

New Components and Solutions

- Position and Motion Sensors
- Transmission Technology
- Counting Technology
- Process Technology

# Safety first



further information about Safety Solutions on page 6

[www.kuebler.com/safety](http://www.kuebler.com/safety)

## Encoders for Functional Safety

- Safe Incremental Encoder Function
- Safe Absolute Encoder Function
- Safe mechanical connection



**SIL3**  
Functional Safety  
**PLe**

■■■ *pulses for automation*

# Table of contents

## General

Company profile / Product portfolio	4 - 5
Contacts Germany, Europe, Worldwide	72 - 74

## New Products

Incremental and absolute Encoders for Functional Safety	6 - 7
Compact and Miniature Encoders	8
Encoders for Special applications	9 - 10
Transmission technology	11 - 12
Encoders - Accessories	13
Codix Preset Counters	14
Counters and Displays	15

## Datasheets

<b>Encoders for Functional Safety</b>	
Sendix incremental, 5814 SIL / 5834 SIL	16 - 19
Sendix absolute, Singleturn 5853 SIL / 5873 SIL	20 - 24
Sendix absolute, Multiturn 5863 SIL / 5883 SIL	25 - 29
<b>Absolute Encoders</b>	
Sendix absolute, Singleturn F3653 / F3673, SSI/BiSS	30 - 33
Sendix absolute, Multiturn F3663 / F3683, SSI/BiSS	34 - 37
Sendix absolute, Singleturn F3658 / F3678 CANopen	38 - 40
Sendix absolute, Multiturn F3668 / F3688 CANopen	41 - 43
Miniature series, magnetic, Singleturn 2450 / 2470	44 - 45
Sendix absolute, Singleturn M3658 / M3678 SAE J1939	46 - 48
Sendix absolute, Singleturn 7053 with ATEX approval	49 - 51
Sendix absolute, Multiturn 7063 with ATEX approval	52 - 54
<b>Incremental Encoders</b>	
Magnetic measurement system RI50 / LI50	55 - 56
Miniature series, magnetic 2430 / 2440	57 - 58
Large hollow shaft 5821	59 - 60
Sendix 5006 Stainless-steel	61 - 62
<b>Connection Technology</b>	
Optical fibre signal transmission	63 - 64
8-pin M12 Cordsets with integrated control LEDs	65
M12 Connection technology	66
EtherCat Connection technology	67
<b>Accessories</b>	
Robust Bearing Unit	68
<b>Preset Counter</b>	
LED Preset Counter Codix 560	69 - 70

**New for 2009/2010**

## Our pulses are our assets



The core business of Kübler GmbH is the development, manufacture and marketing of leading-edge position and motion sensors, innovative display and counting technology as well as connection and transmission technology.

Founded in the year 1960, the family business is now led by the next generation of the family, Gebhard and Lothar Kübler. It is active worldwide with the export share of its turnover exceeding 60 percent. 6 subsidiaries and 50 exclusive representatives offer product know-how, service and advice globally on-site.

We see the opportunities for our business in the field of application-oriented innovations and service-intensive achievements – always with the success of our customers in mind.

With over 250 employees, we reliably ensure the high level of flexibility of our products, superior quality management as well as exceptional delivery dependability.



# Our Product Portfolio



## Position and Motion Sensors



- Incremental Encoders
- Absolute Encoders
- Draw-wire Systems
- Linear Measuring Systems
- Inclinometers
- Lift systems

## Counters and Process Displays



- Display and Preset Counters
- Timers and Preset Hour Meters
- Frequency Meters and Tachometers
- Combination Time and Energy Meters
- Position Displays
- Process Displays and Controllers

## Connector and Signal Transmission Technology



- Slip rings
- Fibre Optic Modules
- Cables, Connectors and Cable Assemblies

## OEM Products and Systems (OPS)



- Customised Display, Measurement and Control Components
- Complete Systems Solutions: Sensor Technology, Electronics, Mechanics

# Incremental and absolute encoders for Functional Safety

**Safety is – not least since the EU Machinery Directive 2006/42/EG – an “integral part of the construction of drives”. When choosing the right encoder for functional safety the principle applies that safety is achieved through the intelligent combination of encoder, controller and actuator.**

Sendix SSI absolute encoders, with an additional Sin/Cos incremental output, and Sin/Cos versions of incremental encoders are available with certification. But safety goes further than this: safe components are characterised by a robust reliable interface and by the ability to cope with high mechanical and electronic loads.

## Safe Incremental Encoder Function

In order to achieve safe incremental information with the encoder, the controller must monitor the validity of the analogue, 90° phase-shifted sine/cosine signals with the help of the function:  $\sin^2 + \cos^2 = 1$

## Safe Absolute Encoder Function

In order to obtain safe information with the encoder regarding the absolute position, the controller counts the incremental pulses and compares the result with the absolute positions also provided by the encoder.

## Safe mechanical connection

A 100% reliable mechanical connection is required for a safe function in the applications. Suitably sturdy fixing elements can help eliminate the risk of faults.



## Compliance with Safety Standards

According to DIN EN 13849-1 and DIN EN 61800-5-2 up to SIL3/PLe/Kat.4 the following safety functions can be implemented with the encoder:

- SS1:** Safe Stop 1  
controlled braking, STO after time or standstill
- SS2:** Safe Stop 2  
controlled braking until SOS
- SOS:** Safe Operating Stop  
safe operating stop in position control
- SLS:** Safe Limited Speed
- SLI:** Safe Limited Increment of Position
- SLP:** Safe Limited Position
- SSR:** Safe Speed Range
- SDI:** Safe Direction
- SSM:** Safe Speed Monitoring

## MTTFd Values

With regard to the requirements of the Machinery Directive 2006/42/EC the MTTFd values for the most important standard encoders from Kübler are also provided.

This thus enables the user to carry out his own calculations according to DIN EN 61800-5-2 and DIN EN ISO 13849.



### **Sendix 5814 SIL / 5834 SIL**

#### **Incremental encoders with Sin/Cos outputs**

The incremental position of the encoder family 58x4SIL is provided in the form of an analogue sine/cosine signal; here the resolution per revolution is 1024 or 2048 sine/cosine periods.

Additional features (incremental and absolute):

- With protected Safety Lock™ Technology: interlocked bearings for a high degree of ruggedness, accuracy and long service life.
- Protection rating IP65 or IP67
- Magnetically insensitive due to optical scanning.

### **Sendix 5853 SIL / 5873 SIL, Sendix 5863 SIL / 5883 SIL**

#### **Absolute encoders single and multiturn with SSI and Sin/Cos outputs**

The absolute position of the encoder family 58x3SIL is transmitted in the form of a digital SSI or BiSS data word. With the singleturn variants 5853SIL and 5873SIL the resolution is between 10 bits and 17 bits, depending on the variant.

In contrast to the singleturn variants 5853SIL / 5873SIL, the multiturn variants 5863SIL / 5883SIL have in addition a gear for detecting positions greater than 360°. The number for detecting the revolutions amounts to 12 bits. This thus gives a total resolution for the multiturn of up to 29 bits.

The incremental position is provided in the form of an analogue sine/cosine signal. The resolution per revolution is 1024 or 2048 sine/cosine periods.

Data sheet page 16

Data sheets page 20



# Compact and Miniature Encoders

From compact and robust up to highly accurate



Data sheets page 30

## Sendix F36

### Absolute Singleturn / Multiturn Encoders

With a diameter of only 36 mm, the absolute multiturn and single-turn variants offer a hollow shaft diameter of up to 10 mm. The Sendix F36 is the first optical multiturn encoder without gear that is also totally insensitive to magnetic fields. It received lastly the „Winner Golden Mousetrap Award 2009“.

- Singleturn resolution up to 17 bits
- Purely optical electronic multiturn
- Multiturn resolution up to 24 bits (41 bits total)
- Robust Safety Lock™ Design bearings construction
- Suitable for outdoor use: IP 67, -40°C to +90°C
- High accuracy, data up-to-dateness  $\leq 1 \mu s$
- Short regulation cycles, clock rate up to 2 MHz (SSI)/10 MHz (BISS)
- High-resolution real-time feedback thanks to SinCos or RS422 incremental outputs
- Also with BiSS interfaces



Data sheets page 38

## Sendix F36

### Singleturn / Multiturn absolute encoders CANopen®

The particularly compact, robust and high-resolution encoder series Sendix F36 is now also available with CANopen® interface.

- Encoder Profile DS-406/3.1 according to CiA Standard DS-301/4.02



Data sheet page 57

## Magnetic Miniature Incremental Encoders 2430/2440

The new miniature-format magnetic incremental encoders with a resolution of up to 256 pulses per revolution offer compact dimensions (24 mm) and an interesting price/performance ratio.

- Non-contact magnetic technology – prevents wear
- Multiple clamping for high strain relief and long service life of the cable outlet
- Wide temperature range -20°C to +85°C
- With radial or axial cable outlet



# Encoders for Special applications

## Large hollow shaft, stainless steel, sea water-resistant

### Incremental hollow-shaft encoders with 28 mm hollow shaft

Optimized proportions, optimized costs: With a total diameter of only 58 millimeters, the 5821 incremental encoders offer a hollow shaft with a diameter of up to 28 millimeters.

- Cost-effective alternative, e.g. for electrical drives
- Rotational speed up to 3000 RPM
- Temperature up to +70 °C



Data sheet page 59

### Compact incremental 3610/3620 encoders with M12 connectors

The industrial standard M12 is now also available for the compact incremental encoders with a diameter of 36 millimeters.

- 8-pin connectors: radial for hollow-shaft versions, axial for shaft versions
- Quick and comfortable connection, using suitable pre-confectioned cable sets of the Kübler range



[www.kuebler.com/incremental](http://www.kuebler.com/incremental)

### Stainless steel encoders Sendix 5006

Sturdy stainless steel housings are required for applications that have to be cleaned using strong chemicals or a steam jet. The stainless steel product family Sendix 5006 is manufactured out of stainless austenitic chrome-nickel steel.

- In compliance with the high requirements of the Food Ordinance
- Resistant cables and special stainless steel connectors
- Viton seals



Data sheet page 61

### Seawater-resistant encoders

The specially coated encoders of Kübler are a cost-effective alternative to encoders out of sea water-resistant stainless steel. They are sea water-resistant according to the salt spray test IEC 68-2-11. Almost all encoders of the Sendix series are also available in sea water-resistant versions.

Contact us for these encoders.



Tested  
acc. to the  
salt-spray test  
IEC 68-2-11  
=> 672 hours

seawater resistant on request

# Special Uses – Special Solutions

## Encoders for special applications – ATEX, Special Measuring Systems



Data sheet page 49

### ATEX Sendix Encoders 7053/7063

In explosion-proof areas, special protection requirements must be respected. For such applications, Kübler offers the new Sendix absolute singleturn and multiturn with ATEX approval

- "Flameproof enclosure" type – released for Zone 1, 2 and 21, 22
- Ex II 2G Ex d IIC T6 and Ex II 2D Ex tD A21 IP6X T85°C
- Housing and flange out of sea water-resistant aluminum
- Remains sealed, even in the roughest environments
- Protection IP 67



Data sheet page 55

### Magnetic measurement system RI50/LI50

Thanks to its installation depth of just 16 mm, the magnetic measurement system RI50/LI50 is ideally suited to plant and machinery where space is very tight.

- Non-contact measurement system
- Protection rating IP67
- Function display via LED
- Large mounting tolerance between magnetic band and sensor head



[www.kuebler.com/linearsystem](http://www.kuebler.com/linearsystem)

### Compact draw-wire system A50

#### measuring range up to 1250 mm, SSI und CANopen

The draw-wire system A50 can now also be combined with the absolute encoders Sendix F3663 SSI or Sendix F3668 CANopen.

Order code Standard device:

SSI: D8.6A1.0125.F321.G222

CANopen: D8.6A1.0125.F821.2112



[www.kuebler.com/lift](http://www.kuebler.com/lift)

### Lift technology – Measuring systems for shaft copying

The mechanical loads experienced by the encoder within the lift mechanics are quite considerable. And here the prefabricated LM lift systems prove their worth: they guarantee very quiet, smooth operation of the system.

- Pulleys with duplex bearings
- Smooth-running timing belts
- Vibration-resistant encoder mounting fixture

You can find more information in our "Lift technology" flyer.

# Transmission technology

For current, signal, air, hydraulics and light

## Slip rings range with more options – also for pneumatics and hydraulics

The slip ring range of both series SR085 and SR060 has been extended. The new order codes allow now for significantly more options.

- Fitting of the modular SR085 series for the transmission of air or hydraulics
- Versions with media passage



Version with media passage, air or hydraulics



Version with media passage, air or hydraulics

[www.kuebler.com/transmission](http://www.kuebler.com/transmission)

## Fiber optic modules – now also for SSI encoders

The proven fiber optic transmission modules for incremental encoders have been extended with a variant for absolute encoders with the standard interface SSI.

- Connection of standard encoders over very long distances, up to 1500 m
- Reliable connections, even in case of very strong EMC perturbations



Data sheet page 63

# Transmission technology

## Connectors and cordsets – Solutions for our customers



Data sheet page 67

### Connectors and cordsets for Ethercat

The table on page 67 offers an overview of the comprehensive range of accessories for Ethercat encoders.



Data sheet page 66

### Cordsets for CANopen and analog encoders

(Sendix 3651, draw-wire system with potentiometer)

A new series of ready-to-use, confectioned cordsets for CANopen and analog encoders completes the range of suitable transmission technology for the Kübler sensors.



Data sheet page 65

### M12 cordsets with integrated control LED's

The new 8-pin M12 cordset for incremental encoders allows easy and quick connections under tough external conditions.

The transparent, right-angle housing includes three LED's to display channels A, B and Z.

- Check of all important encoder functions
- Easy Troubleshooting
- Help for the installation – Zero point detection



# Accessories

## For more flexibility in the use of encoders

### Tapered shaft-mounting Kit

The new mounting kit upgrades the large incremental hollow shaft encoder A02H for mounting onto a tapered shaft. Tapered shafts are used for high-precision direct coupling.

- With an isolating insert, which reliably protects the encoder from shaft currents
- Application e.g. in generators of wind turbines



Order number 8.0010.4028.0000

### Robust bearing unit

The new robust bearing unit separates the bearing load from the sensor technology and can be easily retrofitted.

- Ideal solution where strong forces exert pressure on the shafts – e.g. when belts are under high tension
- Suitable for all Sendix 50xx and 58xx encoders

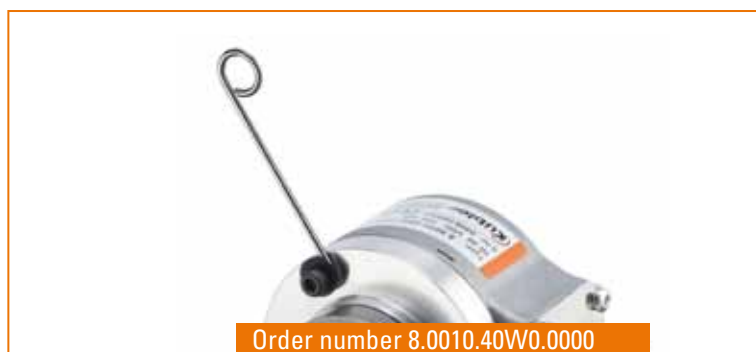


Data sheet page 68

### Spring tether element

This new torque stop offers a maximum amount of fastening flexibility. Spring tether elements can be fixed at almost any angle.

- Pitch circles can be selected steplessly from 42 up to 84.5 mm
- Suitable for all hollow shaft encoders



Order number 8.0010.40W0.0000

### Protective cover for hollow shaft series A02H

A02H hollow shaft encoders (hollow shaft diameter up to 42 mm) are particularly robust and resistant against vibrations. They are used, among others, for AC vector motors in steel works.

For applications with a very high degree of pollution, Kübler now offers a protective cover for

- Improved reliability
- Extension of the service life of the encoder



Order number 8.0010.40Y0.0001

# Codix Preset Counters



[www.kuebler.com/zaehler](http://www.kuebler.com/zaehler)

## Codix 907 / 908

A state-of-the-art preset counter for pulses, time and position. The high quality LCD display with optional backlighting offers a 2-line 6-digit display including preset indicators.

- Extremely cost-effective
- Made in Germany
- 3 years warranty
- Relay outputs
- Plug-in screw terminals
- Adding and subtracting
- 1 / 2 presets
- 2 x 6-digit display with preset indicator from -999999 to +999999
- With or without backlighting



## Codix 560

For pulses, time, frequency, position. The new large preset counter Codix 560 covers a wide range of functions and counting modes: from the preset counting up to simple control tasks.

- DIN dimensions 96 x 48 mm
- Very bright and large 14-segment LED's
- Simple operation and programming structure with scrolling help texts
- Total counter or batch counter
- Preset status display
- 3 predefined settings
- 4-level RESET Modes
- Comfortable screw terminals
- Minimal mounting depth
- Suitable for integration in mosaic systems
- Tracking preset
- Teach mode

Data sheet page 69

# Counters and Displays

## HR47 Operating hour meter

The electromechanical hour meter HR 47 from Kübler with run indicator is indispensable, wherever service intervals have to be effectively monitored and planned.

- Wide counting range with 7-digit display
- Impossible to manipulate
- Particularly reliable and robust
- Protection IP 65, wide temperature range
- Exceptional shock and vibration resistance



[www.kuebler.com/counters](http://www.kuebler.com/counters)

## Codix 538 – CAN display

The Codix 538 can be integrated without difficulty into any CAN or CANopen® network in order to display locally any value.

- Scaling of numerical values with factor and offset directly in the display device
- Bright, 8 mm high LED display
- With floating decimal point



[www.kuebler.com/counters](http://www.kuebler.com/counters)

## Codix 140 / 141 – Standard pulse counters / timers

With their clear 7-digit display and 8 millimeters high figures, the pulse counters Codix 140 and the timers Codix 141 provide the information at a glance.

- The values are reliably stored in the EEPROM and protected against data loss

## Codix 142 / 143 – Service pulse counters / timers

The preset values of the service counters Codix 142 / 143 can be displayed and output at any time – on the display and via the solid-state output.

- The service intervals are permanently factory-pre-programmed in line with the customer's wishes (starting from a min. order quantity of 25 pcs.).
- A pre-signal for the intervals is displayed as a text message
- Manual and electrical reset possible



[www.kuebler.com/counters](http://www.kuebler.com/counters)

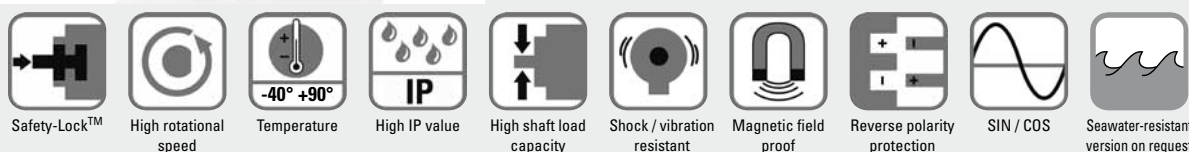
# Encoders for Functional Safety

Incremental Encoders	Sendix incremental	5814 SIL/5834 SIL (Shaft / Hollow shaft)	Functional Safety
----------------------	--------------------	--	-------------------



The incremental multiturn encoders Sendix 5814 SIL and 5834 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.

These devices are ideal for applications in the field of safe drive engineering.



## 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
- With incremental Sin/Cos tracks

## Flexible

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

## Order code Shaft version

8.5814SIL . XXXX . XXXX  
Type ① ② ③ ④ ⑤

### ① Flange

1 = Clamping flange, ø 58 mm, IP 65

### ② Shaft (ø x L)

2 = 10 mm x 20 mm, with flat  
A = 10 mm x 20 mm,  
with feather key shaft slot

### ③ Output circuit / Power supply

1 = SinCos, 5 V DC  
2 = SinCos, 10 ... 30 V DC

### ④ Type of connection

1 = axial cable (1 m PVC)  
2 = radial cable (1 m PVC)  
3 = 12-pin plug connector M23, axial  
4 = 12-pin plug connector M23, radial  
5 = 8-pin plug connector M12, axial  
6 = 8-pin plug connector M12, radial

### ⑤ Pulse rate

1024 or 2048

Preferred types are underlined

Seawater-resistant version  
on request

## Order code Hollow shaft

8.5834SIL . XXXX . XXXX  
Type ① ② ③ ④ ⑤

### ① Flange

A = with torque stop set  
B = with stator coupling

### ② Hollow shaft

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

### ③ Output circuit / Power supply

1 = SinCos, 5 V DC  
2 = SinCos, 10 ... 30 V DC

### ④ Type of connection

2 = radial cable (1 m PVC)  
4 = 12-pin plug connector M23, radial  
E = tangential cable outlet (1 m PCV cable)  
6 = 8-pin plug connector M12, radial

### ⑤ Pulse rate

1024 or 2048

Preferred types are underlined

Seawater-resistant version  
on request

## Suitable accessories:

– further cables and connectors, also pre-assembled, can be found in the Connection Technology section.



# Encoders for Functional Safety

Incremental Encoders	Sendix incremental	5814 SIL/5834 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

### Max. speed, shaft version

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)

### Max. speed, hollow shaft version

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)

### 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 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	IP 67
	shaft side	IP 65, opt. IP 67

<b>Working temperature range</b>	-40°C ... +90°C <sup>1)</sup>
----------------------------------	-------------------------------

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

<b>Shock resistance</b> acc. DIN-IEC 68-2-27	> 2500 m/s <sup>2</sup> , 6 ms
--	--------------------------------

<b>Vibration resistance</b> acc. DIN-IEC 68-2-6	> 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> (w/o output load)	5 V DC	max. 70 mA
	24 V DC	max. 45 mA
<b>Reverse polarity protection of the power supply (Ub)</b>	yes	
<b>Conforms to CE requirements</b> acc. to	EN 61000-6-2, EN 61000-6-4, EN 61000-6-3	
<b>RoHS compliant</b> acc. to	EU guideline 2002/95/EG	

## Output Sine / Cosine (A / B)

<b>Max. frequency -3dB</b>	400 kHz
<b>Signal level</b>	1 Vpp (± 20%)
<b>Short circuit proof</b>	yes <sup>2)</sup>

## Terminal assignment

Signal:	GND	+V	A	A inv	B	B inv	PE
Cable colour:	WH	BN	GN	YE	GY	PK	Shield
M23 connector:	10	12	5	6	8	1	PH
M12	1	2	3	4	5	6	PH

+V: Encoder Power Supply +V DC  
 GND: Encoder Power Supply Ground (0V)  
 PE: Protective earth  
 PH: Plug connector housing (Shield)  
 A, Ainv: Sine output  
 B, Binv: Cosine output

## Top view of mating side, male contact base

Connector type	8-pin M12 connector	12-pin M23 connector
Corresponding mating connector	05.CMB-8181-0	8.0000.5012.0000

1) Cable version: -30°C ... + 90°C fixed installation

2) Short circuit proof to 0V or to output, one channel at a time, supply voltage correctly applied

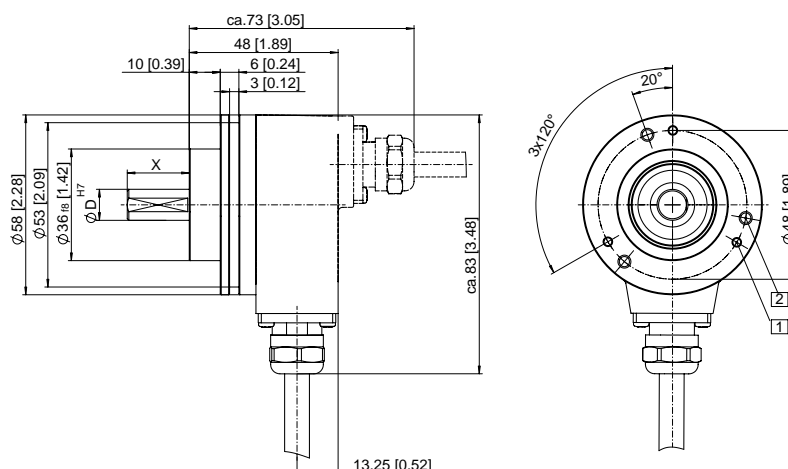
# Encoders for Functional Safety

Incremental Encoders	Sendix incremental	5814 SIL/5834 SIL (Shaft / Hollow shaft)	Functional Safety
----------------------	--------------------	--	-------------------

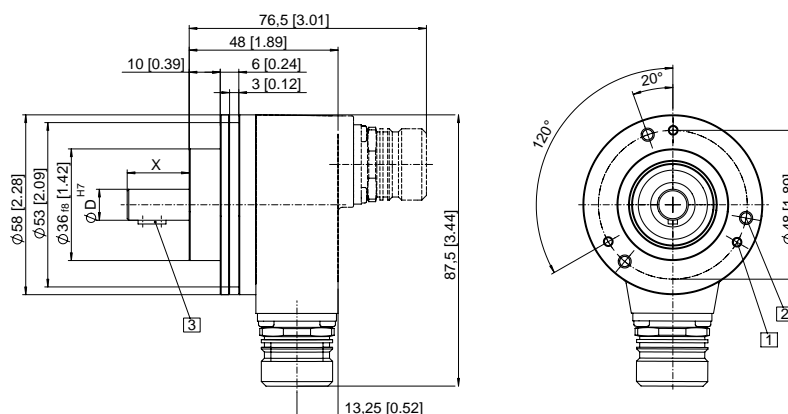
## Dimensions shaft version

### 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
- 3 Feather key DIN 6885 - A - 3x3x6  
optional: Feather key DIN 6885 - A - 4x4x8

## Incremental Encoders

## Sendix incremental

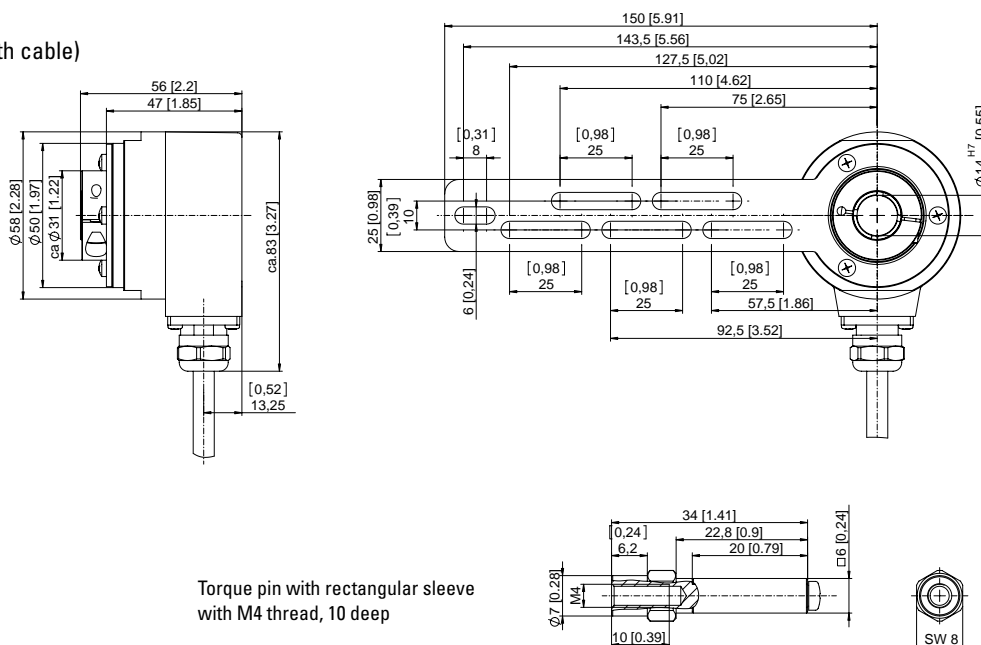
**5814 SIL/5834 SIL (Shaft / Hollow shaft)**

## Functional Safety

### Dimensions hollow shaft version

### With torque stop set

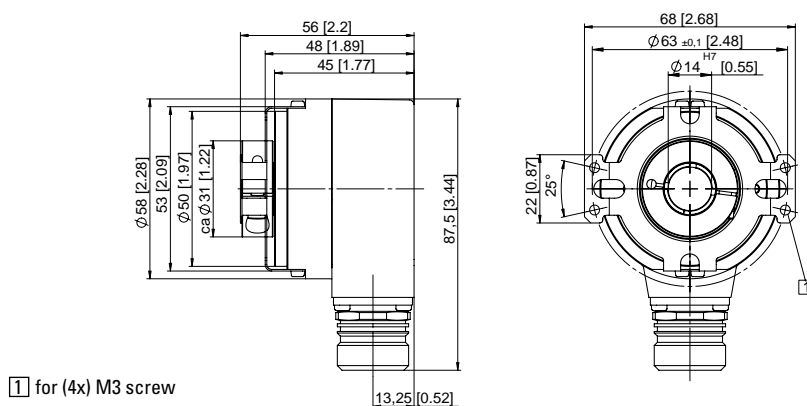
Flange type A (Drawing with cable)



### Flange with stator coupling and hollow shaft

Flange type B

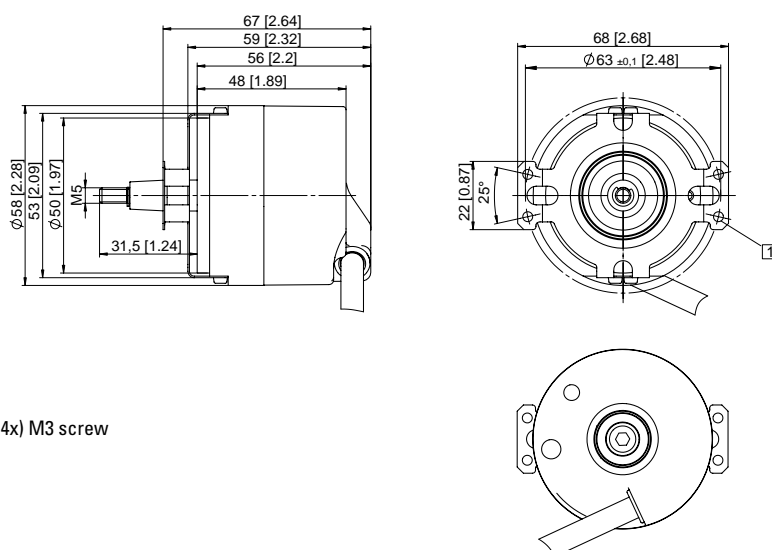
(Drawing with M23 connector)



### Flange with stator coupling and tapered shaft

### Flange type B

(Drawing with tangential cable outlet)



# Encoders for Functional Safety

**Absolute Singleturn Encoders**

**Sendix absolute**

**5853 SIL / 5873 SIL (Shaft / Hollow shaft)**

**Functional Safety**



The absolute singleturn encoders Sendix 5863 SIL and 5883 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



High IP value



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SIN / COS



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 interface with incremental Sin/Cos tracks

## Flexible

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

## Order code Shaft version

**8.5853SIL . XXXX . XXXX**  
Type                      ① ② ③ ④                      ⑤ ⑥ ⑦ ⑧

### ① Flange

1 = Clamping flange, ø 58 mm, IP 65

### ② Shaft (ø x L)

2 = 10 mm x 20 mm, with flat  
A = 10 mm x 20 mm,  
with feather key shaft slot

### ③ Output circuit / Power supply

3 = SSI/BiSS + 2048 ppr SinCosSpur, 5 V DC  
4 = SSI/BiSS + 2048 ppr SinCos, 10 ... 30 V DC

### ④ Type of connection

1 = axial cable (1 m PVC)  
2 = radial cable (1 m PVC)  
3 = 12-pin plug connector M23, axial  
4 = 12-pin plug connector M23, radial

### ⑤ Code

B = SSI, Binary  
C = BiSS, Binary  
G = SSI, Gray

### ⑥ Resolution <sup>1)</sup>

A = 10 bits ST  
1 = 11 bits ST  
2 = 12 bits ST  
3 = 13 bits ST  
4 = 14 bits ST  
7 = 17 bits ST

### ⑦ Input / output <sup>1)</sup>

2 = SET, DIR inputs  
additional status output

### ⑧ Options (Service)

1 = no Option  
2 = Status-LED  
3 = SET button and status LED

Preferred types are underlined

Seawater-resistant version on request

## Order code Hollow shaft

**8.5873SIL . XXXX . XXXX**  
Type                      ① ② ③ ④                      ⑤ ⑥ ⑦ ⑧

### ① Flange

A = with torque stop set  
B = with stator coupling

### ② Hollow shaft

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

### ③ Output circuit / Power supply

3 = SSI/BiSS + 2048 ppr SinCosSpur, 5 V DC  
4 = SSI/BiSS + 2048 ppr SinCos, 10 ... 30 V DC

### ④ Type of connection

2 = radial cable (1 m PVC)  
4 = 12-pin plug connector M23, radial  
E = tangential cable outlet  
(1 m PCV cable)

### ⑤ Code

B = SSI, Binary  
C = BiSS, Binary  
G = SSI, Gray

### ⑥ Resolution <sup>1)</sup>

A = 10 bit ST  
1 = 11 bit ST  
2 = 12 bit ST  
3 = 13 bit ST  
4 = 14 bit ST  
7 = 17 bit ST

### ⑦ Input / output <sup>1)</sup>

2 = SET, DIR inputs  
additional status output

### ⑧ Options (Service)

1 = no Option  
2 = Status-LED  
3 = SET button and status LED

Preferred types are underlined

Seawater-resistant version on request

## Suitable accessories:

- Further cables and connectors can be found in the section Connection Technology.
- Further mounting attachments and stator couplings can be found in the section Accessories.

<sup>1)</sup> Resolution, preset value and count direction are factory-programmable



# Encoders for Functional Safety

Absolute Singleturn Encoders	Sendix absolute	5853 SIL / 5873 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 IP 67
	shaft side IP 65, opt. IP 67
<b>Working temperature range</b>	-40°C ... +90°C <sup>1)</sup>
<b>Materials</b>	shaft/hollow shaft stainless steel
	flange aluminium
	housing zinc die-cast housing
	cable PVC
<b>Shock resistance</b> acc. DIN-IEC 68-2-27	> 2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance</b> acc. DIN-IEC 68-2-6	> 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> (w/o output load)	5 V DC max. 75 mA
	24 V DC max. 45 mA
<b>Reverse polarity protection of the power supply (Ub)</b>	yes
<b>Conforms to CE requirements</b> acc. to	EN 61000-6-2, EN 61000-6-4, EN 61000-6-3
<b>RoHS compliant</b> acc. to	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 typ 3,8 V
	low at I <sub>Load</sub> = 20 mA 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 Interface

<b>Singleturn resolution</b>	10 ... 14 bits and 17 bit <sup>3)</sup>
<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 (Option incremental track)

<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 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.

## 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.

# Encoders for Functional Safety

Absolute Singleturn Encoders	Sendix absolute	5853 SIL / 5873 SIL (Shaft / Hollow shaft)	Functional Safety
------------------------------	-----------------	--	-------------------

## 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	B inv	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

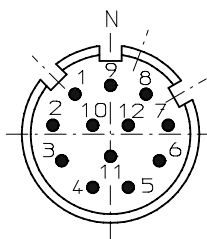
PE: Protective earth

PH: Plug connector housing (shield)

A, A inv: Sine output (incremental)

B, B inv: Cosine output (incremental)

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



**Corresponding mating connector:**

8.0000.5012.0000

# Encoders for Functional Safety

## Absolute Singleturn Encoders

## Sendix absolute

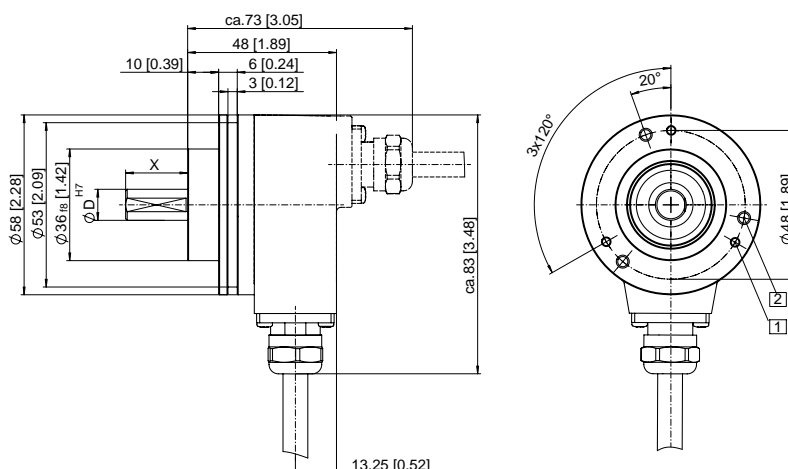
## 5853 SIL / 5873 SIL (Shaft / Hollow shaft)

## Functional Safety

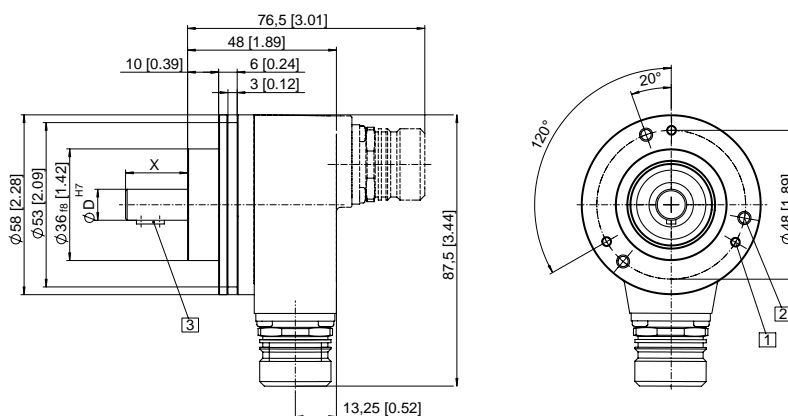
### Dimensions shaft version

#### 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
- 3 Feather key DIN 6885 - A - 3x3x6  
optional: Feather key DIN 6885 - A - 4x4x8

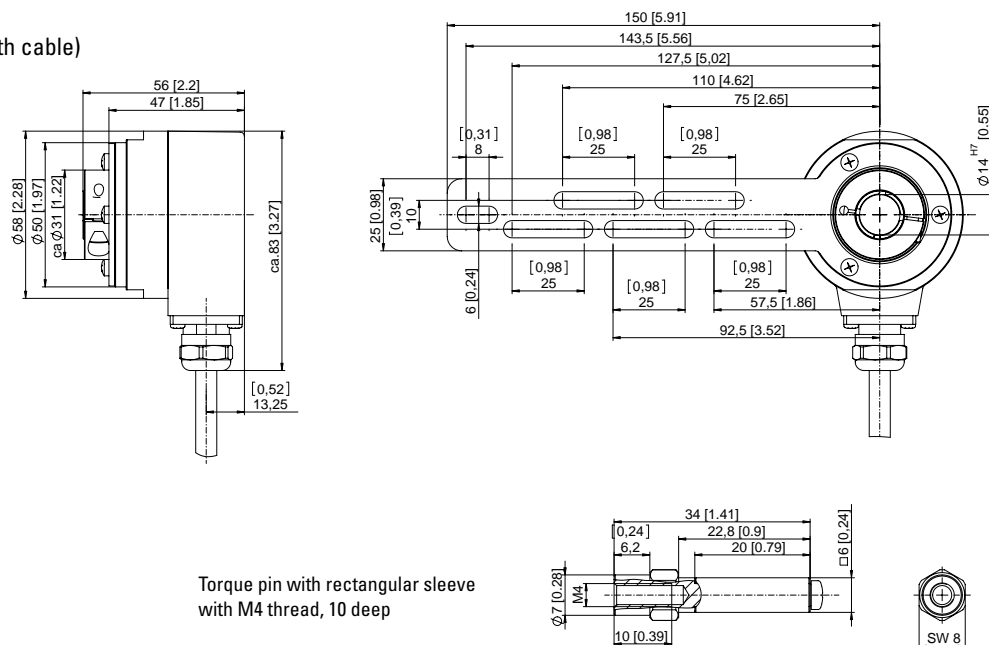
# Encoders for Functional Safety

Absolute Singleturn Encoders	Sendix absolute	5853 SIL / 5873 SIL (Shaft / Hollow shaft)	Functional Safety
------------------------------	-----------------	--	-------------------

## Dimensions hollow shaft version

### With torque stop set

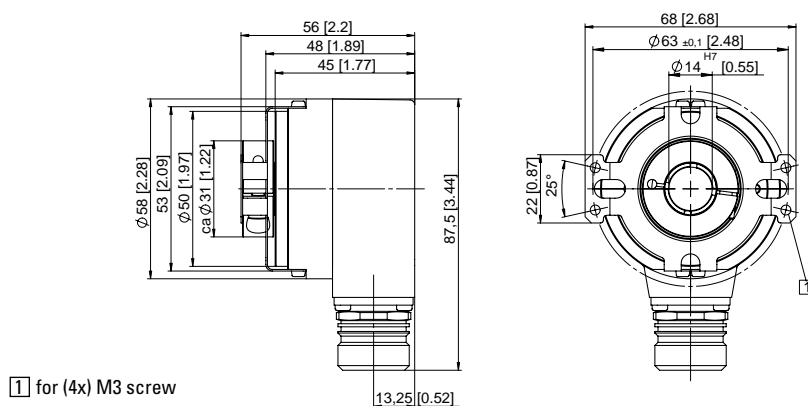
Flange type A (Drawing with cable)



## Flange with stator coupling and hollow shaft

Flange type B

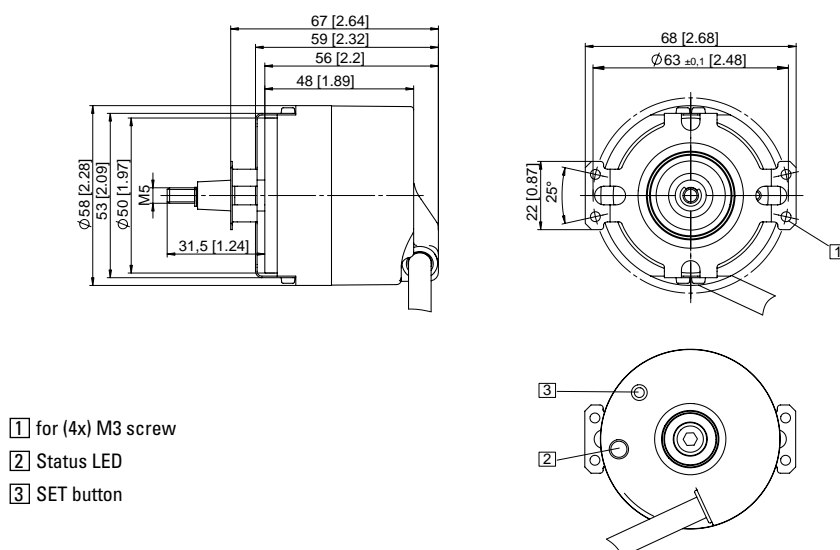
(Drawing with M23 connector)



## Flange with stator coupling and tapered shaft

Flange type B

(Drawing with tangential cable outlet)



# Encoders for Functional Safety

## Absolute Multiturn Encoders

## Sendix absolute

## 5863 SIL / 5883 SIL (Shaft / Hollow shaft)

## Functional Safety



The absolute multiturn encoders Sendix 5863 SIL and 5883 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.



Mechanical drive



Safety-Lock™



High rotational speed



Temperature



High IP value



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SIN COS



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 interface with incremental Sin/Cos tracks

### Flexible

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

### Order code

#### Shaft version

8.5863SIL . XXXX . XXXX  
Type 1 2 3 4 5 6 7 8

#### 1 Flange

1 = Clamping flange, ø 58 mm, IP 65

#### 2 Shaft (ø x L)

2 = 10 mm x 20 mm, with flat  
A = 10 mm x 20 mm, with feather key shaft slot

#### 3 Output circuit / Power supply

3 = SSI/BiSS + 2048 ppr SinCosSpur, 5 V DC  
4 = SSI/BiSS + 2048 ppr SinCos, 10 ... 30 V DC

#### 4 Type of connection

1 = axial cable (1 m PVC)  
2 = radial cable (1 m PVC)  
3 = 12-pin plug connector M23, axial  
4 = 12-pin plug connector M23, radial

#### 5 Code

B = SSI, Binary  
C = BiSS, Binary  
G = SSI, Gray

#### 6 Resolution <sup>1)</sup>

A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
3 = 13 bit ST + 12 bit MT  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

#### 7 Input / output <sup>1)</sup>

2 = SET, DIR inputs  
additional status output

#### 8 Options (Service)

1 = no Option  
2 = Status-LED  
3 = SET button and status LED

Preferred types are underlined

Seawater-resistant version on request

### Order code

#### Hollow shaft

8.5883SIL . XXXX . XXXX  
Type 1 2 3 4 5 6 7 8

#### 1 Flange

A = with torque stop set  
B = with stator coupling

#### 2 Hollow shaft

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

#### 3 Output circuit / Power supply

3 = SSI/BiSS + 2048 ppr SinCosSpur, 5 V DC  
4 = SSI/BiSS + 2048 ppr SinCos, 10 ... 30 V DC

#### 4 Type of connection

2 = radial cable (1 m PVC)  
4 = 12-pin plug connector M23, radial  
E = tangential cable outlet (1 m PCV cable)

#### 5 Code

B = SSI, Binary  
C = BiSS, Binary  
G = SSI, Gray

#### 6 Resolution <sup>1)</sup>

A = 10 bit ST + 12 bit MT  
1 = 11 bit ST + 12 bit MT  
2 = 12 bit ST + 12 bit MT  
3 = 13 bit ST + 12 bit MT  
4 = 14 bit ST + 12 bit MT  
7 = 17 bit ST + 12 bit MT

#### 7 Input / output <sup>1)</sup>

2 = SET, DIR inputs  
additional status output

#### 8 Options (Service)

1 = no Option  
2 = Status-LED  
3 = SET button and status LED

Preferred types are underlined

Seawater-resistant version on request

#### Suitable accessories:

- Further cables and connectors can be found in the section Connection Technology.
- Further mounting attachments and stator couplings can be found in the section Accessories.

<sup>1)</sup> Resolution, preset value and count direction are factory-programmable



# 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	IP 67
	shaft side	IP 65, opt. IP 67

<b>Working temperature range</b>	-40°C ... +90°C <sup>1)</sup>
----------------------------------	-------------------------------

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

<b>Shock resistance</b> acc. DIN-IEC 68-2-27	> 2500 m/s <sup>2</sup> , 6 ms
--	--------------------------------

<b>Vibration resistance</b> acc. DIN-IEC 68-2-6	> 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> (w/o output load)	5 V DC	max. 80 mA
	24 V DC	max. 50 mA
<b>Reverse polarity protection of the power supply (Ub)</b>	yes	
<b>Conforms to CE requirements</b> acc. to	EN 61000-6-2, EN 61000-6-4, EN 61000-6-3	
<b>RoHS compliant</b> acc. to	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	typ 3,8 V
	low at I <sub>Load</sub> = 20 mA	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 (Option incremental track)

<b>Max. frequency -3dB</b>	400 kHz	
<b>Signal level</b>	1 Vpp (± 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.

# Encoders for Functional Safety

<b>Absolute Multiturn Encoders</b>	<b>Sendix absolute</b>	<b>5863 SIL / 5883 SIL (Shaft / Hollow shaft)</b>	<b>Functional Safety</b>
------------------------------------	------------------------	---	--------------------------

## Terminal assignment

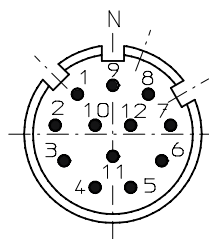
for output circuit 3 or 4 and type of connection 1, 2, 3, 4 or E (2 control inputs, Sine/Cosine)

Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	A	A inv	B	B inv	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

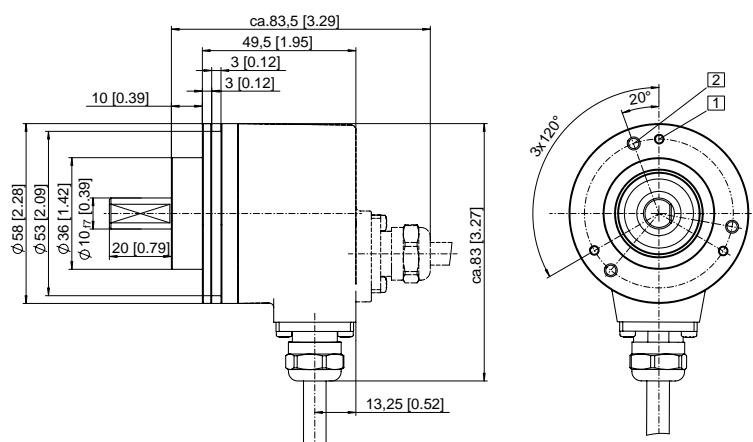
# Encoders for Functional Safety

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

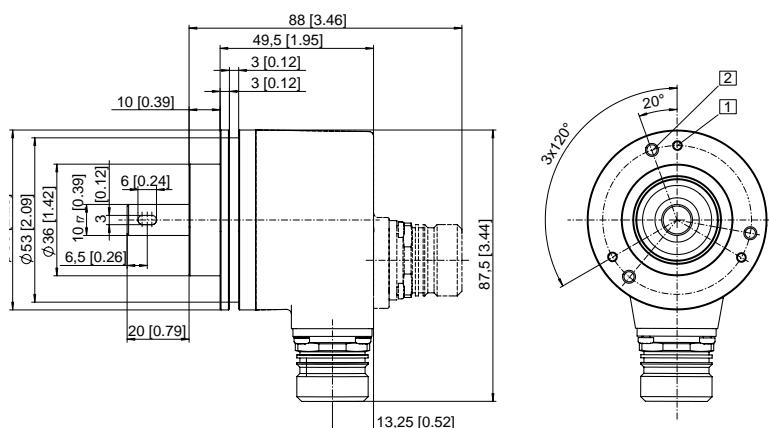
## Dimensions shaft version

### 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

## Encoders for Functional Safety

## Absolute Multiturn Encoders

## Sendix absolute

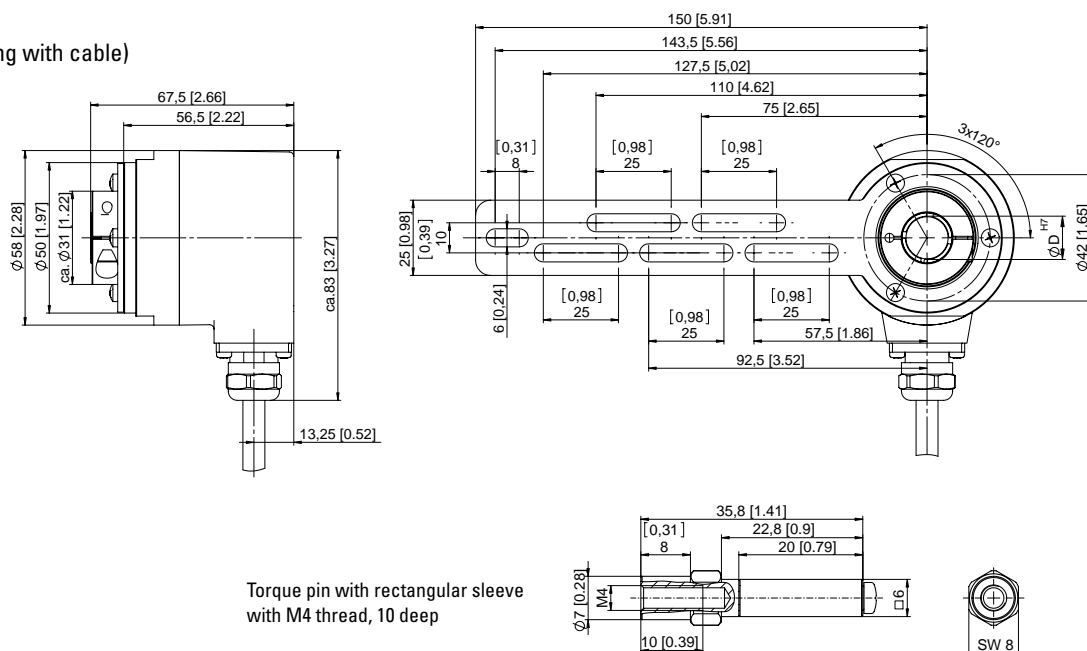
**5863 SIL / 5883 SIL (Shaft / Hollow shaft)**

## Functional Safety

### Dimensions hollow shaft version

### With torque stop set

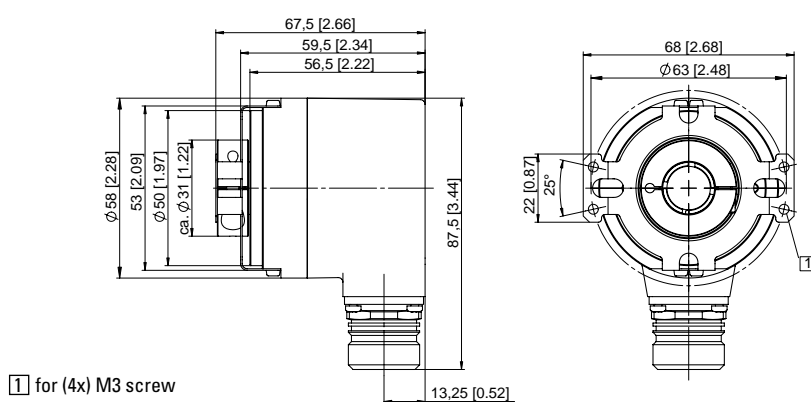
### Flange type A (Drawing with cable)



### Flange with stator coupling and hollow shaft

### Flange type B

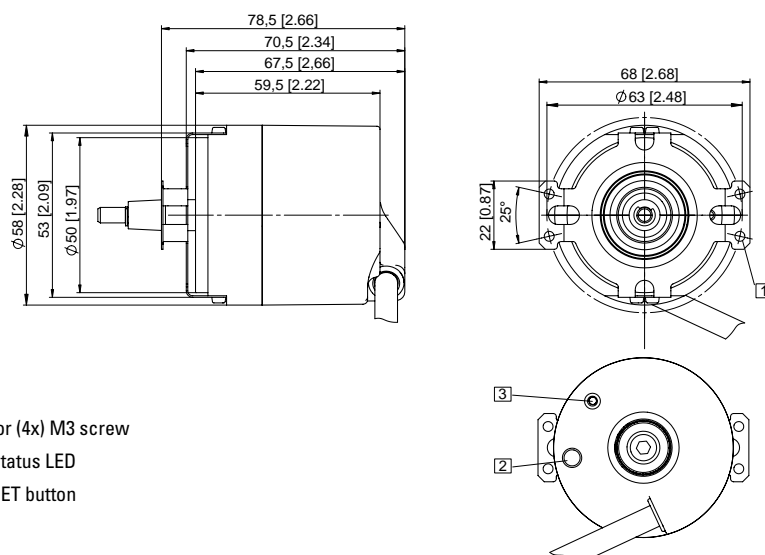
(Drawing with M23 connector)



### Flange with stator coupling and tapered shaft

### Flange type B

(Drawing with tangential cable outlet)



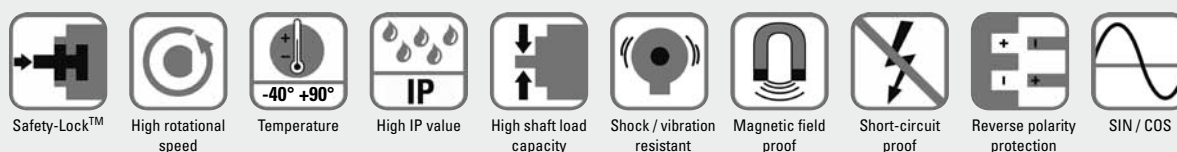
# Absolute Encoders

Singleturn	Sendix absolute	F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS
------------	-----------------	--------------------------------------	------------



The Sendix F36 singleturn boasts exceptional ruggedness and compact dimensions. With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.

Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.



## Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Ideal for use outdoors thanks to IP 67 protection and wide temperature range from -40°C up to +90°C

## Optimised performance

- High-precision with a data refresh rate of the position value  $\leq 1\mu s$
- High-resolution feedback in real-time via incremental outputs SinCos and RS422
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz

## Order code Shaft version

8.F3653 . XXXX . XX 12  
Type 1 2 3 4 5 6



### 1 Flange, ø 36 mm

- 1 = Clamping flange, IP67
- 2 = Synchro flange, IP67
- 3 = Clamping flange, IP65
- 4 = Synchro flange, IP65

### 2 Shaft (ø x L)

- 1 = ø 6 x 12,5 mm
- 2 = ø 6,35 x 12,5 mm
- 3 = ø 8 x 15 mm
- 4 = ø 9,525 x 15,875 mm
- 5 = ø 10 x 20 mm

### 3 Interface / Power supply, SSI or BiSS

- 1 = 5 V DC
- 2 = 10 ... 30 V DC
- 3 = 5 V DC and 2048 ppr SinCos track
- 4 = 10 ... 30 V DC and 2048 ppr SinCos
- 5 = 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = 5 V DC and 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder
- 7 = 5 V DC and 2048 ppr incremental signals RS422
- 8 = 10 ... 30 V DC and 2048 ppr incremental signals RS422

### 4 Type of connection

- 1 = Cable, tangential (1 m PUR)
- 3 = Cable, tangential (5 m PUR)
- 8 = 8-pin connector M12, axial (only with output circuits 1 and 2)

### 5 Code

- B = SSI, Binary
- C = BiSS, Binary
- G = SSI, Gray

### 6 Resolution

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST
- 7 = 17 bit ST

Preferred types are underlined

## Order code Hollow shaft

8.F3673 . XXXX . XX 12  
Type 1 2 3 4 5 6



### 1 Flange

- ø 36 mm, IP65
- 1 = with torque stop
- 2 = with stator coupling

### 2 Hollow shaft

- 1 = ø 6 mm
- 2 = ø 6,35 mm
- 3 = ø 8 mm
- 4 = ø 10 mm (Blind hollow shaft)

### 3 Interface / Power supply, SSI or BiSS

- 1 = 5 V DC
- 2 = 10 ... 30 V DC
- 3 = 5 V DC and 2048 ppr SinCos track
- 4 = 10 ... 30 V DC and 2048 ppr SinCos
- 5 = 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = 5 V DC and 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder
- 7 = 5 V DC and 2048 ppr incremental signals RS422
- 8 = 10 ... 30 V DC and 2048 ppr incremental signals RS422

### 4 Type of connection

- 1 = Cable, tangential (1 m PUR)
- 3 = Cable, tangential (5 m PUR)
- 8 = 8-pin connector M12, axial (only with output circuits 1 and 2 and Blind hollow shaft 10 mm)

### 5 Code

- B = SSI, Binary
- C = BiSS, Binary
- G = SSI, Gray

### 6 Resolution

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST
- 7 = 17 bit ST

Preferred types are underlined

## Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.



# Absolute Encoders

Singleturn	Sendix absolute	F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS
------------	-----------------	--------------------------------------	------------

## Mechanical characteristics:

<b>Maximum speed</b>		
Shaft- or blind hollow shaft version without shaft seal (IP65)		12 000 min-1
		10 000 min-1 (continuous op.)
Shaft version (IP 67) or hollow shaft version (IP 65) with shaft seal		10 000 min-1
		8 000 min-1 (continuous op.)
<b>Starting torque</b>	without shaft seal	< 0,007 Nm
	with shaft seal (IP67)	< 0,01 Nm
<b>Shaft load capacity</b>	radial	40 N
	axial	20 N
<b>Weight</b>		ca. 0,2 kg
<b>Protection to EN 60 529</b>	housing side	IP 67
	shaft side	IP 65 (solid shaft version opt. IP 67)
<b>EX approval for hazardous areas</b>		optional Zone 2 and 22
<b>Working temperature range</b>		-40°C ... +90°C
<b>Materials</b>	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PUR
<b>Shock resistance acc. to DIN-IEC 68-2-27</b>		2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance acc. to DIN-IEC 68-2-6</b>		100 m/s <sup>2</sup> , 55 ... 2000 Hz

## General electrical characteristics:

<b>Supply voltage</b>		
5 V DC ± 5% or 10 ... 30 V DC		
<b>Current consumption (no load)</b>		
5 V DC	max. 60 mA	
24 V DC	max. 20 mA	
<b>Reverse connection of the supply voltage</b>		
yes		
<b>CE compliant acc. to</b>		
EN 61 000-6-2, EN 61 000-6-4 and EN 61 000-6-3		
<b>RoHS compliant acc. to</b>		
EG-guideline 2002/95/EG		

## Interfaces

### General interface characteristics

<b>Output driver</b>		
RS 485 transceiver type		
<b>Permissible load/channel</b>		
max. ± 30 mA		
<b>Signal level</b>		
high	typ 3,8 V	
low with I <sub>Load</sub> = 20 mA	typ 1,3 V	
<b>Short-circuit proof outputs</b>		
yes <sup>1)</sup>		

### SSI interface

<b>Resolution, singleturn</b>		
10 ... 17 bit		
<b>Code</b>		
Binary or Gray		
<b>SSI clock rate</b>		
≤ 14 bit	50 kHz ... 2 MHz	
≥ 15 bit	50 kHz ... 125 kHz	
<b>Monoflop time</b>		
≤ 15 µs		
<b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.		
<b>Data refresh rate</b>		
up to 14 bit	≤ 1 µs	
up to 15 ... 17 bit	4 µs	
<b>Status and Parity Bit</b>		
on request		

### BiSS interface

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

### Incremental outputs (A/B), 2048 ppr

	Sine/Cosine	RS 422 TTL-compatible
<b>Max. frequency -3dB</b>	400 kHz	400 kHz
<b>Signal level</b>	1 V <sub>pp</sub> (≤ 20%)	high: min. 2,5 V low: max. 0,5 V
<b>Short circuit proof</b>	yes <sup>1)</sup>	yes <sup>1)</sup>

### SET input

<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. 30 % of V <sub>+</sub>
(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

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 processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 14 ms before the new position data can be read. During this time the status output is at LOW.

### DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.

<b>Response time (DIR input)</b>	1 ms
----------------------------------	------

### Status output

<b>Output driver</b>		Open collector, internal pull up resistor 22 kOhm
<b>Permissible load</b>		-20 mA
<b>Signal level</b>		high +V low < 1 V
<b>Active</b>		low

The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open-collector with int. pull-up 22 kOhm).

An active status output (LOW) displays:  
LED fault (failure or ageing) – over-temperature – undervoltage  
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

### Power-on delay

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

<sup>1)</sup> Short circuit proof to 0V or to output when supply voltage correctly applied

# Absolute Encoders

Singleturn	Sendix absolute	F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS
------------	-----------------	--------------------------------------	------------

## Terminal assignment

Interface	Type of connection	Features	Cable
1, 2	1,3	SSI or BiSS, SET, DIR, Status	Signal:
			GND +V +C -C +D -D SET DIR Stat PE
			Cable colour: WH BN GN YE GY PK BU RD BK Shield

Interface	Type of connection	Features	M12 Connector
1, 2	3	SSI or BiSS, SET, DIR	Signal:
			GND +V +C -C +D -D SET DIR Shield/PE
			M12 connector: 1 2 3 4 5 6 7 8 PH

Interface	Type of connection	Features	Cable
3, 4	1, 3	SSI or BiSS, SET, DIR, 2048 Sin/Cos	Signal:
			GND +V +C -C +D -D SET DIR A A inv B B inv PE
			M12 connector: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU Shield

Interface	Type of connection	Features	Cable
5	1, 3	SSI or BiSS, SET, DIR, Sensor outputs	Signal:
			GND +V +C -C +D -D SET DIR GND <sub>sens</sub> +V <sub>sens</sub> PE
			Cable colour: WH BN GN YE GY PK BU RD RD-BU VT Shield

Interface	Type of connection	Features	Cable
6	1, 3	SSI or BiSS, 2048 Sin/Cos Sensor outputs	Signal:
			GND +V +C -C +D -D GND <sub>sens</sub> +V <sub>sens</sub> A A inv B B inv PE
			Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU Shield

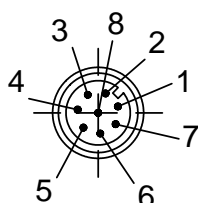
Interface	Type of connection	Features	Cable
7, 8	1, 3	SSI or BiSS, 2048 incr. RS422	Signal:
			GND +V +C -C +D -D A A inv B B inv PE
			Cable colour: WH BN GN YE GY PK BK VT GY-PK RD-BU Shield

+V: Encoder power supply +V DC  
 GND: Encoder power supply ground GND (0V)  
 +C, -C: Clock signal  
 +D, -D: Data signal  
 SET: Set input. The current position becomes defined as position zero.

DIR: Direction input:  
 If this input is active, 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: Incremental output channel A  
 B, Binv: Incremental output channel B

Top view of mating side, male contact base: 8-pin M12 connector



Corresponding mating connector: 05.CMB-8181-0

# Absolute Encoders

**Singleturn**

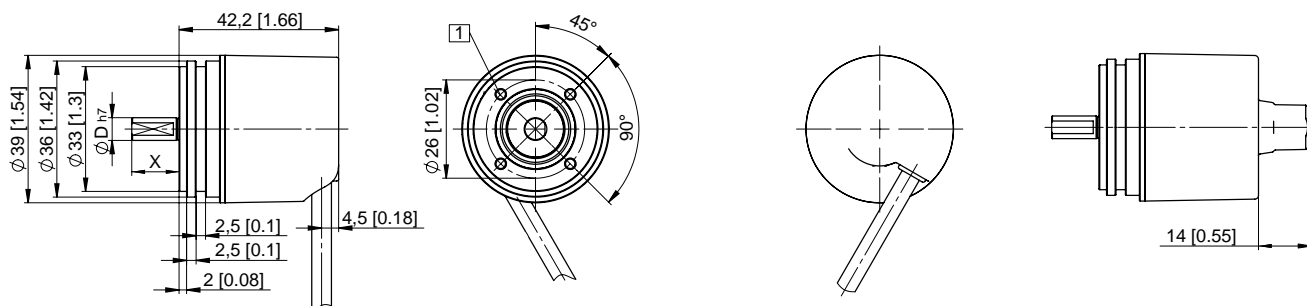
**Sendix absolute**

**F3653 / F3673 (Shaft / Hollow shaft)**

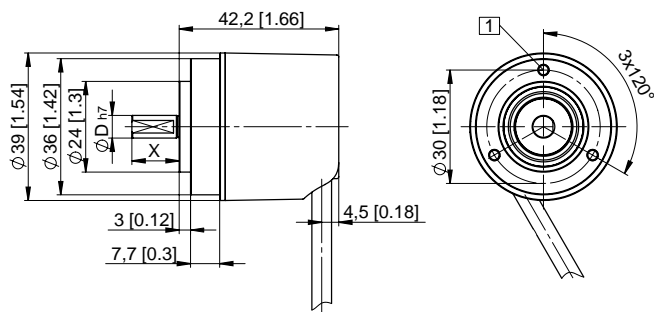
**SSI / BiSS**

## Dimensions shaft version:

Synchro flange,  $\varnothing 36$  mm



Clamping flange,  $\varnothing 36$  mm

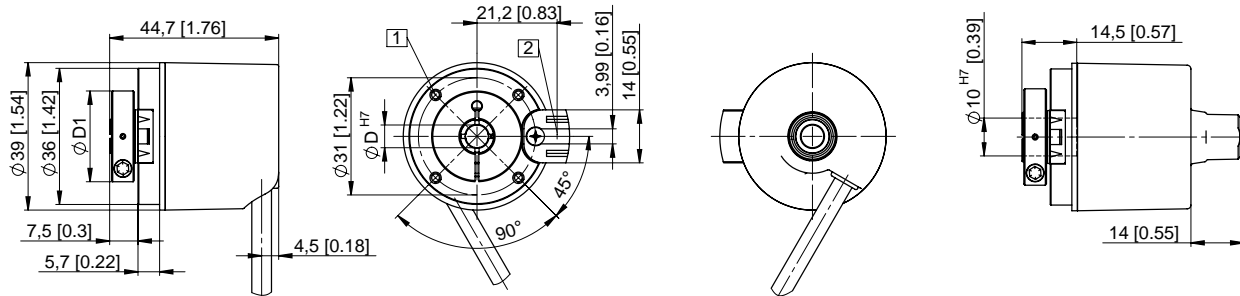


1 M3, 6 [0.24] deep

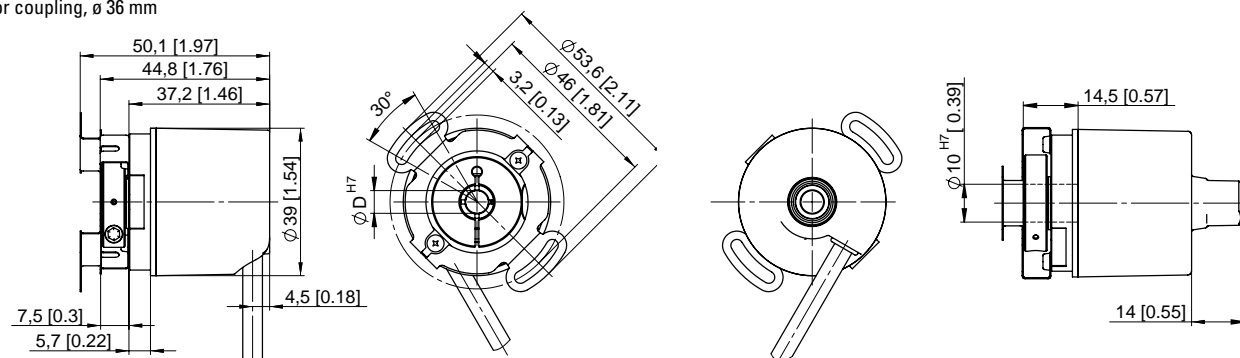
Shaft acc. to order code	Length X
1	12,5 mm
2	12,5 mm
3	15 mm
4	15,875 mm
5	20 mm

## Dimensions hollow shaft version:

with torque stop,  $\varnothing 36$  mm



with stator coupling,  $\varnothing 36$  mm



1 M2,5, 5 [0,2] deep

2 Torque stop slot  
Recommendation:  
Cylindrical pin DIN7,  $\varnothing 4$

Hollow shaft acc. to order code	D1
1	$\varnothing 24$ mm
2	$\varnothing 24$ mm
3	$\varnothing 25,5$ mm
4	$\varnothing 25,5$ mm

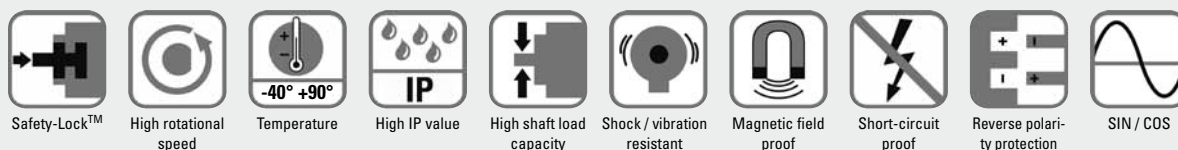
# Absolute Encoders

Multiturn	Sendix absolute	F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS
-----------	-----------------	--------------------------------------	------------



The Sendix F36 multiturn is an optical multiturn encoder without gears, 100% insensitive to magnetic fields, in miniature format.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.



## Reliable and magnetically insensitive

- Electronic multiturn 100 % magnetic-field resistant
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Reduced number of components ensures magnetic insensitivity
- Ideal for use outdoors thanks to IP 67 protection and wide temperature range from -40°C up to +90°C

## Optimized performance

- High-precision with a data refresh rate of the position value  $\leq 1\mu s$
- High-resolution feedback in real-time via incremental outputs SinCos and RS422
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz

## Order code Shaft version

8.F3663 . XXXX . XXX 2  
Type 1 2 3 4 5 6 7



### 1 Flange, $\varnothing$ 36 mm

- 1 = Clamping flange, IP67
- 2 = Synchro flange, IP67
- 3 = Clamping flange, IP65
- 4 = Synchro flange, IP65

### 2 Shaft ( $\varnothing$ x L)

- 1 = 6 x 12,5 mm
- 2 = 6,35 x 12,5 mm
- 3 = 8 x 15 mm
- 4 = 9,525 x 15,875 mm
- 5 = 10 x 20 mm

### 3 Interface / Power supply, SSI or BiSS

- 1 = 5 V DC
- 2 = 10 ... 30 V DC
- 3 = 5 V DC and 2048 ppr SinCos track
- 4 = 10 ... 30 V DC and 2048 ppr SinCos
- 5 = 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = 5 V DC and 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder
- 7 = 5 V DC and 2048 ppr incremental signals RS422
- 8 = 10 ... 30 V DC and 2048 ppr incremental signals RS422

### 4 Type of connection

- 1 = Cable, tangential (1 m PUR)
- 3 = Cable, tangential (5 m PUR)

### 5 Code

- B = SSI, Binary
- C = BiSS, Binary
- G = SSI, Gray

### 6 Resolution (Singleturn)

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST
- 7 = 17 bit ST

### 7 Resolution (Multiturn)

- 2 = 12 Bit MT
- 6 = 16 Bit MT
- 4 = 24 Bit MT

Preferred types are underlined

## Order code Hollow shaft

8.F3683 . XXXX . XXX 2  
Type 1 2 3 4 5 6 7



### 1 Flange $\varnothing$ 36 mm, IP65

- 1 = with torque stop
- 2 = with stator coupling

### 2 Hollow shaft ( $\varnothing$ x L)

- 1 = 6 mm
- 2 = 6,35 mm
- 3 = 8 mm
- 4 = 10 mm (Blind hollow shaft)

### 3 Interface / Power supply, SSI or BiSS

- 1 = 5 V DC
- 2 = 10 ... 30 V DC
- 3 = 5 V DC and 2048 ppr SinCos track
- 4 = 10 ... 30 V DC and 2048 ppr SinCos
- 5 = 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = 5 V DC and 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder
- 7 = 5 V DC and 2048 ppr incremental signals RS422
- 8 = 10 ... 30 V DC and 2048 ppr incremental signals RS422

### 4 Type of connection

- 1 = Cable, tangential (1 m PUR)
- 3 = Cable, tangential (5 m PUR)

### 5 Code

- B = SSI, Binary
- C = BiSS, Binary
- G = SSI, Binary

### 6 Resolution (Singleturn)

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST
- 7 = 17 bit ST

Preferred types are underlined

## Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

# Absolute Encoders

Multiturn	Sendix absolute	F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS
-----------	-----------------	--------------------------------------	------------

Mechanical characteristics:			
<b>Maximum speed</b>			
Shaft- or blind hollow shaft version without shaft seal (IP65)		12 000 min <sup>-1</sup>	10 000 min <sup>-1</sup> (continuous op.)
Shaft version (IP 67) or hollow shaft version (IP 65) with shaft seal		10 000 min <sup>-1</sup>	8 000 min <sup>-1</sup> (continuous op.)
<b>Starting torque</b>		without shaft seal < 0,007 Nm	with shaft seal (IP67) < 0,01 Nm
<b>Shaft load capacity</b>		radial 40 N	axial 20 N
<b>Weight</b>		ca. 0,2 kg	
<b>Protection to EN 60 529</b>		housing side IP 67	shaft side IP 65 (solid shaft version opt. IP 67)
<b>EX approval for hazardous areas</b>		optional Zone 2 and 22	
<b>Working temperature range</b>		-40°C ... +90°C	
<b>Materials</b>		shaft/hollow shaft stainless steel	flange aluminium
		housing zinc die-cast	cable PUR
<b>Shock resistance acc. to DIN-IEC 68-2-27</b>		2500 m/s <sup>2</sup> , 6 ms	
<b>Vibration resistance acc. to DIN-IEC 68-2-6</b>		100 m/s <sup>2</sup> , 55 ... 2000 Hz	

General electrical characteristics:			
<b>Supply voltage</b>		5 V DC ± 5% or 10 ... 30 V DC	
<b>Current consumption (no load)</b>		5 V DC max. 60 mA	24 V DC max. 30 mA
<b>Reverse connection of the supply voltage</b>		yes	
<b>CE compliant acc. to</b>		EN 61 000-6-2, EN 61 000-6-4 and EN 61 000-6-3	
<b>RoHS compliant acc. to</b>		EG-guideline 2002/95/EG	

Interfaces			
General interface characteristics			
<b>Output driver</b>		RS 485 transceiver type	
<b>Permissible load/channel</b>		max. ± 30 mA	
<b>Signal level</b>		high typ 3,8 V	low at I <sub>Load</sub> = 20 mA typ 1,3 V
<b>Short-circuit proof outputs</b>		yes <sup>1)</sup>	

SSI interface		
Resolution, singleturn	10 ... 17 bit	
Number of revolutions	max. 24 bit	
Code	Binary or Gray	
SSI clock rate	≤ 14 bit	50 kHz ... 2 MHz
	≥ 15 bit	50 kHz ...125 kHz
Monoflop time	≤ 15 μs	
<b>Note:</b> If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.		
Data refresh rate	up to 14 bit	< 1 μs
	up to 15 ... 17 bit	4 μs
Status and Parity Bit	on request	

BiSS interface	
<b>Resolution, singleturn</b>	10 ... 17 bit
<b>Number of revolutions</b>	max. 24 bit
<b>Code</b>	Binary
<b>BiSS clock rate</b>	up to 10 MHz
<b>Max. update rate</b>	< 10 µs, depends on the clock rate and the data length
<b>Data refresh rate</b>	≤ 1 µs
<b>Note:</b>	<ul style="list-style-type: none"> <li>– Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– Multi-cyclic data output, e.g. for temperature</li> <li>– CRC data verification</li> </ul>

Incremental outputs (A/B), 2048 ppr		
	Sine/Cosine	RS 422 TTL-compatible
<b>Max. frequency -3dB</b>	400 kHz	400 kHz
<b>Signal level</b>	1 V <sub>pp</sub> (± 20%)	high: min. 2,5 V low: max. 0,5 V
<b>Short circuit proof</b>	yes <sup>1)</sup>	yes <sup>1)</sup>

SET input		
<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. 30 % of V <sub>+</sub>
<b>Input current</b>	< 0,5 mA	
<b>Min. pulse duration (SET)</b>	10 ms	
<b>Timeout after SET signal</b>	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 processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 14 ms before the new position data can be read. During this time the status output is at LOW.

DIR input	
A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
<b>Response time (DIR input)</b>	1 ms

Status output	
<b>Output driver</b>	Open collector, internal pull up resistor 22 kOhm
<b>Permissible load</b>	-20 mA
<b>Signal level</b>	high +V low < 1 V
<b>Active</b>	low
The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open-collector with int. pull-up 22 kOhm).	
An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

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

<sup>1)</sup> Short circuit proof to 0V or to output when supply voltage correctly applied



# Absolute Encoders

Multiturn	Sendix absolute	F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS
-----------	-----------------	--------------------------------------	------------

## Terminal assignment

Interface	Type of connection	Features	Cable										
1, 2	1, 3	SSI or BiSS, SET, DIR, Status	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	Stat	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	Shield

Interface	Type of connection	Features	Cable													
3, 4	1, 3	SSI or BiSS, SET, DIR, 2048 Sin/Cos	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	A	A inv	B	B inv	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield

Interface	Type of connection	Features	Cable												
5	1, 3	SSI or BiSS, SET, DIR, Sensor outputs	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	GND <sub>sens</sub>	+V <sub>sens</sub>	PE	
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	RD-BU	VT	Shield	

Interface	Type of connection	Features	Cable														
6	1, 3	SSI or BiSS, 2048 Sin/Cos Sensor outputs	Signal:	GND	+V	+C	-C	+D	-D	GND <sub>sens</sub>	+V <sub>sens</sub>	A	A inv	B	B inv	PE	
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield	

Interface	Type of connection	Features	Cable												
7, 8	1, 3	SSI or BiSS, 2048 incr. RS422	Signal:	GND	+V	+C	-C	+D	-D	A	A inv	B	B inv	PE	
			Cable colour:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	Shield	

+V: Encoder power supply +V DC  
 GND: Encoder power supply ground GND (0V)  
 +C, -C: Clock signal  
 +D, -D: Data signal  
 SET: Set input. The current position becomes defined as position zero.

DIR: Direction input:  
 If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.  
 Stat: Status output

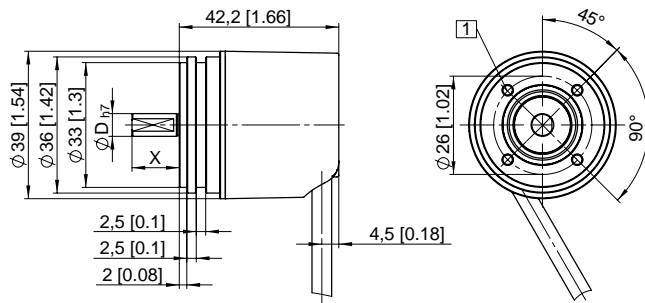
PE: Protective earth  
 PH: Plug connector housing (Shield)  
 A, Ainv: Incremental output channel A  
 B, Binv: Incremental output channel B

# Absolute Encoders

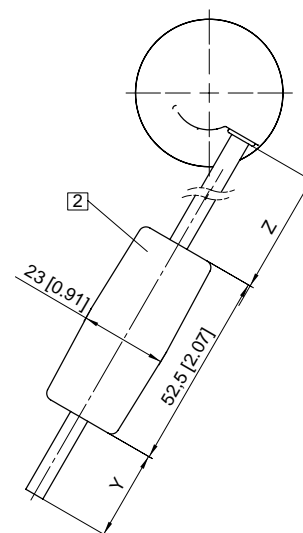
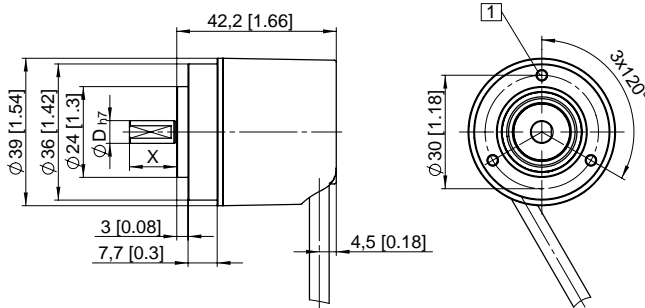
<b>Multiturn</b>	<b>Sendix absolute</b>	<b>F3663 / F3683 (Shaft / Hollow shaft)</b>	<b>SSI / BiSS</b>
------------------	------------------------	---	-------------------

## Dimensions shaft version:

Synchro flange,  $\varnothing 36$  mm



Clamping flange,  $\varnothing 36$  mm

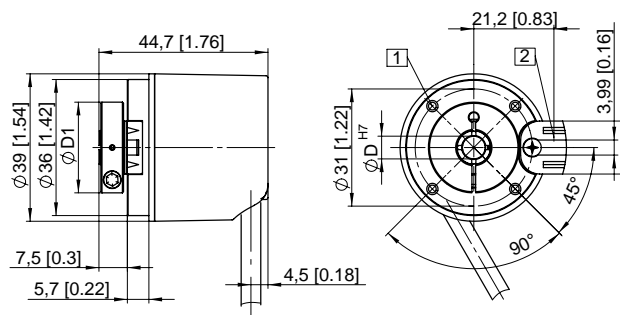


- 1 M3, 6 [0.24] deep
- 2 Battery (in the cable)

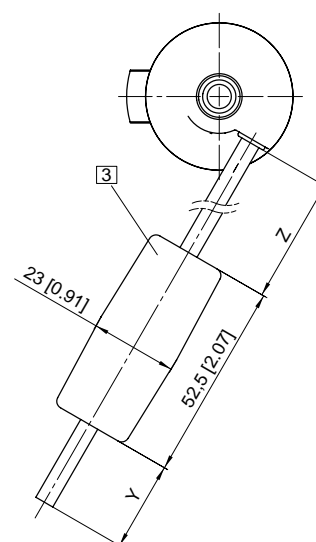
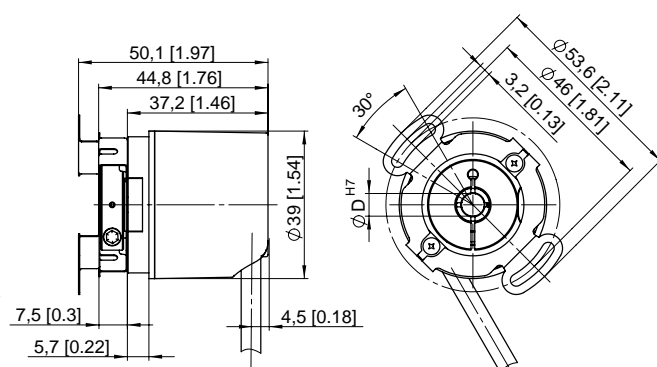
Y	Z
1 m	150 mm
5 m	150 mm

## Dimensions hollow shaft version:

with torque stop,  $\varnothing 36$  mm



with stator coupling,  $\varnothing 36$  mm



- 1 M2.5, 5 [0.2] deep
- 2 Torque stop slot  
Recommendation:  
Cylindrical pin DIN7,  $\varnothing 4$
- 3 Battery (in the cable)

Hollow shaft acc. to order code	D1
1	$\varnothing 24$ mm
2	$\varnothing 24$ mm
3	$\varnothing 25,5$ mm
4	$\varnothing 25,5$ mm

Y	Z
1 m	150 mm
5 m	150 mm

# Absolute Encoders

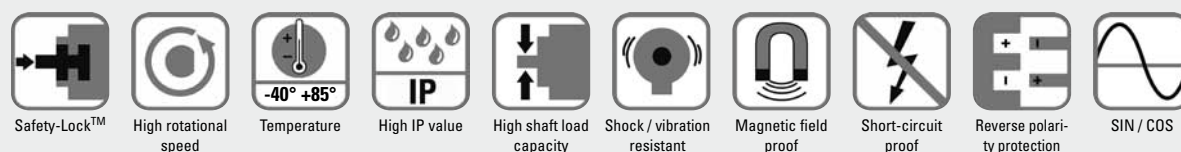
Singleturn	Sendix absolute	F3658 / F3678 (Shaft / Hollow shaft)	CANopen
------------	-----------------	--------------------------------------	---------



The Sendix F36 singleturn boasts exceptional ruggedness and compact dimensions. With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.

Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.

CANopen



## Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Ideal for use outdoors thanks to IP 67 protection and wide temperature range from -40°C up to +85°C

## Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile
- LSS services for configuration of the node address and baud rate
- Variable PDO mapping in the memory

## Order code Shaft version

8.F3658 . XX 2 X . 21 1 2

- 1 Flange, ø 36 mm**  
 1 = Clamping flange, IP67  
 2 = Synchro flange, IP67  
 3 = Clamping flange, IP65  
4 = Synchro flange, IP65
- 2 Shaft (ø x L)**  
 1 = ø 6 x 12,5 mm  
 2 = ø 6,35 x 12,5 mm  
3 = ø 8 x 15 mm  
 4 = ø 9,525 x 15,875 mm  
 5 = ø 10 x 20 mm

- 3 Interface / Power supply**  
2 = CANopen DS301 V4.0, 10 ... 30 V DC
- 4 Type of connection**  
 1 = Cable, tangential (1 m PUR)  
 3 = Cable, tangential (5 m PUR)

- 5 Fieldbus profile**  
21 = CANopen Encoder profile DS406 V3.1

Preferred types are underlined

## Order code Hollow shaft

8.F3678 . XX 2 X . 21 1 2

- 1 Flange ø 36 mm, IP65**  
 1 = with torque stop  
2 = with stator coupling
- 2 Blind hollow shaft**  
4 = ø 10 mm  
 5 = ø 6 mm  
 6 = ø 6,35 mm  
 7 = ø 8 mm

- 3 Interface / Power supply**  
2 = CANopen DS301 V4.0, 10 ... 30 V DC
- 4 Type of connection**  
 1 = Cable, tangential (1 m PUR)  
 3 = Cable, tangential (5 m PUR)

- 5 Fieldbus profile**  
21 = CANopen Encoder profile DS406 V3.1

Preferred types are underlined

### Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

# Absolute Encoders

Singleturn	Sendix absolute	F3658 / F3678 (Shaft / Hollow shaft)	CANopen
------------	-----------------	--------------------------------------	---------

Mechanical characteristics:		
Maximum speed		
Shaft- or blind hollow shaft version without shaft seal (IP65)		12 000 min-1 10 000 min-1 (continuous op.)
Shaft version (IP 67) or hollow shaft version (IP 65) with shaft seal		10 000 min-1 8 000 min-1 (continuous op.)
Starting torque	without shaft seal with shaft seal (IP67)	< 0,007 Nm < 0,01 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		ca. 0,2 kg
Protection to EN 60 529	housing side shaft side	IP 67 IP 65 (solid shaft version opt. IP 67)
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C
Materials	shaft/hollow shaft flange housing cable	stainless steel aluminium zinc die-cast PUR
Shock resistance acc. to DIN-IEC 68-2-27		> 2500 m/s², 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6		> 100 m/s², 55 ... 2000 Hz

Diagnostic LED (two-colour, red/green)		
<b>LED ON or blinking</b>		
red	Error display	
green	Status display	

## General information about CANopen

The CANopen encoders of the M3658 and M3678 series support the latest CANopen communication profile according to DS 301 V4.02. In addition, device-specific profiles like the encoder profile DS 406 V3.1 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN-Bus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection. The device address and baud rate can be set/modified by means of the software. The two-colour LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics. Node address, baud rate and CANbus termination are programmable.

## CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated. Class C2 functionality:

- NMT Slave
- Heartbeat Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's
- Node address, baud rate and CANbus / Programmable termination

## Terminal assignment

Signal:	+Ub	0 V	CAN GND	CAN High	CAN Low
Cable colour:	BN	WH	GY	GN	YE

General electrical characteristics:		
Supply voltage	10 ... 30 V DC	
Current consumption (no load)	24 V DC	max. 60 mA
Reverse connection of the supply voltage (U <sub>b</sub> )	yes	
RoHS compliant acc. to	EG-guideline 2002/95/EG	
CE compliant acc. to	EN 61000-6-2, EN 61000-6-4, and EN 61000-6-3	

Interface characteristics CANopen:	
Resolution Singleturn	1 ... 65536 (16 bit), scaleable:: 1 ... 65536
Default value Singleturn	8192 (13 bit)
Code	Binary
Interface	CAN High-Speed according to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	CANopen profile DS 406 V3.1 with manufacturer-specific add-ons LSS-Service DS305 V2.0
Baud rate	10 ... 1000 kbit/s (Software configurable)
Node address	1 ... 127 (Software configurable)
Termination switchable	Software configurable
LSS Protocol	CIA LSS protocol DS305 Global command support for node address and baud rate Selective commands via attributes of the identity object

## CANopen Encoder Profile DS406 V3.1

The following parameters can be programmed:

- Event mode
- 1 work area with upper and lower limit and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status 1 LED two colours
- Customer-specific memory - 16 Bytes

"Watchdog controlled" device

## LSS Layer Setting Services DS305 V2.0

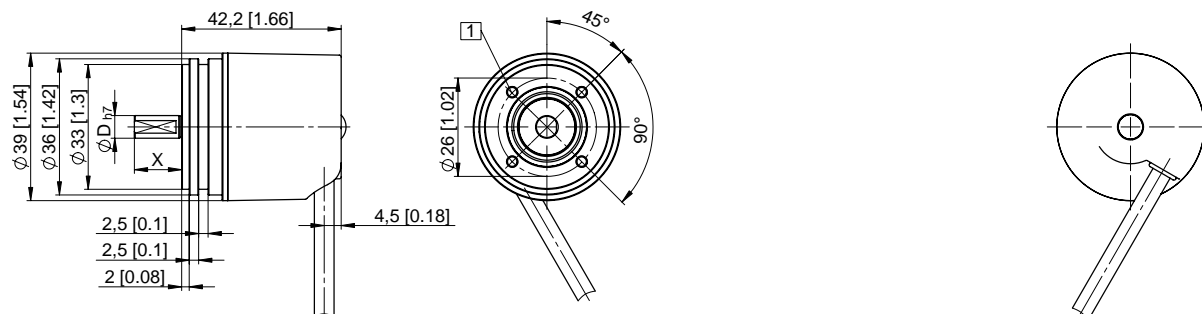
- Global support of Node-ID and baud rate
- Selective protocol via identity object (1018h)

# Absolute Encoders

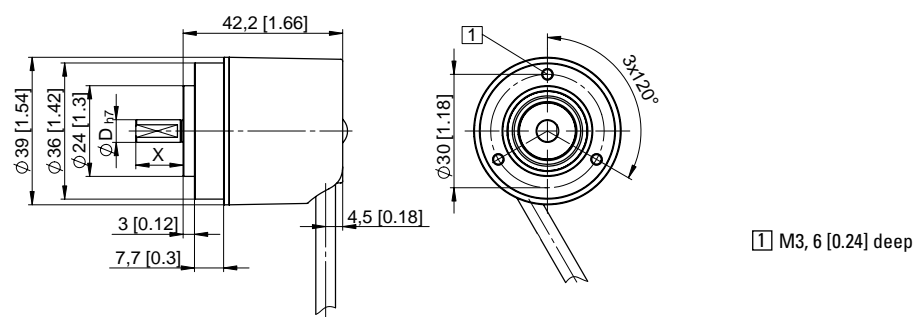
Singleturn	Sendix absolute	F3658 / F3678 (Shaft / Hollow shaft)	CANopen
------------	-----------------	--------------------------------------	---------

## Dimensions shaft version:

Synchro flange,  $\varnothing 36$  mm

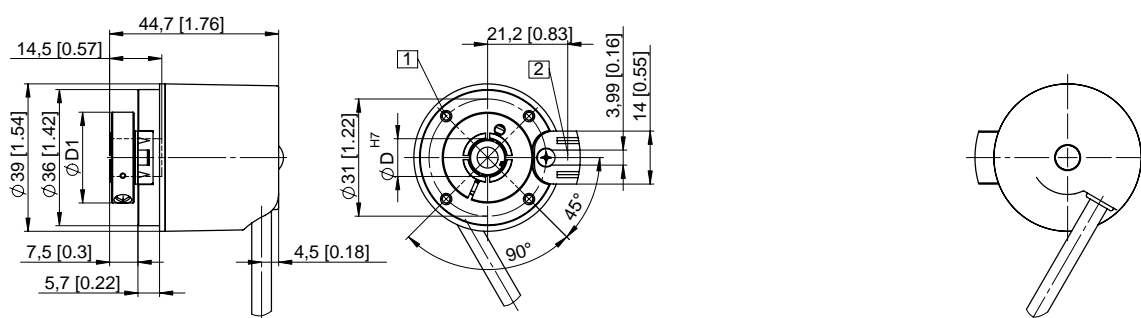


Clamping flange,  $\varnothing 36$  mm

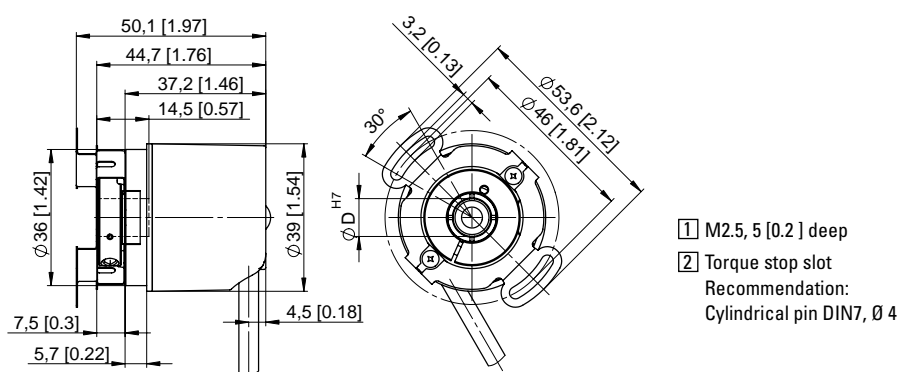


## Dimensions hollow shaft version:

with torque stop,  $\varnothing 36$  mm



with stator coupling,  $\varnothing 36$  mm



Hollow shaft acc. to order code	D1
1	$\varnothing 24$ mm
2	$\varnothing 24$ mm
3	$\varnothing 25,5$ mm
4	$\varnothing 25,5$ mm



# Absolute Encoders

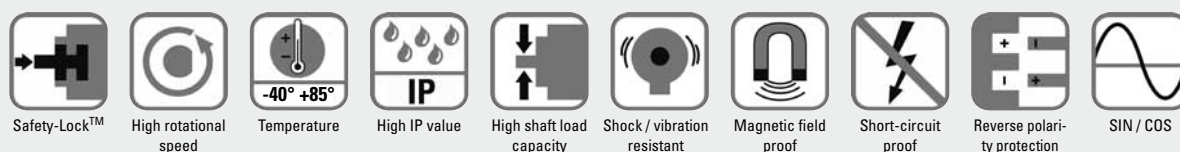
Multiturn	Sendix absolute	F3668 / F3688 (Shaft / Hollow shaft)	CANopen
-----------	-----------------	--------------------------------------	---------



The Sendix F36 multiturn is an optical multiturn encoder without gears, 100% insensitive to magnetic fields, in miniature format.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.

CANopen



## Reliable and magnetically insensitive

- Electronic multiturn 100 % magnetic-field resistant
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Reduced number of components ensures magnetic insensitivity
- Ideal for use outdoors thanks to IP 67 protection and wide temperature range from -40°C up to +85°C

## Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile
- LSS services for configuration of the node address and baud rate
- Variable PDO mapping in the memory

### Order code Shaft version

8.F3668 . XX2X . 21 1 2  
Type 1 2 3 4 5



- 1 Flange, ø 36 mm**  
 1 = Clamping flange, IP67  
 2 = Synchro flange, IP67  
 3 = Clamping flange, IP65  
 4 = Synchro flange, IP65

- 2 Shaft (ø x L)**  
 1 = 6 x 12,5 mm  
 2 = 6,35 x 12,5mm  
 3 = 8 x 15 mm  
 4 = 9,525 x 15,875 mm  
 5 = 10 x 20 mm

- 3 Interface / Power supply**  
 2 = CANopen DS301 V4.0, 10 ... 30 V DC

- 4 Type of connection**  
 1 = Cable, tangential (1 m PUR)  
 3 = Cable, tangential (5 m PUR)

- 5 Fieldbus profile**  
 21 = CANopen Encoder profile DS406 V3.1

Preferred types are underlined

### Order code Hollow shaft

8.F3688 . XX2X . 21 1 2  
Type 1 2 3 4 5



- 1 Flange**  
 ø 36 mm, IP65  
 1 = with torque stop  
 2 = with stator coupling

- 2 Blind hollow shaft**  
 4 = 10 mm  
 5 = 6 mm  
 6 = 6,35 mm  
 7 = 8 mm

- 3 Interface / Power supply**  
 2 = CANopen DS301 V4.0, 10 ... 30 V DC

- 4 Type of connection**  
 1 = Cable, tangential (1 m PUR)  
 3 = Cable, tangential (5 m PUR)

- 5 Fieldbus profile**  
 21 = CANopen Encoder profile DS406 V3.1

Preferred types are underlined

#### Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

# Absolute Encoders

Multiturn	Sendix absolute	F3668 / F3688 (Shaft / Hollow shaft)	CANopen
-----------	-----------------	--------------------------------------	---------

Mechanical characteristics:		
Maximum speed		
Shaft- or blind hollow shaft version without shaft seal (IP65)	12 000 min-1	10 000 min-1 (continuous op.)
Shaft version (IP 67) or hollow shaft version (IP 65) with shaft seal	10 000 min-1	8 000 min-1 (continuous op.)
Starting torque	without shaft seal with shaft seal (IP67)	< 0,007 Nm < 0,01 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		ca. 0,2 kg
Protection to EN 60 529	housing side shaft side	IP 67 IP 65 (solid shaft version opt. IP 67)
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C
Materials	shaft/hollow shaft flange housing cable	stainless steel aluminium zinc die-cast PUR
Shock resistance acc. to DIN-IEC 68-2-27		> 2500 m/s <sup>2</sup> , 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6		> 100 m/s <sup>2</sup> , 55 ... 2000 Hz

Diagnostic LED (two-colour, red/green)		
<b>LED ON or blinking</b>	red	Error display
	green	Status display

## General information about CANopen

The CANopen encoders of the M3658 and M3678 series support the latest CANopen communication profile according to DS 301 V4.02. In addition, device-specific profiles like the encoder profile DS 406 V3.1 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN-Bus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection. The device address and baud rate can be set/modified by means of the software. The two-colour LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics. Node address, baud rate and CANbus termination are programmable.

## CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated. Class C2 functionality:

- NMT Slave
- Heartbeat Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's
- Node address, baud rate and CANbus / Programmable termination

## Terminal assignment

Signal:	+Ub	0 V	CAN GND	CAN High	CAN Low
Cable colour:	BN	WH	GY	GN	YE

General electrical characteristics:		
<b>Supply voltage</b>		10 ... 30 V DC
<b>Current consumption (no load)</b>		24 V DC max. 60 mA
<b>Reverse connection of the supply voltage (Ub)</b>		yes
<b>RoHS compliant acc. to</b>		EG-guideline 2002/95/EG
<b>CE compliant acc. to</b>		EN 61000-6-2, EN 61000-6-4, and EN 61000-6-3

Interface characteristics CANopen		
<b>Resolution Singleturn</b>		1 ... 65536 (16 bit), scaleable: 1 ... 65536
<b>Default value Singleturn</b>		8192 (13 bit)
<b>Total resolution</b>		1 ... 4.294.967.296 (32 bit) Default: 25 bit
<b>Code</b>		Binary
<b>Interface</b>		CAN High-Speed according to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
<b>Protocol</b>		CANopen profile DS 406 V3.1 with manufacturer-specific add-ons LSS-Service DS305 V2.0
<b>Baud rate</b>		10 ... 1000 kbit/s (Software configurable)
<b>Node address</b>		1 ... 127 (Software configurable)
<b>Termination switchable</b>		Software configurable
<b>LSS Protocol</b>		CIA LSS protocol DS305 Global command support for node address and baud rate. Selective commands via attributes of the identity object

## CANopen Encoder Profile DS406 V3.1

The following parameters can be programmed:

- Event mode
- 1 work area with upper and lower limit and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status 1 LED two colours
- Customer-specific memory - 16 Bytes

"Watchdog controlled" device

## LSS Layer Setting Services DS305 V2.0

- Global support of Node-ID and baud rate
- Selective protocol via identity object (1018h)

# Absolute Encoders

**Multiturn**

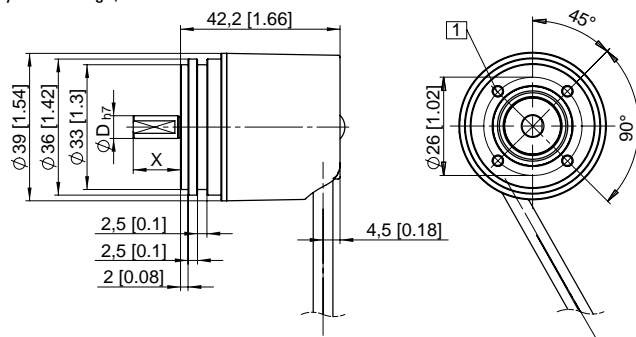
**Sendix absolute**

**F3668 / F3688 (Shaft / Hollow shaft)**

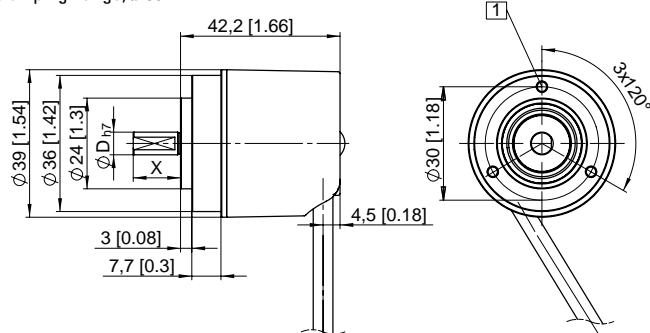
**CANopen**

## Dimensions shaft version:

Synchro flange,  $\varnothing$  36 mm

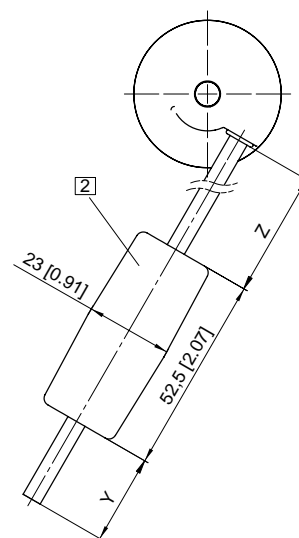


Clamping flange,  $\varnothing$  36 mm



1 M3, 6 [0.24] deep

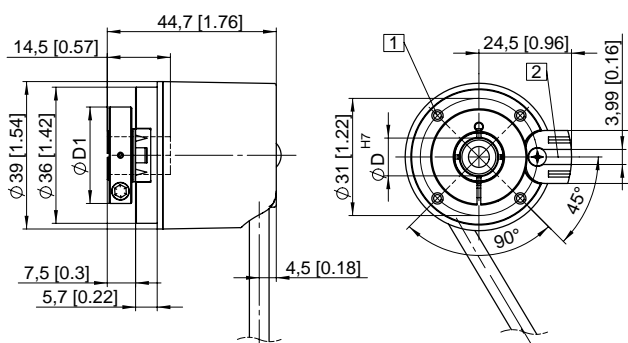
2 Battery (in the cable)



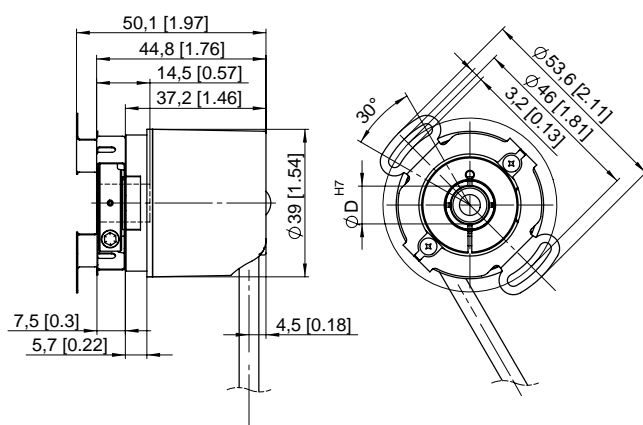
Y	Z
1 m	150 mm
5 m	150 mm

## Dimensions hollow shaft version:

with torque stop,  $\varnothing$  36 mm



with stator coupling,  $\varnothing$  36 mm



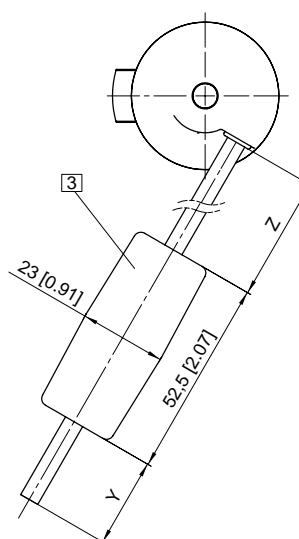
1 M2.5, 5 [0.2] deep

2 Torque stop slot

Recommendation:

Cylindrical pin DIN7,  $\varnothing$  4

3 Battery (in the cable)



Hollow shaft acc. to order code	D1
1	$\varnothing$ 24 mm
2	$\varnothing$ 24 mm
3	$\varnothing$ 25,5 mm
4	$\varnothing$ 25,5 mm

Y	Z
1 m	150 mm
5 m	150 mm

# Absolute Encoders

**Singleturn**

**Miniature series, magnetic**

**2450 / 2470 (Shaft / Hollow shaft)**



The absolute singleturn encoders 2450 and 2470 are the specialists when space is tight. Thanks to a new magnetic measuring principle, they require installation space of just 24 mm.

Because of their high 12 Bit resolution with 4096 different positions for 360° they offer exceptional repeat accuracy.



Safety-Lock™



High rotational speed



Temperature



Shock / vibration resistant



Short-circuit proof



Reverse polarity protection

## Minimal space requirement

- The outer diameter measures 24 mm; the shaft diameter at least 4 mm
- Flexible connection with radial or axial cable outlet

## Durable and accurate

- Long service life and freedom from wear due to non-contact measuring system
- Wide temperature range from -20°C up to +85°C
- High 12 Bit resolution with 4096 different positions for 360°

## Order code Shaft version

8.2450 . XXXX . G121  
Type 1 2 3 4 5



### 1 Flange

- 1 = ø 24 mm
- 2 = ø 30 mm
- 3 = ø 28 mm

### 3 Output circuit / Power supply

- 1 = SSI / 5 V DC
- 2 = SSI / 8 ... 30 V DC

### 5 Gray-Code

12 Bit resolution

### 2 Shaft

- 1 = ø 4 mm
- 2 = ø 6 mm
- 3 = ø 5 mm x 10 mm with flat

### 4 Type of connection

- 1 = cable axial (2 m PVC cable ø 4,5 mm)
- 2 = cable radial (2 m PVC cable ø 4,5 mm)

Preferred types are underlined

## Order code hollow shaft

8.2470 . XXXX . G121  
Type 1 2 3 4 5



### 1 Flange

- 1 = ø 24 mm

### 3 Output circuit / Power supply

- 1 = SSI / 5 V DC
- 2 = SSI / 8 ... 30 V DC

### 5 Gray-Code

12 Bit resolution

### 2 Blind hollow shaft (insertion depth max. 14 mm)

- 1 = ø 4 mm
- 2 = ø 6 mm

### 4 Type of connection

- 1 = cable axial (2 m PVC cable ø 4,5 mm)
- 2 = cable radial (2 m PVC cable ø 4,5 mm)

Preferred types are underlined

## Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

# Absolute Encoders

<b>Singleturn</b>	<b>Miniature series, magnetic</b>	<b>2450 / 2470 (Shaft / Hollow shaft)</b>
-------------------	-----------------------------------	---

Mechanical characteristics			
<b>Speed</b>		max. 12.000 min <sup>-1</sup>	
<b>Rotor moment of inertia</b>		approx. 0,1 x 10 <sup>-6</sup> kgm <sup>2</sup>	
<b>Starting torque</b>		< 0,001 Nm	
<b>Shaft load capacity</b>	radial	10 N	
	axial	20 N	
<b>Weight</b>		ca. 0,06 kg	
<b>Protection to EN 60529</b>	housing side	IP 64 (IP 67 on request)	
	flange side	IP 50 (IP 67 on request)	
<b>Working temperature range</b>		-20°C ... +85°C <sup>1)</sup>	
<b>Materials</b>	shaft/hollow shaft	stainless steel	
	clamping ring	MS58	
<b>Shock resistance acc. to DIN-IEC 68-2-27</b>		1000 m/s <sup>2</sup> , 6 ms	
<b>Vibration resistance acc. to DIN-IEC 68-2-27</b>		100 m/s <sup>2</sup> , 55 ... 2000 Hz	

## Terminal assignment

Signal:	0V	+Ub	+T	-T	+D	-D	
cable colour:	WH	BN	GN	YE	GY	PK	

Electrical characteristics SSI Interface	
<b>Sensor</b>	
<b>Supply voltage</b>	5 (+0,4) V DC or 8 ... 30 V DC <sup>1)</sup>
<b>Current consumption (no load)</b>	< 40 mA
<b>Reverse connection of the supply voltage</b>	yes
<b>Measuring range</b>	360°
<b>Resolution/Code</b>	12 Bit/Gray
<b>Linearity (25°C)</b>	< 1,5°
<b>Repeat accuracy</b>	< 0,1°
<b>Data refresh rate</b>	typ 100 µs
<b>RoHS compliant acc. to</b>	EG-guideline 2002/95/EG
<b>CE compliant acc. to</b>	EN 61000-6-2, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behaviour under magnetic influence)

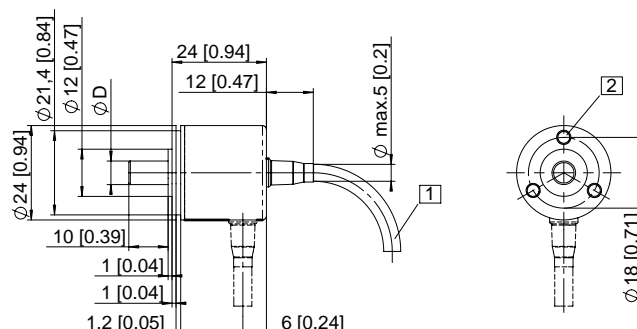
## SSI interface

<b>Clock speed:</b>	100 kHz ... 750 kHz
<b>Output driver</b>	RS 485
<b>Monoflop time typ./max.</b>	16 µs / 20 µs
<b>Short circuit proof outputs</b>	yes <sup>2)</sup>
<b>Permissible load/channel</b>	typ. 60 Ohm (acc. to RS 485)

## Dimensions shaft version:

Flange Type 1 (ø 24 mm)

- 1 min. R50 [1,97]      2 3 x M3, 4 [0,16] deep

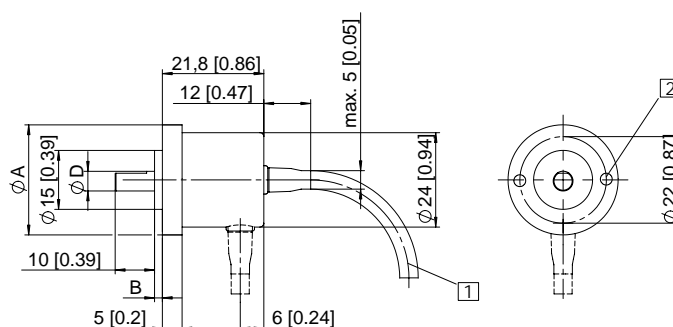


Flange Type 2 (ø 30 mm)

Flange Type 3 (ø 28 mm)

Flange Type	2	3
A	ø 30 mm	ø 28 mm
B	3 mm	2 mm

- 1 min. R50 [1,97]      2 3 x M3, 4 [0,16] tief



## Mounting advice:

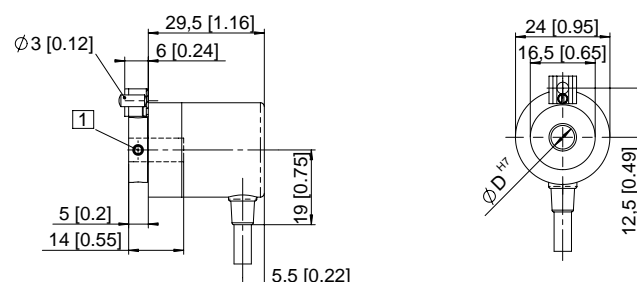
The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time! We recommend the use of suitable couplings (see Accessories section).

## Dimensions hollow shaft version

- 1 4 x M3 DIN 915 - SW15

## Mounting advice:

The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time! Mounting attachments and couplings can be found in the chapter Accessories



1) The supply voltage at the encoder input must not be less than 4.75 V (5 V - 5%)

2) Short circuit to 0 V or to output, only one channel at a time, supply voltage correctly applied

# Absolute Encoders

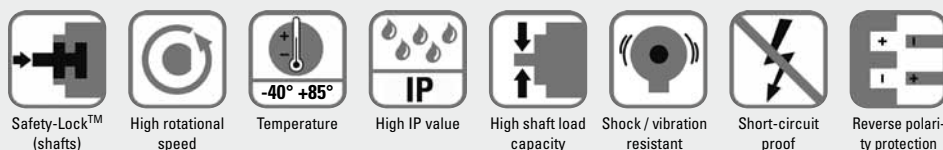
Singleturn	Sendix absolute	M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939
------------	-----------------	--------------------------------------	-----------



SAE J1939

The absolute Sendix encoders M3658 and M3678 with SAE J1939 interface support all common requirements of the special protocol for utility vehicles and make a considerable contribution to the comprehensive system diagnostics or to fast fault localisation.

The encoders offer fast, error-free start-up with no need to set switches; the encoder address is assigned automatically via Address Claiming (ACL).



## Safe Technology

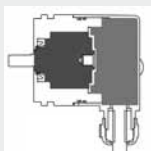
- Increased resistance against vibration and installation errors
- Sturdy bearing construction in Safety Lock™ Design
- Fewer components and connection points increase the operational reliability
- OptoASIC technology with highest integration density (Chip-on-Board)
- Resistant die cast housing and protection up to IP 69K

## Versatile Applications

- Up-to-the-minute Fieldbus performance in the application: SAE J1939 with CAN-Highspeed to ISO 11898
- Suitable connection variant for every specific case
- Bus cover with M12 connector or cable connection
- Fast determination of the operating status via two-colour LED
- Fast, error-free start up with no need to set switches; with automatic Address Claiming (ACL).

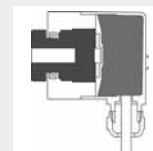
## Safety-Lockplus™

IP69k protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal



## Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly



## Order code Shaft version

8.M3658 . XXXX . 32 XX  
Type 1 2 3 4 5 6 7



1 Flange  
2 = Synchro flange

3 Output circuit / Power supply  
C = CAN Highspeed 8 ... 30 V DC

5 Fieldbus profile  
32 = J1939

Preferred types are underlined

2 Shaft (ø x L)  
3 = ø 6 x 12,5 mm  
5 = ø 6,35 (1/4") x 12,5 mm  
6 = ø 8 x 12,5 mm

4 Type of connection  
2 = cable radial (1 m PUR)  
4 = M12 connector radial

6 Option 2  
1 = Standard

7 Option 1  
1 = IP67  
2 = IP69k

Corresponding mating connector:  
05.B-8151-0/9

Seawater resistant version on request

## Order code Hollow shaft

8.M3678 . XXXX . 32 XX  
Type 1 2 3 4 5 6 7



1 Flange  
2 = with long torque stop  
5 = with stator coupling

3 Output circuit / Power supply  
C = CAN Highspeed 8 ... 30 V DC

5 Fieldbus profile  
32 = J1939

Preferred types are underlined

2 Hollow shaft  
2 = ø 6 mm  
3 = ø 6,35 (1/4")  
4 = ø 8 mm  
6 = ø 10 mm

Type of connection  
4 = cable radial (1 m PUR)  
4 = M12 connector radial

6 Option 2  
1 = Standard

7 Option 1  
1 = IP67  
2 = IP69k

Corresponding mating connector:  
05.B-8151-0/9

Seawater resistant version on request

## Accessories:

- Cables and connectors, also pre-assembled, can be found in the chapter Connection Technology
- Mounting attachments and couplings can be found in the chapter Accessories



# Absolute Encoders

Singleturn	Sendix absolute	M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939
------------	-----------------	--------------------------------------	-----------

Mechanical characteristics			
Max. speed		6000 min <sup>-1</sup>	
Starting torque		< 0,06 Nm	
Shaft load capacity	radial	40 N	
	axial	20 N	
Weight		ca. 0,2 kg	
Protection to EN 60 529/DIN 40050-9		IP 67/IP 69k	
EX approval for hazardous areas		optional Zone 2 und 22	
Working temperature range		-40 °C ... +85 °C	
Materials	Shaft / Hollow shaft	stainless steel	
	Flange	Aluminium	
	Housing	Zinc die-cast	
	Cable	PUR	
Shock resistance acc. to DIN-IEC 68-2-27		5000 m/s <sup>2</sup> , 6 ms	
Vibration resistance acc. to DIN-IEC 68-2-6		300 m/s <sup>2</sup> , 10 ... 2000 Hz	
Permanent shock resistance acc. to DIN-IEC 68-2-29		1000 m/s <sup>2</sup> , 2 ms	
Vibration (broad-band random) acc. to DIN-IEC 68-2-64		5 ... 2500 Hz, 100 m/s <sup>2</sup> - rms	

Diagnostic LED (two-colour, red/green)		
LED ON or blinking	red	Error display
	green:	Status display

General electrical characteristics	
Supply voltage	8 ... 30 V DC
Current consumption, 24 V DC, (no load)	< 25 mA
Reverse connection of the supply voltage (U <sub>b</sub> )	yes
Measurement range	360°
Linearity	< 1°
Repeat accuracy	< 0,1°
Data refresh	400 µs
RoHS compliant acc. to	EG-guideline 2002/95/EG
CE compliant acc. to	EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3

Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), scaleable: 1 ... 16384
Default value	16384 (14 bit)
Code	Binary
Interface	CAN High-Speed according to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	SAE J1939
Baud rate	250 kbit/s
Node address	1 ... 255 (via address claiming)
Termination	Software configurable

## General Information concerning SAE J1939

The protocol J1939 originates from the international Society of Automotive Engineers (SAE) and operates on the physical layer with high speed CAN as per ISO11898. The application emphasis lies in the area of the power train and chassis of commercial vehicles.

It serves to transfer diagnostic data (for example, motor speed, position, temperature) and control information. Type series M3658 and M3678 encoders support the total functionality of J1939. This protocol is a multimaster system with decentralised network management that does not involve channel-based communication.

It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as Parameters (signals) and combined on 4 memory pages (Data Pages) into Parameter Groups (PGs). Each parameter group can be identified via a unique number, the Parameter Group Number (PGN). Independently of this, each signal is assigned a unique SPN (Suspect Parameter Number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore the parameter groups are optimised to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol.

If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (Broadcast Announce Message) and CMTD (Connection Mode Data Transfer). With BAM TP the transfer of data occurs as a broadcast.

## Encoder Implementation SAE J1939

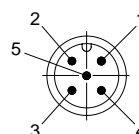
- PGNs that are adaptable to the customer's application
- Resolution of address conflicts -> Address Claiming (ACL)
- Continuous checking whether control addresses have been assigned twice within a network
- Change of control device addresses during run-time
- Unique identification of a control device with the help of a name that is unique worldwide
- This name serves to identify the functionality of a control device in the network
- Predefined PGs for Position, Speed and Alarm
- 250 kBit/s, 29-Bit Identifier
- Watchdog controlled device

A two-colour LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.



## Terminal assignment

Signal:	+Ub	0 V	CAN GND	CAN High	CAN Low
M12/Pin:	2	3	1	4	5
cable colour:	BN	WH	GY	GN	YE

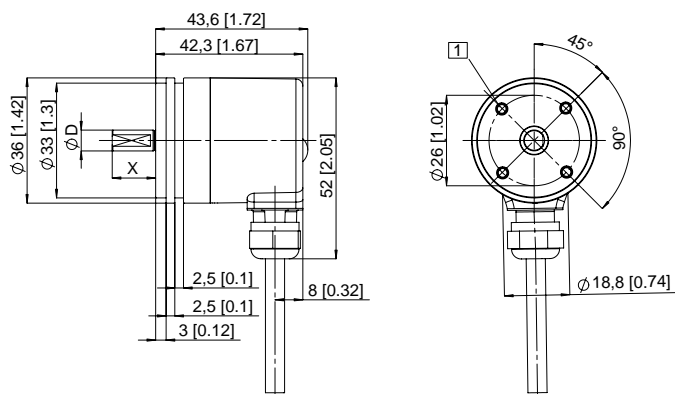


# Absolute Encoders

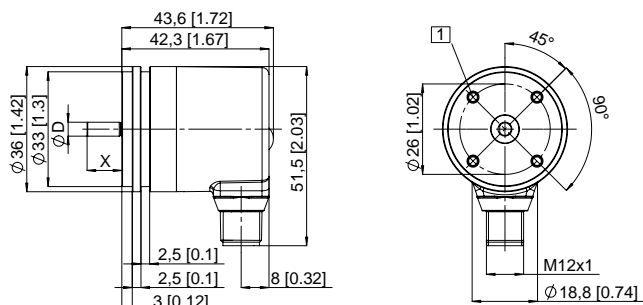
Singleturn	Sendix absolute	M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939
------------	-----------------	--------------------------------------	-----------

## Dimensions shaft version:

ø 36 mm, Synchro flange

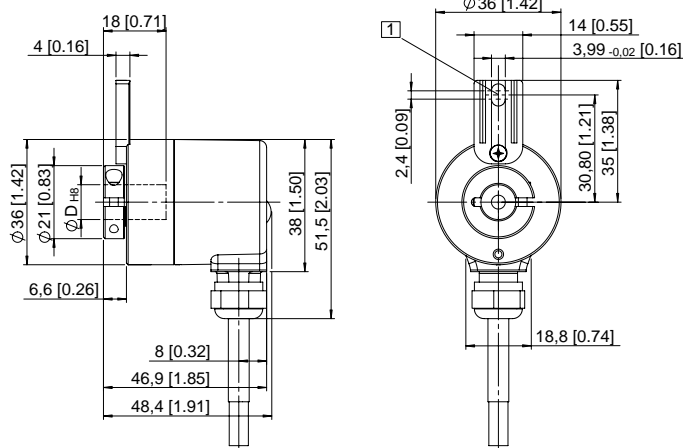


1 M3, 6 [0.24] deep



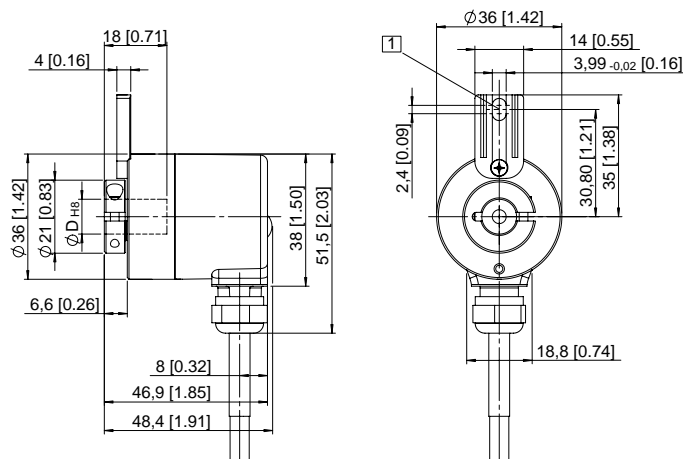
## Dimensions hollow shaft version:

ø 36 mm, Flange with long torque stop



1 Torque stop slot,  
Recommendation: cyl. pin. acc. DIN 7 ø4

ø 36 mm, Stator coupling



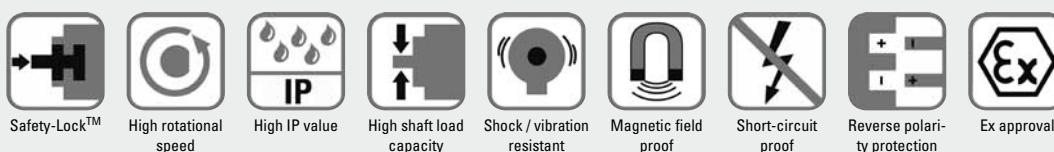
# Absolute Encoders

Singleturn	Sendix absolute	7053 (Shaft) with ATEX approval	SSI
------------	-----------------	---------------------------------	-----



The Sendix 7053 absolute singleturn encoders offer Ex protection in a compact 70 millimetre housing.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available as multiturn encoders.



## Safe

- "Flameproof-enclosure" version: approved for zone 1, 2 and 21, 22
- Zone 1, 2 and 21, 22:
- Can be operated in marine environments – housing and flange out of seawater-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns. IP 67 protection

## Compact

- Can be used even when space is tight
- Installation depth only 145 mm, diameter 70 mm
- Compact cable outlet

## Order code

### Shaft version

8.7053 . 1 X 2 X . XX 2 1 . XXXX  
 Type                      ① ② ③ ④                      ⑤ ⑥ ⑦ ⑧                      ⑨

#### ① Flange

1 = Clamping-synchronous flange, ø 70, IP 67

#### ② Shaft (ø x L)

1 = Shaft 12 mm x 25 mm  
 with keyway for 4 x 4 mm key  
 2 = Shaft 10 mm x 20 mm

#### ③ Output circuit / Supply voltage

2 = SSI, 10 ... 30 V DC

#### ④ Type of connection

1 = Cable axial (2m PVC cable)  
 A = Cable axial (length > 2 m)  
 (preferred lengths, see ⑨, 0100 = 10 m)

#### ⑤ Code

B = SSI, Binary  
G = SSI, Gray

#### ⑥ Resolution <sup>1)</sup>

A = 10 bit ST  
 1 = 11 bit ST  
 2 = 12 bit ST  
3 = 13 bit ST  
 4 = 14 bit ST  
 7 = 17 bit ST

#### ⑦ Inputs/Outputs <sup>1)</sup>

2 = SET, DIR input  
 additional status output

#### ⑧ Options

1 = no option

#### ⑨ Cable length in dm

0050 = 5 m  
 0100 = 10 m  
 0150 = 15 m

Preferred types are underlined

1) Resolution, preset value and counting direction factory-programmable

# Absolute Encoders

Singleturn	Sendix absolute	7053 (Shaft) with ATEX approval	SSI
------------	-----------------	---------------------------------	-----

Explosion protection	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2G Ex d IIC T6
Category (dust)	II 2D Ex tD A21 IP6X T85°C
Directive 94/9 EC	EN 60079-0; DIN EN 60079-1 EN 61241-0; DIN EN 61241-1

Mechanical characteristics	
Max. speed	6 000 min <sup>-1</sup> continuous
Starting torque	< 0,05 Nm
Weight moment of inertia	4,0 x 10 <sup>-6</sup> kgm <sup>2</sup>
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0,6 kg
Protection acc. to EN 60 529	IP 67
Working temperature range	-40°C ... +60°C
Materials	shaft stainless steel flange seawater-resistant Al, type AlSiMgMn (EN AW-6082) (optional: stainless steel) housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) (optional: stainless steel) cable PVC
Shock resistance acc. to DIN-IEC 68-2-27	>2500 m/s <sup>2</sup> , 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6	>100 m/s <sup>2</sup> , 55 ... 2000 Hz

General electrical characteristics	
Supply voltage	10 ... 30 V DC
Current consumption (w/o output load)	24 V DC max. 25 mA
Reverse polarity protection for power supply (Ub)	yes
CE compliant acc. to	EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3
RoHS compliant acc. to	EU guideline 2002/95/EG

SSI interface	
Output driver	RS 485 Transceiver type
Permissible load/channel	max. 20 mA
Signal level	high typ 3,8 V low for I <sub>Last</sub> = 20 mA typ 1,3 V
Short-circuit proof outputs	yes <sup>1)</sup>
Singleturn resolution	10... 14 bit and 17 bit <sup>2)</sup>
Number of revolutions	4096 (12 bit)
Code	Binär or Gray
SSI clock rate	< 14 bit: 50 kHz ... 2 MHz
Monoflop time	< 15 µs <sup>2)</sup>
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.	
Time jitter	up to 14 bit < 1 µ for 15 ... 17 bit < 4 µs
Status and Parity bit	upon request

1) Short-circuit with 0V or output, only one channel at a time, supply voltage correctly applied  
2) Other options upon request

SET input	
Input	high active
Input type	Comparator
Signal level	high min. 60 % of V+ max: V+ low max. 25 % of V+ (V+ = supply voltage)
Input current	< 0,5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response 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. 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.	

DIR input	
A High signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to Low.	

Status output	
Output driver	Open collector internal pull-up resistor 22 kohm
Permissible load	20 mA
Signal level	high +V low < 1 V
Active at	low
The status output serves to display various alarm or error messages. The status output is high (Open Collector with internal pull-up 22k) in normal operation.	

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

# Absolute Encoders

Singleturn	Sendix absolute	7053 (Shaft) with ATEX approval	SSI
------------	-----------------	---------------------------------	-----

## Terminal assignment

for output circuit 1 or 2

Signal	GND	+V	+C	-C	+D	-D	SET	DIR	Stat	PE	PE
Cable marking	1	2	3	4	5	6	7	8	9	yellow/green	Shield

+V: Encoder power supply +V DC

GND: Encoder Ground GND (0V)

+C, -C: Clock signal

+D, -D: Data signal

SET: Set input. The current position becomes defined as position zero.

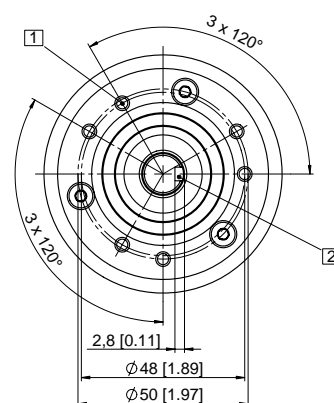
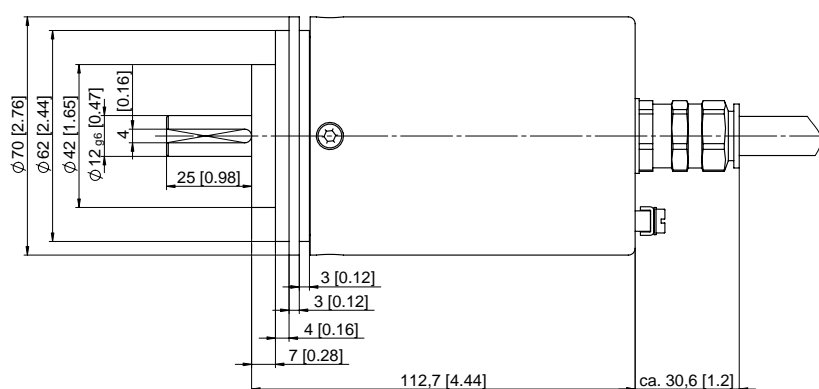
DIR: Direction input. If this input is active, output values are decreasing when shaft is turned clockwise

Stat: Status output

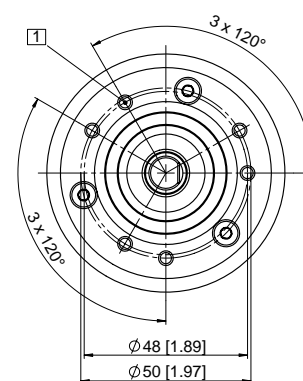
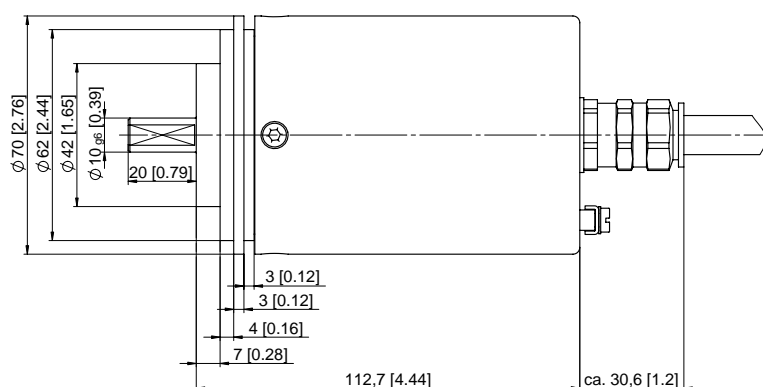
PE: Protective earth

## Dimensions

### Shaft type 1



### Shaft type 2



1 6 x M4, 10 [0.39] deep

2 Keyway for DIN6885-A-4x4x25 key

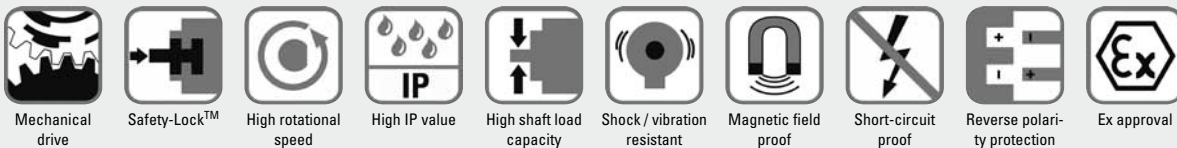
# Absolute Encoders

Multiturn	Sendix absolute	7063 (Shaft) with ATEX approval	SSI
-----------	-----------------	---------------------------------	-----



The Sendix 7063 absolute multiturn encoders offer Ex protection in a compact 70 millimetre housing.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available as singleturn encoders.



## Safe

- "Flameproof-enclosure" version: approved for zone 1, 2 and 21, 22
- Zone 1, 2 and 21, 22:  
 II 2G Ex d IIC T6 and II 2D Ex tD A21 IP6X T85°C
- Can be operated in marine environments – housing and flange out of seawater-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns. IP 67 protection

## Compact

- Can be used even when space is tight
- Installation depth only 145 mm, diameter 70 mm
- Compact cable outlet

## Order code

### Shaft version

8.7063 . 1 X 2 X . X X 2 1 . XXXX  
 Type 1 2 3 4 5 6 7 8 9

#### 1 Flange

1 = Clamping-synchronous flange, ø 70, IP 67

#### 2 Shaft (ø x L)

1 = Shaft 12 mm x 25 mm  
 with keyway for 4 x 4 mm key  
 2 = Shaft 10 mm x 20 mm

#### 3 Output circuit / Supply voltage

2 = SSI, 10 ... 30 V DC

#### 4 Type of connection

1 = Cable axial (2m PVC cable)  
 A = Cable axial (length > 2 m)  
 (preferred lengths, see 9, 0100 = 10 m)

#### 5 Code

B = SSI, Binary  
 G = SSI, Gray

#### 6 Resolution <sup>1)</sup>

A = 10 bit ST + 12 bit MT  
 1 = 11 bit ST + 12 bit MT  
 2 = 12 bit ST + 12 bit MT  
 3 = 13 bit ST + 12 bit MT  
 4 = 14 bit ST + 12 bit MT  
 7 = 17 bit ST + 12 bit MT  
 MT

#### 7 Inputs/Outputs <sup>1)</sup>

2 = SET, DIR input  
 additional status output

#### 8 Options

1 = no option

#### 9 Cable length in dm

0050 = 5 m  
 0100 = 10 m  
 0150 = 15 m

Preferred types are underlined

<sup>1)</sup> Resolution, preset value and counting direction factory-programmable



# Absolute Encoders

Multiturn	Sendix absolute	7063 (Shaft) with ATEX approval	SSI
-----------	-----------------	---------------------------------	-----

Explosion protection	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2G Ex d IIC T6
Category (dust)	II 2D Ex tD A21 IP6X T85°C
Directive 94/9 EC	EN 60079-0; DIN EN 60079-1 EN 61241-0; DIN EN 61241-1

Mechanical characteristics	
Max. speed	6 000 min <sup>-1</sup> continuous
Starting torque	< 0,05 Nm
Weight moment of inertia	4,0 x 10 <sup>-6</sup> kgm <sup>2</sup>
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0,6 kg
Protection acc. to EN 60 529	IP 67
Working temperature range	-40°C ... +60°C
Materials	shaft stainless steel flange seawater-resistant Al, type AlSiMgMn (EN AW-6082) (optional: stainless steel) housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) (optional: stainless steel) cable PVC
Shock resistance acc. to DIN-IEC 68-2-27	> 2500 m/s <sup>2</sup> , 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6	> 100 m/s <sup>2</sup> , 55 ... 2000 Hz

General electrical characteristics	
Supply voltage	10 ... 30 V DC
Current consumption (w/o output load)	24 V DC max. 25 mA
Reverse polarity protection for power supply (Ub)	yes
CE compliant acc. to	EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3
RoHS compliant acc. to	EU guideline 2002/95/EG

SSI interface	
Output driver	RS 485 Transceiver type
Permissible load/channel	max. 20 mA
Signal level	high typ 3,8 V low for I <sub>Last</sub> = 20 mA typ 1,3 V
Short-circuit proof outputs	yes <sup>1)</sup>
Singleturn resolution	10...14 bit and 17 bit <sup>2)</sup>
Number of revolutions	4096 (12 bit)
Code	Binär or Gray
SSI clock rate	< 14 bit: 50 kHz ... 2 MHz
Monoflop time	< 15 µs <sup>2)</sup>
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.	
Time jitter	up to 14 bit < 1 µ for 15 ... 17 bit < 4 µs
Status and Parity bit	upon request

1) Short-circuit with 0V or output, only one channel at a time, supply voltage correctly applied  
2) Other options upon request

SET input	
Input	high active
Input type	Comparator
Signal level	high min. 60 % of V <sub>+</sub> max: V <sub>+</sub> low max. 25 % of V <sub>+</sub> (V <sub>+</sub> = supply voltage)
Input current	< 0,5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response 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. 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.	

DIR input	
A High signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to Low.	

Status output	
Output driver	Open collector internal pull-up resistor 22 kohm
Permissible load	20 mA
Signal level	high +V low < 1 V
Active at	low
The status output serves to display various alarm or error messages. The status output is high (Open Collector with internal pull-up 22k) in normal operation.	

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

# Absolute Encoders

Multiturn	Sendix absolute	7063 (Shaft) with ATEX approval	SSI
-----------	-----------------	---------------------------------	-----

## Terminal assignment

for output circuit 1 or 2

Signal	GND	+V	+C	-C	+D	-D	SET	DIR	Stat	PE	PE
Cable marking	1	2	3	4	5	6	7	8	9	yellow/green	Shield

+V: Encoder power supply +V DC

GND: Encoder Ground GND (0V)

+C, -C: Clock signal

+D, -D: Data signal

SET: Set input. The current position becomes defined as position zero.

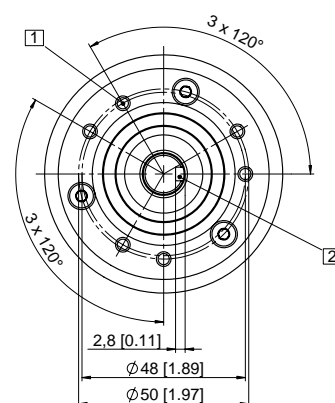
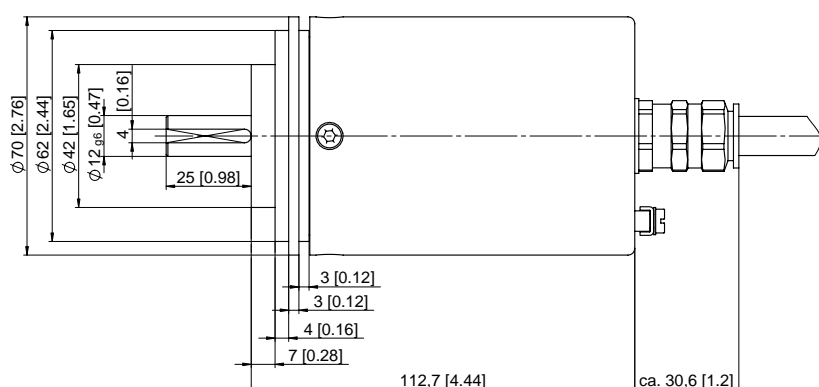
DIR: Direction input. If this input is active, output values are decreasing when shaft is turned clockwise

Stat: Status output

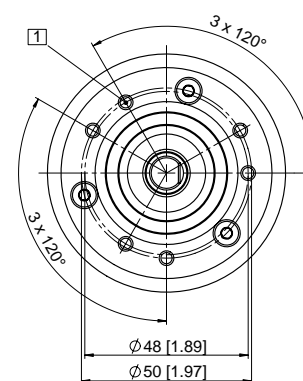
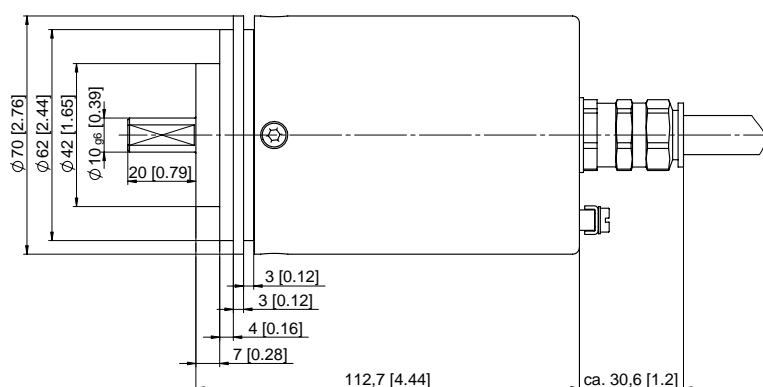
PE: Protective earth

## Dimensions

### Shaft type 1



### Shaft type 2



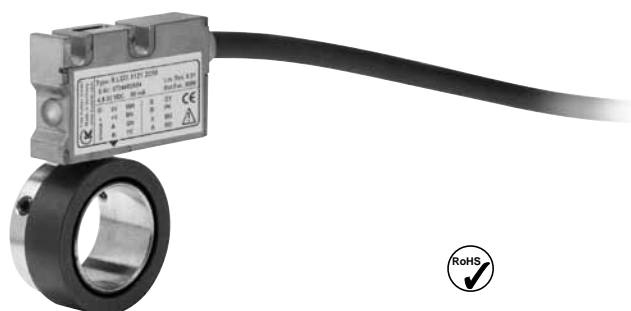
1 6 x M4, 10 [0,39] deep

2 Keyway for DIN6885-A-4x4x25 key

# Incremental Encoders

## Magnetic measurement system

## RI50 / LI50



Thanks to its installation depth of just 16 mm, the magnetic measurement system RI50/LI50, comprising a magnetic ring and sensor head, is ideally suited to plant and machinery where space is very tight.



High rotational speed



High IP value



Shock / vibration resistant



Reverse polarity protection

### Hard-wearing and robust

- High shock and vibration resistance
- Protection rating IP67
- Non-contact measurement system

### Fast start-up

- Function display via LED
- Large mounting tolerance between magnetic band and sensor head
- Slotted hole fixing ensures simple alignment

## Selection guide

Pulse rates/ppr <sup>1)</sup>	Order code Magnetic ring RI50	Order code Magnetic sensor LI50	max. rotational speed (electronic <sup>2)</sup>	
			without using index signal	using index signal
1000	8.RI50.031.XXXX.112	8.LI50.11X1.1050	9000	3000
2000	8.RI50.031.XXXX.112	8.LI50.11X1.1100	4000	3000
1024	8.RI50.048.XXXX.112	8.LI50.11X1.1032	9000	2000
2048	8.RI50.048.XXXX.112	8.LI50.11X1.1064	4000	2000
3600	8.RI50.055.XXXX.112	8.LI50.11X1.1100	2500	1700

\*other pulse rates on request

### Order code

Magnetic sensor Limes LI50

8.LI50. 1 1 X X . 1 X X X



#### ① Interface and supply voltage

1 = RS422 / 4,8...26VDC  
2 = Push-Pull / 4,8...30VDC

#### ② Type of connection

1 = cable PUR, 2 m length

#### ③ Reference signal

1 = separate index signal (linked with A and B)

#### ④ Interpolation factor<sup>1)</sup>

032, 050, 064, 100

### Order code

Magnetic ring RI50

8.RI50. X X X . X X X X . 1 1 2



#### ① Outer diameter

031 = 31 mm  
048 = 48,3 mm  
055 = 54,7 mm

#### ② Bore diameter

0600 = 6 mm  
0800 = 8 mm  
1000 = 10 mm  
1200 = 12 mm  
1500 = 15 mm  
1587 = 15,875 mm (5 / 8")  
2000 = 20 mm  
2500 = 25 mm  
2540 = 25,4 mm (1")<sup>3)</sup>  
3000 = 30 mm<sup>3)</sup>  
3500 = 35 mm<sup>4)</sup>

3) only possible for outer diameters 048 and 055

4) only possible for outer diameter 055

## Stock types

Magnetic ring RI50 8.RI50.048.0600.112      Magnetic sensor LI50 8.LI50.1121.1032

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters

2) With an input frequency of the evaluation unit of 250 kHz

# Incremental Encoders

## Magnetic measurement system

RI50 / LI50

### Mechanical characteristics:

Speed:	max. 12000 min <sup>-1</sup>
Protection class to EN60529:	IP67
Working temperature:	-20 ... + 80°C
Shock resistance:	500 g / 1 ms
Vibration resistance:	30 g / 10 ... 2000 Hz
Housing (Sensor):	zinc die-cast
Pole gap:	5 mm from pole to pole

### Electrical characteristics:

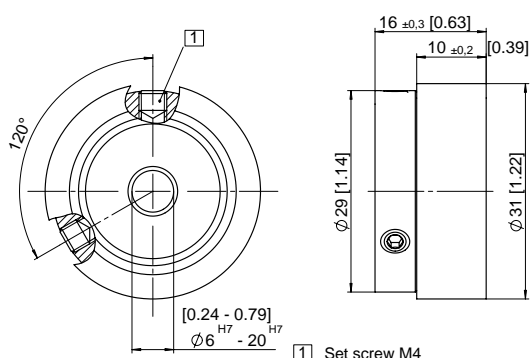
Output circuit:	RS 422	Push-Pull
Supply voltage:	4,8...26 VDC	4,8...30 VDC
Current consumption (without load):	typ 25 mA, max. 60 mA	
Permissible load/channel:	max. 20 mA	
Min. pulse edge interval:	1 µs	
Reference signal:	fixed	
System accuracy:	typ 0,3° with shaft tolerance g6	

### Pin assignment

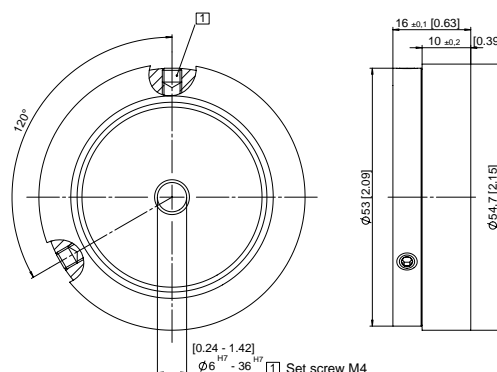
Signal:	0V GND	+UB	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$
Cable, wire colour:	WH	BN	GN	YE	GY	PK	BU	RD

### Dimensions

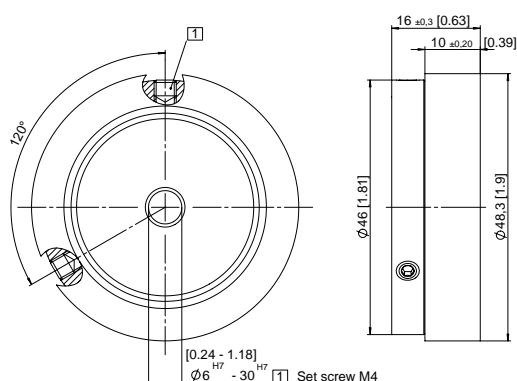
8.RI50.031.XXXX.112



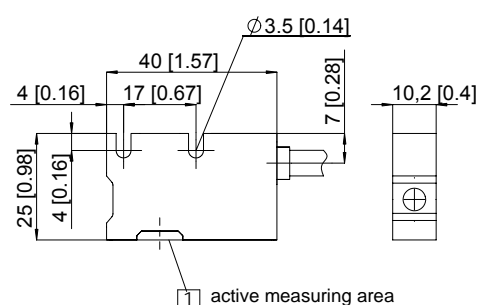
8.RI50.055.XXXX.112



8.RI50.048.XXXX.112

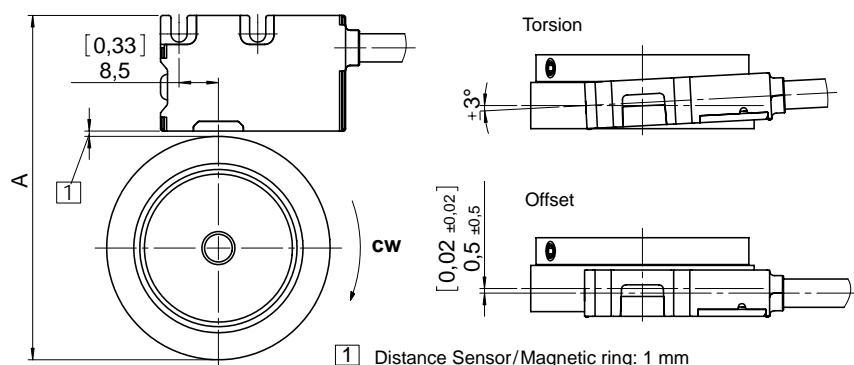


Measuring head Limes LI50



### Mounting orientation and permissible mounting tolerances

Tilting



Magnetic ring	A
8.RI50.031.XXXX.112	57 <sup>1)</sup>
8.RI50.048.XXXX.112	74,3 <sup>1)</sup>
8.RI50.055.XXXX.112	80,7 <sup>1)</sup>

**Warning:**  
When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

# Incremental Encoders

## Miniature series, magnetic

## 2430 / 2440 (Shaft / Hollow shaft)



Thanks to their non-contact magnetic scanning technology the miniature-format encoders 2430 and 2440 guarantee exceptional ruggedness.

