

Absolute Encoders – Singleturn

Compact, optical

Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS-C



The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS-C. interface 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.

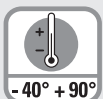
Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.



Recipients of the MessTec & Sensor Master Award and the Golden Mousetrap Award.



Safety-Lock™



Temperature
-40° + 90°



High protection level
IP67



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



SinCos



Optical sensor



Seawater-resistant version on request

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoAsic - offering highest reliability, a high resolution up to 41 bits and 100% magnetic field insensitiveness

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-C up to 10 MHz

Order code

Shaft version

8.F3653

Type

. X X X X . X X 12

a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.

Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange, ø 36 mm

- 1 = clamping flange, IP67
- 2 = synchro flange, IP67
- 3 = clamping flange, IP65
- 4 = synchro flange, IP65

b Shaft (ø x L), with flat

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

c Interface / Power supply

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC
- 3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
- 8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

d Type of connection

- 1 = cable, tangential (1 m PUR)
- 3 = cable, tangential (5 m PUR)
- 8 = M12 connector, 8-pin, axial ¹⁾

e Code

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

f Resolution

- A = 10 bit ST
 - 2 = 12 bit ST
 - 3 = 13 bit ST
 - 4 = 14 bit ST
 - 7 = 17 bit ST
- optional on request
- Ex 2/22
- seawater-resistant
- special cable length

Order code

Hollow shaft

8.F3673

Type

. X X X X . X X 12

a b c d e f

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.

Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange, ø 36 mm, IP65

- 1 = with torque stop, short
- 2 = with stator coupling
- 3 = with torque stop, long

b Hollow shaft

- 1 = ø 6 mm
- 2 = ø 6.35 mm (1/4")
- 3 = ø 8 mm
- 4 = ø 10 mm
(Blind hollow shaft)

c Interface / Power supply

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC
- 3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
- 8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

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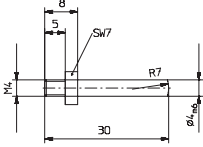
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 - 7 = 17 bit ST
- optional on request
- Ex 2/22
- seawater-resistant
- special cable length

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Compact, optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
Mounting accessory for shaft encoders		
Coupling	Bellows coupling ø 19 mm for shaft 8 mm	8.0000.1101.0808
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops		8.0010.4700.0000
Connection Technology		
Connector, self-assembly (straight)	M12, suitable for connection type 8	05.CMB 8181-0
Cordset, pre-assembled with 2 m PVC cable	M12, suitable for connection type 8	05.00.6041.8211.002M

Further accessories can be found in the Accessories section or in the Accessories area of Kuebler website.
Additional connectors can be found in the Connection Technology section or in the Connection Technology area of Kuebler website.

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 (IP67) or hollow shaