bit)	
<b>Code</b>	Binary or Gray	
<b>SSI clock rate</b>	≤ 14 bits	50 kHz ... 2 MHz
	≥ 15 bits	50 kHz ... 125 kHz
<b>Monoflop time</b>	≤ 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.		
<b>Data refresh rate</b>	≤ 14 bits	< 1 µs
	15 ... 17 bits	4 µs
<b>Status and Parity bits</b>	optional on request	

### Output Sine / Cosine (A / B) 2048 ppr

<b>Max. frequency -3dB</b>	400 kHz
<b>Signal level</b>	1 V <sub>pp</sub> (± 20%)
<b>Short circuit proof</b>	yes

### SET input or SET button

<b>Input</b>	active high
<b>Input type:</b>	comparator
<b>Signal level</b>	high min: 60 % of V <sub>+</sub> , max: V <sub>+</sub> low max: 25 % of V <sub>+</sub> (Supply voltage)
<b>Input current</b>	< 0,5 mA
<b>Min. pulse duration (SET)</b>	10 ms
<b>Timeout after SET signal</b>	14 ms
<b>Reaction Time (DIR input)</b>	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 key (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.

### 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.

### 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-voltage
  - Over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

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## Terminal assignment

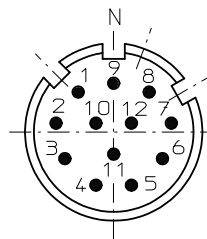
for output circuit 3 or 4 and type of connection 1, 2, 3, 4 or E (2 control inputs, Sine/Cosine)

Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	A	A inv	B	Binv	PE
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
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.

- Stat: Status output
- PE: Protective earth
- PH: Plug connector housing (shield)
- A, Ainv: Sine output (incremental)
- B, Binv: Cosine output (incremental)

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



**Corresponding mating connector:** 8.0000.5012.0000

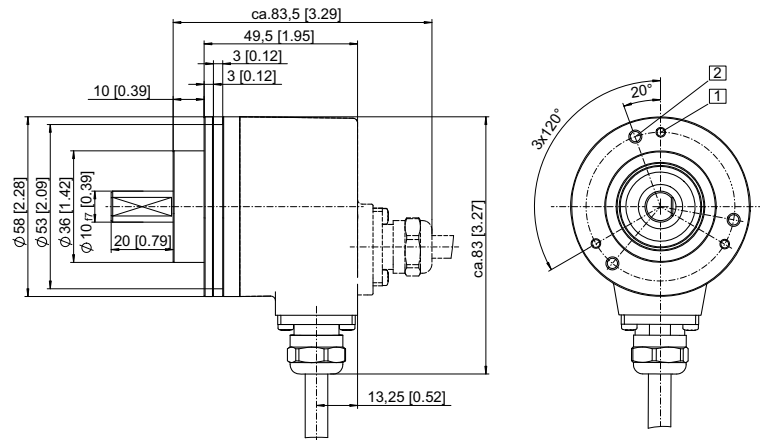
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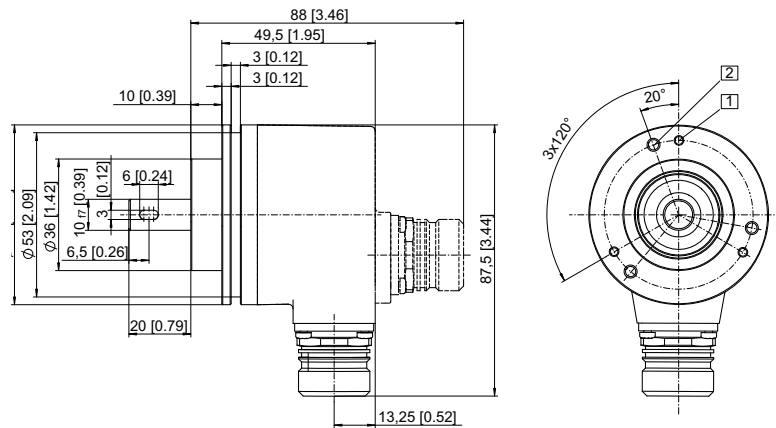
## Dimensions shaft version

### Clamping flange

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



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