As a result of their compact outer diameter, they are ideal for use where installation space is restricted.



Safety-Lock™



High rotational speed



Temperature



Shock/vibration resistant



Short-circuit proof



Reverse polarity protection

### Magnetically robust

- The non-contact magnetic technology prevents wear and guarantees a long service life
- Multiple clamping affords high strain relief to the cable outlet, ensuring longer life.
- Wide temperature range from -20°C up to +85°C

### Compact Power

- Flexible connection options: can be supplied with radial or axial cable outlet

### Order code Shaft version

8.2430 . XXXX . XXXX  
Type 1 2 3 4 5



#### 1 Flange

- 1 = ø 24 mm  
2 = ø 30 mm  
3 = ø 28 mm

#### 3 Interface / Power supply

- 6 = RS422 (with inverted signal) supply voltage 5 V

#### 5 Pulse rate

- 1 ... 128 (factory programmable)  
256  
(e.g. 128 pulses => 0128)  
Other pulse rates on request

#### 2 Shaft (D)

- 1 = ø 4 mm  
2 = ø 6 mm  
3 = ø 5 mm x 10 mm  
with flat

#### 4 Type of connection

- 1 = cable axial (2 m PVC cable ø 4,5 mm)  
2 = cable radial (2 m PVC cable ø 4,5 mm)

Preferred types are underlined

### Order code Hollow shaft

8.2440 . XXXX . XXXX  
Type 1 2 3 4 5



#### 1 Flange

- 1 = ø 24 mm

#### 3 Interface / Power supply

- 6 = RS422 (with inverted signal) supply voltage 5 V

#### 5 Pulse rate

- 1 ... 128 (factory programmable)  
256  
(e.g. 128 pulses => 0128)  
Other pulse rates on request

#### 2 Blind hollow shaft

- (insertion depth max. 14 mm)  
1 = ø 4 mm  
2 = ø 6 mm

#### 4 Type of connection

- 1 = cable axial (2 m PVC cable ø 4,5 mm)  
2 = cable radial (2 m PVC cable ø 4,5 mm)

Preferred types are underlined

#### Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

# Incremental Encoders

## Miniature series, magnetic

## 2430 / 2440 (Shaft / Hollow shaft)

### Mechanical characteristics

<b>Speed</b>		max. 12.000 min <sup>-1</sup>
<b>Rotor moment of inertia</b>		approx. 0,1 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Starting torque</b>		< 0,001 Nm
<b>Shaft load capacity</b>	radial	10 N
	axial.	20 N
<b>Weight</b>		ca. 0,06 kg
<b>Protection</b> acc. to EN 60529	housing side	IP 64 (IP 67 on request)
	flange side	IP 50 (IP 67 on request)
<b>Working temperature range</b>		-20°C ... +85°C <sup>1)</sup>
<b>Materials</b>	Shaft/Hollow shaft	stainless steel
	Clamping flange	MS58
<b>Shock resistance</b> acc. to DIN-IEC 68-2-27		1000 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance</b> acc. to DIN-IEC 68-2-27		100 m/s <sup>2</sup> , 55 ... 2000 Hz

### Terminal assignment

Signal:	0 V	+U <sub>B</sub>	$\bar{A}$	A	$\bar{B}$	B	$\bar{0}$	0
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD

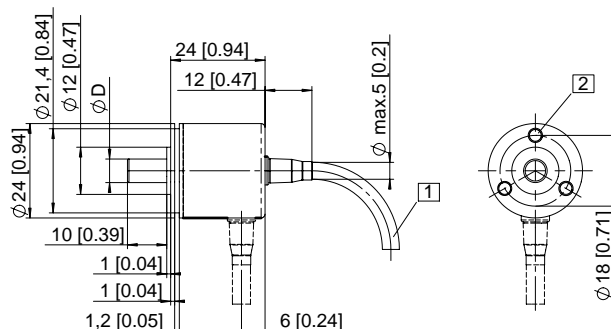
### Electrical characteristics

<b>Output circuit</b>		<b>RS 422</b> (TTL-compatible)
<b>Supply voltage</b>		5 V ±5%
<b>Current consumption</b>	no load	typ. 40 mA
	with inversion	max. 90 mA
<b>Permissible load/channel</b>		max. ±20 mA
<b>Pulse frequency</b>		max. 300 kHz
<b>Signal level</b>	high	min. 2,5 V
	low	max. 0,5 V
<b>Rise time t<sub>r</sub></b>		max. 200 ns
<b>Fall time t<sub>f</sub></b>		max. 200 ns
<b>Min. flange distance</b>		0,5 µs <sup>2)</sup>
<b>Short circuit proof outputs</b> <sup>3)</sup>		yes <sup>4)</sup>
<b>Reverse connection of the supply voltage</b>		no
<b>CE compliant</b> acc. to		EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3
<b>RoHS compliant</b> acc. to		EG-guideline 2002/95/EG

### Dimensions shaft version:

Flange Type 1 (ø 24 mm)

- 1 min. R50 [1,97]      2 3 x M3, 4 [0,16] deep

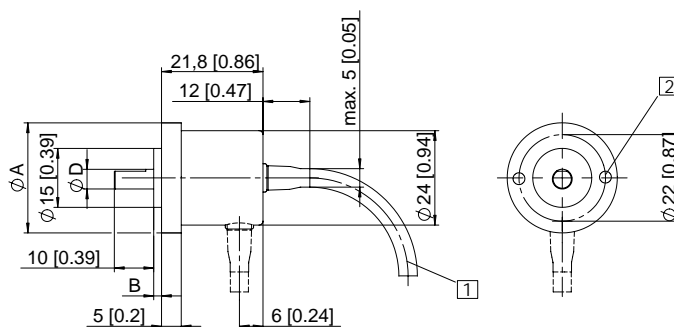


Flange Type 2 (ø 30 mm)

Flange Type 3 (ø 28 mm)

Flange Type	2	3
A	ø 30 mm	ø 28 mm
B	3 mm	2 mm

- 1 min. R50 [1,97]      2 3 x M3, 4 [0,16] deep

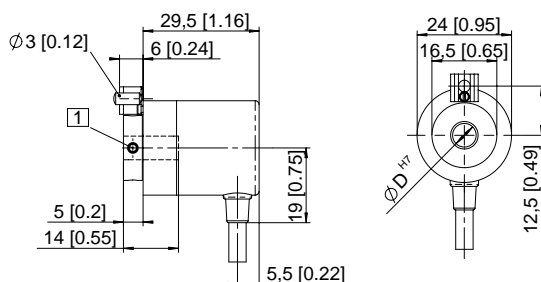


### Mounting advice

The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time! We recommend the use of suitable couplings (see Accessories section).

### Dimensions hollow shaft version

- 1 4 x M3 DIN 915 - SW15



### Mounting advice

The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time! Cylindrical pin (ISO 2338-A-3m6 x 10) for torque stop incl. in scope of delivery.

1) Non-condensing

2) For max. speed use a counter with input frequency of min. 500 kHz.

3) If supply voltage correctly applied

4) Only one channel allowed to be shorted-out:

at U<sub>B</sub> = 5 V short circuit to channel, 0 V, or +U<sub>B</sub> is permitted.  
at U<sub>B</sub> = 5 ... 30 V short circuit to channel or 0 V is permitted.



# Incremental Encoders

## Large hollow shaft

5821



Optimised proportions, optimised costs:

With an overall diameter of just 58 millimetres the series 5821 boasts a hollow shaft of up to 28 millimetres diameter.



Temperature



Shock/vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection

### Order code Hollow shaft

8.5821 . XXXX . XXXX  
Type 1 2 3 4 5



#### 1 Flange

1 = with spring element

#### 2 Hollow shaft

3 = ø 28 mm  
5 = ø 25 mm  
6 = ø 24 mm  
C = ø 20 mm  
K = ø 16 mm  
(other on request)

#### 3 Output circuit / Power supply

1 = RS 422 (with inverted signal) / 5 V  
3 = Push-pull (with inverted signal) / 8-30 V  
4 = RS 422 (with inverted signal) / 8-30 V

#### 4 Type of connection

1 = Cable radial (1 m PVC cable)  
E = 8-pin connector M12, radial

#### 5 Pulse rate

50, 60, 100, 125, 250, 400, 500, 512, 960, 1000, 1024, 2000, 2048, 5000 (z.B. 100 pulses => 0100)

Other pulse rates on request

Preferred types are underlined

### Mechanical characteristics

Speed	max. 3000 min <sup>-1</sup>
Rotor moment of inertia (shaft version)	approx. 3,5 x 10 <sup>-6</sup> kgm <sup>2</sup>
Starting torque	< 0,1 Nm
Weight	ca. 0,4 kg
Protection acc. to EN 60 529	IP 64
Working temperature	-20°C ... +70°C <sup>1)</sup> -20°C ... +60°C <sup>2)</sup>
Material	steel
Shock resistance acc. to DIN-IEC 68-2-27	1000 m/s <sup>2</sup> , 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6	100 m/s <sup>2</sup> , 35...2000 Hz

### Electrical characteristics

Output circuit	RS 422	Push-Pull (7272)
Supply voltage	5 V ±5% / 8 ... 30 V	8 ... 30 V DC
Power consumption		
no load	typ. 40 mA	< 40 mA
with inverted signal	max. 90 mA	max. 100 mA
Permissible load/channel	max. ±20 mA	max. ±40 mA
Pulse frequency	max. 300 kHz	max. 200 kHz
Signal level		
high	min. 2,5 V	min UB - 3 V
low	max. 0,5 V	max. 0,5 V
Rise time tr	max. 200 ns	max. 1 s
Fall time tf	max. 200 ns	max. 1 s
Short circuit proof outputs <sup>3)</sup>	yes	yes
Reverse connection of the supply voltage	yes	yes
CE compliant acc. to	EN 61 000-6-2, EN 61 000-6-4 and EN 61 000-6-3	
RoHS compliant acc. to	EG-guideline 2002/95/EG	

1) At speed max. 2000 min<sup>-1</sup>

2) At speed max. 3000 min<sup>-1</sup>

3) If supply voltage correctly applied

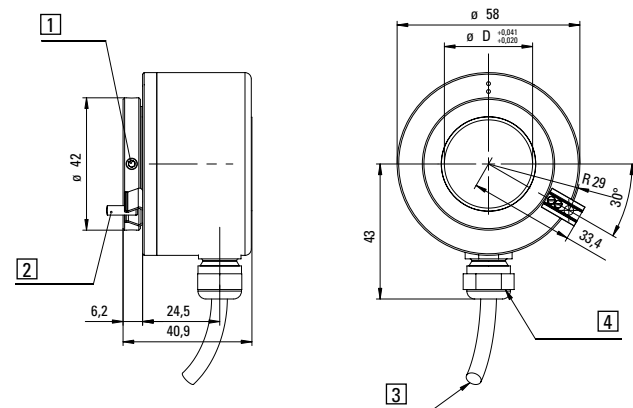
# Incremental Encoders

## Large hollow shaft 5821

### Dimensions shaft version:

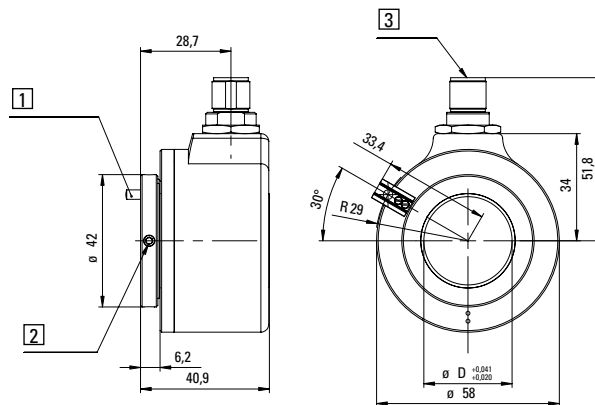
Flange with torque stop,  $\varnothing$  58 mm, spring contact

### Cable version, Connection type 1



- 1 Cylindrical pin 3m6x12 DIN 6325 included
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cable length 2 metres
- 4 Cable gland PG7

### M12 Plug version, Connection type E

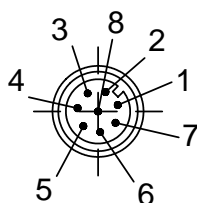


- 1 Cylindrical pin 3m6x12 DIN 6325 included
- 2 4 x socket set screw M4x6 DIN 913
- 3 Connector M12

### Terminal assignment

Signal:	0 V GND	+U <sub>B</sub>	A	A	B	B	0	0	shield
M12 eurofast, 8-pol. connector, Pin	1	2	3	4	5	6	7	8	1)
Cable colour	WH	BN	GN	YE	GY	PK	BU	RD	shield

8-pin M12 connector



### Accessories

Mounting attachments and stator couplings can be found in the Accessories section

#### M12 coupling

straight, 8-pin,  
self-assembly, IP67

Order No.:

**05.CMB8181-0**



#### M12 connector

preassembled with cable  
straight, 8-pin,  
open end, PVC cable 2 -15 m

Order No.:

- 2 m: **05.WAKS8-2/P00**
- 5 m: **05.WAKS8-5/P00**
- 10 m: **05.WAKS8-10/P00**
- 15 m: **05.WAKS8-15/P00**



1) PH = Shield is attached to connector housing.

# Incremental Encoders

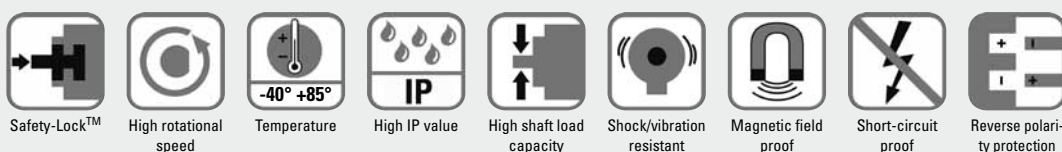
Sendix inkremental

5006 Stainless-steel



The Sendix incremental 5006 in stainless-steel offers optimum material resistance and thus virtually unlimited durability.

The high-grade Viton seals, the IP 67 level of protection as well as the wide temperature range additionally ensure impermeability and ruggedness.



## Durable and sealed

- Protection rating IP67
- Rugged stainless-steel housing
- Viton seals
- Wide temperature range -40 ... +85°C
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors

## Flexible in use

- Compatible with all common US and European standards,
- Supply voltage 5 ... 30 V DC, various interface options, max. 5000 PPR
- Compact dimensions:  
Outer diameter 50 mm, installation depth max. 47 mm

## Order code

8.5006 . XXXX . XXXX  
Type 1 2 3 4 5



### 1 Flange

7 = Clamping flange, metric  $\varnothing$  58 mm  
A = Synchro flange, metric  $\varnothing$  58 mm  
C = Square flange 63,5 mm [2,5 inch]

### 2 Shaft ( $\varnothing \times L$ )

1 =  $\varnothing$  6 mm x 10 mm  
3 =  $\varnothing$  10 mm x 20 mm  
8 =  $\varnothing$  3/8" x 7/8"

### 3 Output circuit / supply voltage

2 = Push-pull (7272 with inversion) / 5 ... 30 V  
4 = RS 422 (with inversion) / 5 V  
5 = Push-pull with inversion / 10 ... 30 V

### 4 Type of connection

4 = 8-pin M12 connector radial

### 5 Pulse rate

360, 512, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000  
(e.g. 100 pulses => 0100) Other pulse rates on request

Preferred types are underlined

### Note:

Encoder will be delivered without mating connector.

Corresponding mating connector: : Type 05.CMB-8181-0

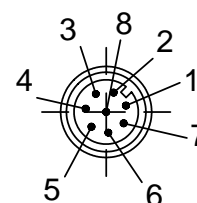
## Mechanical characteristics

Speed <sup>1)</sup>	max. 6000 min <sup>-1</sup>
Rotor moment of inertia (shaft version)	ca. $1,8 \times 10^{-6}$ kgm <sup>2</sup>
Starting torque	< 0,05 Nm
Weight	ca. 0,4 kg
Load capacity of shaft:	radial 80 N axial 40 N
Protection acc. to EN 60 529	IP 67
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature	-40 °C ... +85 °C
Materials	housing, flange, shaft stainless steel, 1.4305 connector stainless steel, Seals Viton
Shock resistance acc. to DIN-IEC 68-2-27	2500 m/s <sup>2</sup> , 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6	100 m/s <sup>2</sup> , 10...2000 Hz

## Terminal assignment

Signal:	0 V GND	+U <sub>B</sub>	A	A	B	B	0	0	shield
M12 eurofast, 8-pin connector, Pin	1	2	3	4	5	6	7	8	<sup>1)</sup>

## 8-pin M12 connector



Matching mating connector: 05.CMB-8181-0

### Suitable accessories:

- further cables and connectors, also pre-assembled, can be found in the Connection Technology section.
- further mounting attachments and stator couplings can be found in the Accessories section.

<sup>1)</sup> For continuous operation max. 3000 min<sup>-1</sup>

# Incremental Encoders

**Sendix inkremental**

**5006 Stainless-steel**

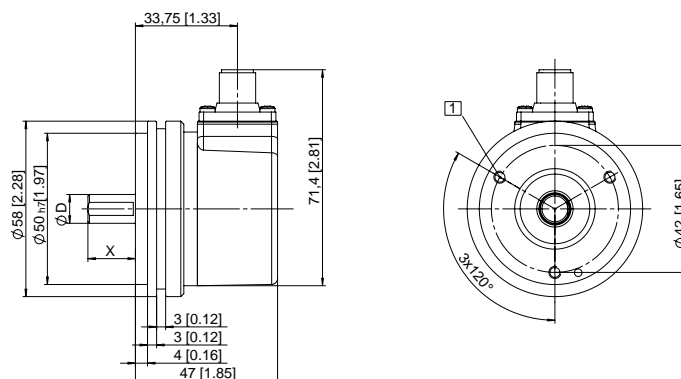
## Electrical characteristics

Output circuit:	RS 422 (TTL-compatible)	Push-Pull	Push-Pull (7272)
Supply voltage	5 V $\pm$ 5%	10 ... 30 V DC	5 ... 30 V DC
Current consumption	no load typ. 40 mA with inverted signal max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load/channel	max. $\pm$ 20 mA	max. $\pm$ 20 mA	max. $\pm$ 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level	high min. 2,5 V low max. 0,5 V	min UB - 1 V max. 0,5 V	min. UB-2,0 V max. 0,5 V
Rise time tr	max. 200 ns	max. 1 $\mu$ s	max. 1 $\mu$ s
Fall time tf	max. 200 ns	max. 1 $\mu$ s	max. 1 $\mu$ s
Short circuit proof outputs <sup>1)</sup>	yes <sup>2)</sup>	yes	yes
Reverse connection of the supply voltage	no	yes	no
UL-certified	File 224618		
CE compliant acc. to	EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to	EG-guideline 2002/95/EG		

## Dimensions

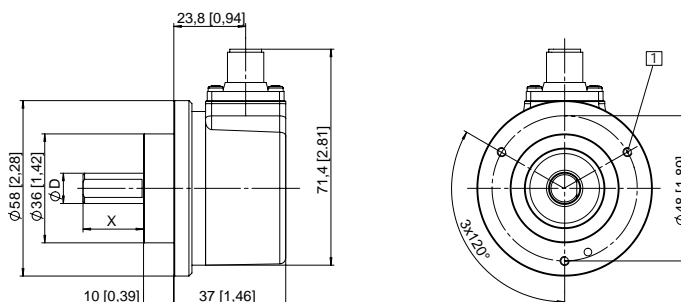
**Synchro flange,  $\varnothing$  58 mm, (Flange type A)**

1 3 x M3, 6 [0.24] deep

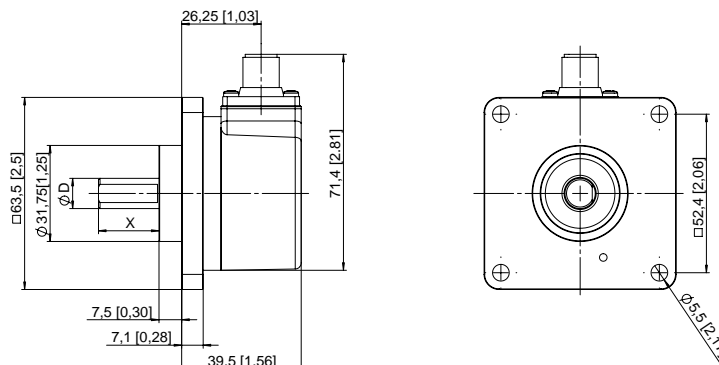


**Clamping flange,  $\varnothing$  58 mm (Flange type 7)**

1 M3, 5,5 [0.21] deep



**Square flange,  $\square$  63,5 mm [2.5 inch] (Flange type C)**



1) If supply voltage correctly applied

2) Only one channel allowed to be shorted-out:

at UB = 5 V short circuit to channel, 0 V, or +UB is permitted.  
at UB = 5 ... 30 V short circuit to channel or 0 V is permitted.

## Optical fibre signal transmission

## SSI



Cost advantage compared to conventional wiring over 150 m length\*

### Optical fibre transmission system for SSI absolute encoders

The system is made up of an optical fibre transmitter and an optical fibre receiver.

The optical fibre transmitter converts the electrical signals of a normal absolute encoder with Synchronous Serial Interface (SSI) into a light signal for transmission by means of an optical fibre. The receiving module converts the optical signal back into electrical signals. Absolute signals can be transmitted safely through one glass fibre over distances of up to 1500 m.

The resolution of 13 bit for a singleturn encoder or 25 bit for a multi-turn encoder can be defined by means of a DIP-switch on the front side of the module.

### Reliable transmission

- Safe signal transmission up to 1500 m
- Resists extremely strong electro-magnetic fields

### Easy installation

- Signal transmission via a single glass fibre.
- Resolution of 13 bit or 25 bit can be set via DIP-switch
- LED for monitoring of power supply, clock and date
- DIN-rail mounting – requires min. installation space – only 22 mm wide

### Application areas

- Process control technology and automation technology
- Interference-sensitive applications
- High voltage plant
- Plant with long transmission distances
- Potential separation
- Hazardous areas

### Order code

#### Optical fibre transmitter

$U_B = 10 \dots 30 \text{ V DC}$

$U_B = 5 \text{ V DC}$

**LWLS.A1**

**LWLS.A4**

#### Optical fibre receiver

$U_B = 10 \dots 30 \text{ V DC}$

$U_B = 5 \text{ V DC}$

**LWLE.A1**

**LWLE.A4**

**Scope of delivery:**

- Optical fibre module
- Multilingual operating manual

### Accessories

#### Simplex Patch cable ST-ST – Multimode

Connector: 2xST/PC, Optical fibre: 1x50/125  
Standard lengths: 2 m, 5m, 8m, 10m, 15m, 20m, ... (in 5 m steps)

Order code:

**05.B09-B09-821-L XXX**

①

① Length in m

#### ST Multimode coupling

Barrel: ceramic, slotted

Order No.:

**05.LWLK.001**

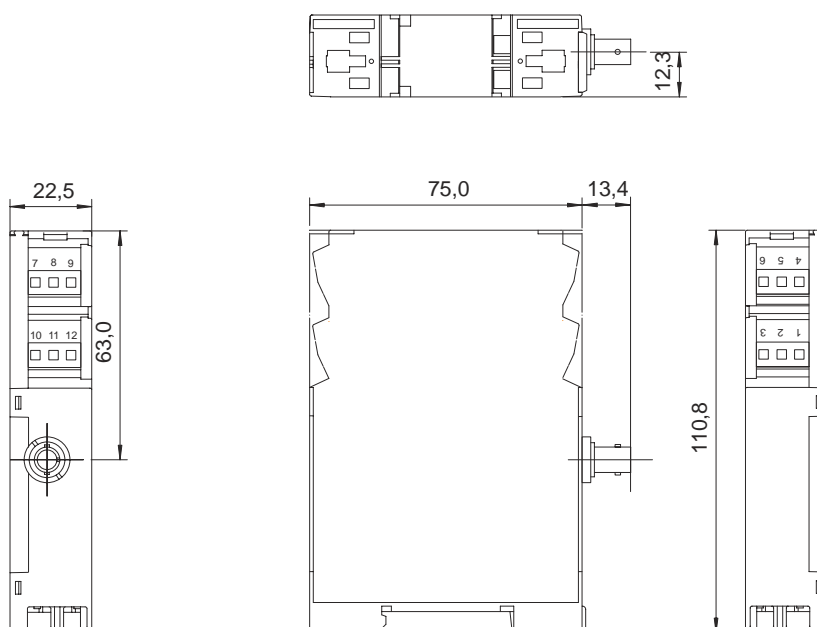
\* Cost comparison:

Costs per metre standard copper cable with costs per metre optical fibre (LWL) cable + costs of transmitter + costs of receiver

## Optical fibre signal transmission SSI

Technical data			
Supply voltage		10 ... 30 V or 5 V ± 5%	
Power consumption per module	U <sub>B</sub> 10 ... 30 V DC	max 1,6 W	
	U <sub>B</sub> 5 V DC	max 0,8 W	
Operating voltage reverse connection protection		available	
Encoder inputs	optical fibre transmitter	-T, +T and -D, +D	
SSI clock rate		500 kHz fixed setting	
Optical wavelength		820 nm	
Optical transmission rate		120 Mbit/s	
Optical fibre connection		ST connector, 13 mm, ø 9 mm on the bottom side of the housing	
Glass fibre		multimode fibre, 50/125 µm, 62,5/125 µm	
Max. optical fibre transmission distance		max. 1500 m	
Dimensions		(W x L x H)	22,5 x 110,8 x 88,4 mm
Protection		IP 40, terminals IP 20	
Terminals		max.conductor diameter	protected against contact, 2.5 mm <sup>2</sup>
Temperature range		-10 °C ... +60 °C	
Weight		approx. 100 g	
Standards		EN 55 011 Class B1 EN 61 000-6-2: 2006	

### Dimensions

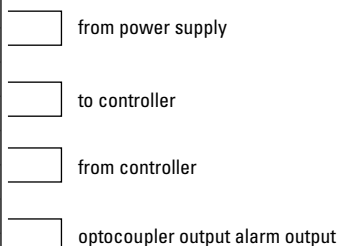


### Connecting diagram Optical fibre transmitter:

Pin	signal
1	0 V (GND)
2	+ $U_B$
3	+ T
4	- T
5	+ D
6	- D
7	0 V (GND)
8	+ $U_B$

### Connecting diagram Optical fibre receiver:

Pin	signal
1	0 V (GND)
2	+ $U_B$
3	+ D
4	- D
5	+ T
6	- T
7	emitter (-)
8	collector (+)







The 8-pin M12 Cordset for incremental encoders ensures fast, simple connections under difficult outdoor conditions.

The Cordset, in a transparent, right-angle housing, contains three LEDs, which display the channels A,B and Z.

### Informative

- With LEDs to display channels A, B (both green) and Z (amber)
- LEDs for start-up and to display the zero point
- Shows current status of the output channels

### Versatile

- Suitable for Incremental Encoders
- Right Angle Female Connector
- 5 - 30 V DC

### Order code

#### 8-pin M12 Cordset

with integrated control LEDs

Order-No.:

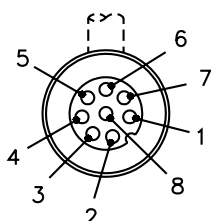
**05.E-WKC 8T-PX3-930-XXXX**

### Cable

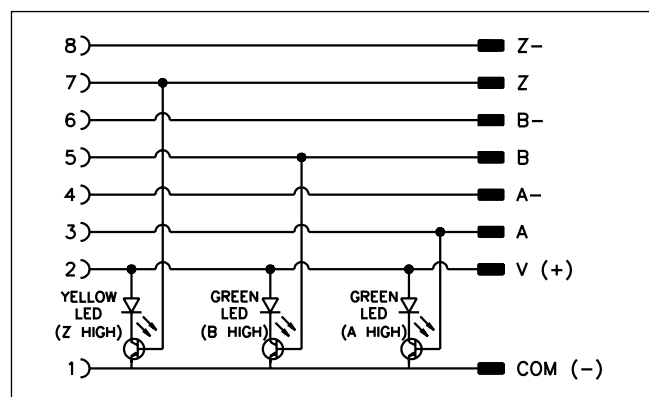
- PVC
- 8 x 24 AWG
- 7.2 mm OD
- Standard lengths: 2, 4, 6, 8, 10 m

### Terminal assignment

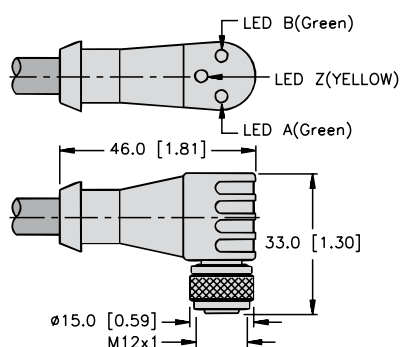
Signal:	0 V	+U <sub>B</sub>	$\bar{A}$	A	$\bar{B}$	B	$\bar{0}$	0
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD



### Wiring diagram



### Dimensions



# Connection Technology

## M12 connectors, cordsets

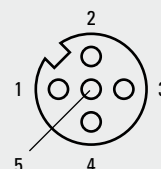
### CANopen



#### M12 coupling – 5-pin, straight, self-assembly

CANopen Bus in

Order No.: **8.0000.5116.0000**



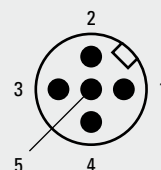
suitable for encoders:  
Sendix 3658 | 3678,  
Sendix 5858 | 5878,  
Sendix 5868 | 5888



#### M12 connector – 5-pin, straight, self-assembly

CANopen Bus out

Order No.: **8.0000.5111.0000**



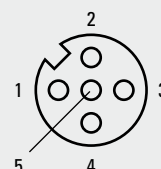
suitable for encoders:  
Sendix 5858 | 5878,  
Sendix 5868 | 5888



#### M12 coupling – 5-pin, straight, single-ended, PVC cable 2...15m

CANopen Bus in

Order No.: 2m	<b>8.0000.6V81.0002</b>
5m	<b>8.0000.6V81.0005</b>
10m	<b>8.0000.6V81.0010</b>
15m	<b>8.0000.6V81.0015</b>



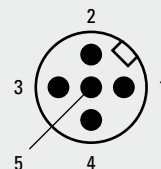
suitable for encoders:  
Sendix 3658 | 3678,  
Sendix 5858 | 5878,  
Sendix 5868 | 5888



#### M12 connector – 5-pin, straight, single-ended, PVC cable 2...15m

CANopen Bus out

Order No.: 2m	<b>8.0000.6V88.0002</b>
5m	<b>8.0000.6V88.0005</b>
10m	<b>8.0000.6V88.0010</b>
15m	<b>8.0000.6V88.0015</b>



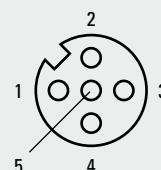
suitable for encoders:  
Sendix 5858 | 5878,  
Sendix 5868 | 5888

### Analogue encoder



#### M12 coupling – 5-pin, straight, self-assembly

Order No.: **8.0000.5116.0000**

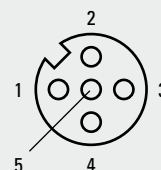


suitable for:  
draw-wire,  
A50, B80, C120, D135,  
Inclinometer IS40,  
Sendix 3658 | 3678



#### M12 coupling – 5-pin, straight, single-ended, PVC cable 2...15m

Order No.: 2m	<b>05.WAKS4.5-2/P00</b>
5m	<b>05.WAKS4.5-5/P00</b>
10m	<b>05.WAKS4.5-10/P00</b>
15m	<b>05.WAKS4.5-15/P00</b>



suitable for:  
draw-wire,  
A50, B80, C120, D135,  
Inclinometer IS40,  
Sendix 3658 | 3678

## EtherCat Connector Technology

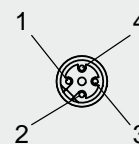


### 4-pin plug connector with M12 coupling

D-coded, straight, end open, PUR cable 2...10 m long

Use:  
EtherCat bus cable Port A and B

Order No.:	2 m	<b>05.WASSY4.029-2/S2171/S222</b>
	5 m	<b>05.WASSY4.029-5/S2171/S222</b>
	10 m	<b>05.WASSY4.029-10/S2171/S222</b>



Suitable for encoders:  
5858, 5878, 5868,  
5888 with EtherCat  
interface

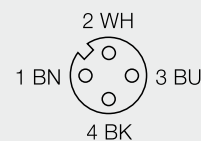


### M12 coupling, straight,

end open, PUR cable 2...10 m long

Use:  
EtherCat Power supply

Order No.:	2 m	<b>05.WAK4-2/S90</b>
	5 m	<b>05.WAK4-5/S90</b>
	10 m	<b>05.WAK4-10/S90</b>



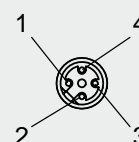
Suitable for encoders:  
5858, 5878, 5868,  
5888 with EtherCat  
interface



### 4-pin plug connector M12 coupling straight, D-coded, self-assembly

Use:  
EtherCat cable Port A and B

Order No.:	<b>05.WASCSY4S</b>
------------	--------------------



Suitable for encoders:  
5858, 5878, 5868,  
5888 with EtherCat  
interface

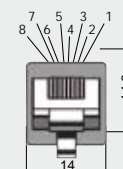


### RJ45 plug connector

straight, self-assembly

Use:  
EtherCat cable Port A and B

Order No.:	<b>05.VS-08-RJ45-5-Q/IP20</b>
------------	-------------------------------



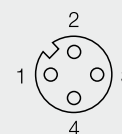
Suitable for encoders:  
5858, 5878, 5868,  
5888 with EtherCat  
interface



### 4-pin plug connector M12 coupling straight, self-assembly

Use:  
EtherCat Power supply

Order No.:	<b>05.B8141-0</b>
------------	-------------------



Suitable for encoders:  
5858, 5878, 5868,  
5888 with EtherCat  
interface

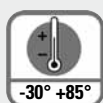
## Accessories

### Robust Bearing Unit

Suitable for 58-size with solid shaft



Shock / vibration resistant



Temperature



High IP value



High shaft load capacity

### Quick and Easy – More Protection

- The separation of bearing load and sensor technology affords the encoder greater protection in tough environments
- Retrofitting can be carried out very quickly and easily

### Order code

#### Robust bearing unit

(matching shaft encoders with clamping flange and shaft 6 mm)

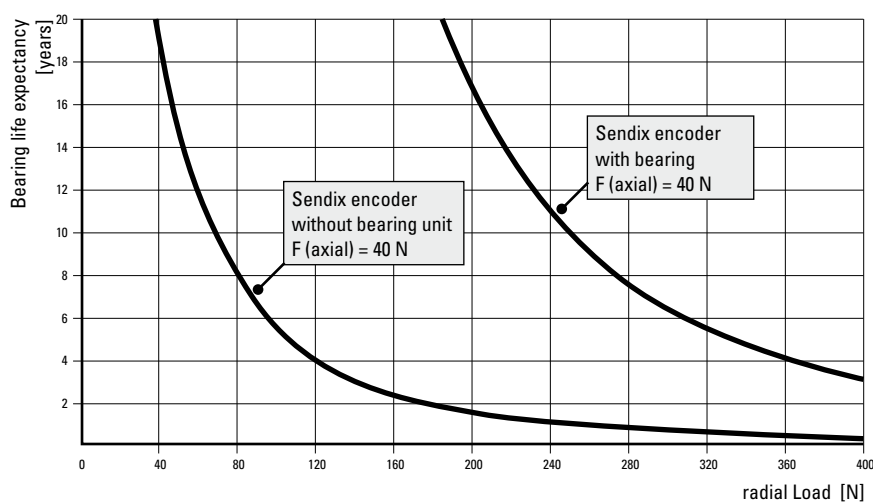
Ord.-No. **8.0010.8200.000B**

### Mechanical characteristics

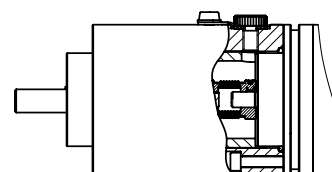
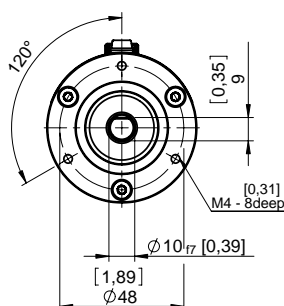
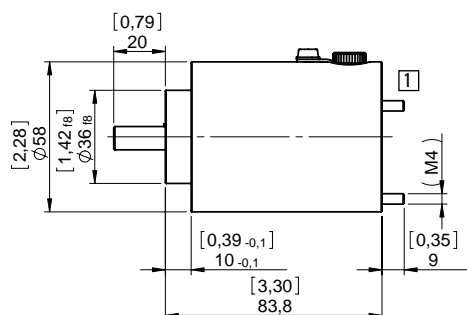
Speed	max. 6.000 min <sup>-1</sup>
Weight	ca. 560 g
Protection	IP 67
Material	housing aluminium (Seawater resistant) shaft stainless steel

### Bearing life expectancy L10

at 3,000 revolutions/min with continuous operation



### Dimensions



1 3 x Cylindrical pin M4x25 (SW3)  
1 x O-Ring  
included as mounting set

# Preset Counters

## LED Preset Counters

## 2 Presets

## Codix 560



With its automatic help texts, clearly and legibly displayed on 14 LED segments, the Codix 560 preset counter takes the user effortlessly through the programming. The large user-friendly front keys can be operated even when wearing gloves.



<b>DC</b> 10 ... 30 V Power supply	<b>AC</b> 90 ... 260 V Power supply	<b>-20° +65°</b> Temperature range	<b>DIN 96 x 48</b> DIN front bezel	<b>Prog</b> Menu-driven programming	<b>IP 65</b> High IP value	<b>max. 60 kHz</b> High count frequency	<b>t/Hz</b> Multifunction	<b>HRA</b> Frequency display with HRA	<b>POSITION</b> Position display	<b>A..Z*</b> LED 1 x 6 LCDs
<b>Batch</b> Batch counter	<b>Σ</b> Total counter									

### Multifunction

- Counter, Tachometer, Timer and Position Display in one device
- Can be used as Preset Counter, Batch Counter or Total Counter
- Many different count modes
- Scalable display
- Set value
- Multi-range power supply for AC or DC

### User-friendly:

- Automatic help texts, displayed in German and English
- 14-segment LED for improved text representation
- Status display of the presets
- 3 predefined parameters
- Tracking presets eliminate the need for reprogramming of the pre-signal
- Minimum installation depth
- 4-stage RESET modes
- 3-stage keypad locking
- Suitable for installation in mosaic systems

### Order code

6.560 . 010 . X X 0  
① ②

#### ① Supply voltage

- 0 = 90 ... 260 V AC
- 3 = 10 ... 30 V DC

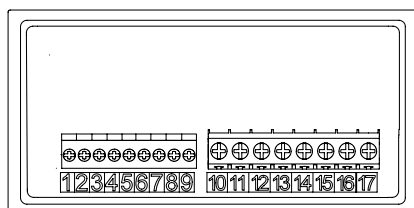
#### ② Input trigger levels

- 0 = Standard level (HTL)
- A = 4...30 V DC level

#### Delivery specification

- Preset counter
- Mounting clip
- Instruction manual

### Connections



#### Signal and Control inputs

- INP A (Signal input A)
- INP B (Signal input B)
- RESET (Reset input)
- LOCK (Keypad lock)
- GATE (Gate input)
- MPI 1 (User input 1)
- MPI 2 (User input 2)
- Sensor supply voltage  
AC: 24 VDC/80 mA  
DC: UB connected through
- Shared connection for signal and control inputs  
GND (0 VDC)

#### Version with relay/optocoupler

- Relay contact C.2
- Relay contact N.O.2
- Relay contact N.C.2
- Relay contact C.1
- Relay contact N.O.1
- Relay contact N.C.1
- AC: 90..260 VAC N~  
DC: 10..30 VDC
- AC: 90..260 VAC L~  
DC: GND (0 VDC)

Output 1

Output 2

Supply voltage

# Preset Counters

<b>LED Preset Counters</b>	<b>2 Presets</b>	<b>Codix 560</b>
----------------------------	------------------	------------------

## Technical data

<b>Sensor supply voltage</b>	AC	90 ... 260 V AC max. 11 VA, 50/60 HZ
	DC	10 ... 30 V, max. 5,5 W
<b>External fuse protection</b>	230 V AC	T 0,1 A
	10 ... 30 V DC	T 0,25 A
<b>Display</b>	6-digit, 14 segment LED Display, 14 mm [0.551"] high	
<b>Data retention</b>	> 10 years, EEPROM	
<b>Response time of the frequency meter:</b>	100 / 600 ms, for details, see instruction manual	
<b>Input modes</b>	Input modes:	Count direction (cnt.dir), Difference (up.dn), Addition A+B (up.up), phase discriminator x1, x2, x4 (quad, quad x2, quad x4), Ratio (A/B), Ratio in % ((A-B)/A x 100%)
	Frequency meter:	A, A-B, A+B quad, A/B, (A-B)/A x 100%
	Timer:	4 Start modes: FrErun, Auto, InpA.InpB., InpB.InpB.
<b>Sensor supply voltage</b>	AC supply	24 V DC $\pm$ 15%, 80 mA
	DC supply	max. 50 mA, external supply voltage is connected through
<b>Operating temperature</b>	-20 °C ... +65 °C	
<b>Storage temperature</b>	-25 °C ... +75 °C	
<b>Relative humidity</b>	at +40 °C	r.F. 93%, non-condensing
<b>Altitude</b>	up to 2000 m	
<b>EMV</b>	Emitted interference	EN55011 Class B
	Immunity to interference	EN 61000-6-2
<b>Device safety</b>	EN 61010 part 1; Protection 2	
<b>Application area</b>	Soiling Level 2	
<b>Protection</b>	IP65 (from the front)	
<b>Weight</b>	AC version	approx. 180 g

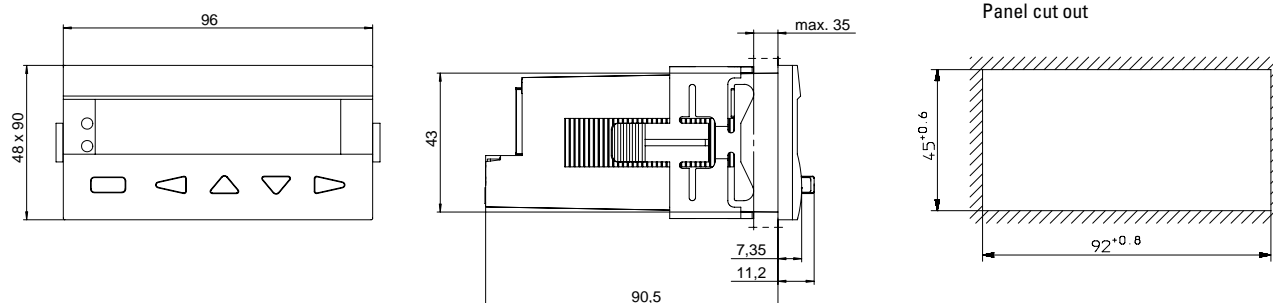
## Inputs

<b>Count inputs</b>	A and B		
<b>Polarity of the inputs</b>	programmable for all inputs in common NPN/PNP		
<b>Input resistance</b>	5 k $\Omega$		
<b>Count frequency</b>	max. 5 kHz (details see manual) can be damped to 30 Hz (mechanical contacts)		
<b>Control / Reset input</b>	MPI 1 and MPI 2, Lock, Gate, Reset		
<b>Min pulse duration of the inputs</b>	10 ms / 1 ms		
<b>Switching levels with DC supply</b>	HTL-level:	low:	0 ... 4 V DC
		high:	12 ... 30 V DC
	4 ... 30 V DC:	low:	0 ... 2 V DC
		high:	3,5 ... 30 V DC
<b>Switching levels with AC supply</b>	HTL-level:	low:	0 ... 0,2 x UB
		high:	0,6 x UB ... 30 V DC
	4 ... 30 V DC:	low:	0 ... 2 V DC
		high:	3,5 ... 30 V DC
<b>Pulse shape</b>	variable, Schmitt-Trigger characteristics		

## Outputs

<b>Switching voltage</b>	max. 250 V AC / 150 V DC
<b>Switching current</b>	max. 3 A AC / DC min. 30 mA DC
<b>Switching capacity</b>	max. 750 VA / 90 W
<b>Output 1 + 2</b>	
Mech. service life (switching cycles)	2 x 10 <sup>7</sup>
N° of switching cycles at 3 A / 250 V AC	5 x 10 <sup>4</sup>
N° of switching cycles at 3 A / 30 V DC	5 x 10 <sup>4</sup>
Relay with changeover contact	
<b>Reaction time of the outputs</b> (pulse / time)	13 ms Details s. instruction manual

## Dimensions



# Preset Counters

LED Preset Counters	2 Presets	Codix 560
---------------------	-----------	-----------

## Pulse counter

### Functions / Count modes

- Count with direction mode
- Difference mode
- Quadrature mode quad / quad2 / quad4
- Add, Sub, automatic reset
- 2-input adding mode A+B
- Ratio measurement A/B
- Multi-range power supply for AC or DC
- Percentage difference measurement  $(A-B)/A \times 100\%$
- Batch counting
- Totaliser (Overall total)
- Multiplication and division factor (up to 99,9999)
- Set value
- Step or tracking preset

## Application examples

### CountDir + Add

Roller shutter door with automatic shut-off

### Quad + Add

Running direction and position on milling machines, Limit switch monitoring

### UpDown + Add

Automatic subtraction of faulty or reject parts from the total piece count

### CountDir + Batch

Logging of piece numbers and packing units plus control of replenishment of packing cartons

### UpUp + Add

Adding up of two parallel or staggered production lines

### Quad + Add tot

Cut-to-length with overall total count and control of the machine



# The simple, economical, high-performance Preset Counter

Kübler Codix 907 | Kübler Codix 908

For Pulses, Time, and Position

3-year warranty

Quality brand – Made in Germany

Menu-driven programming

High-quality LCD display

Plug-in screw terminals



[www.kuebler.com/newpresetcounter](http://www.kuebler.com/newpresetcounter)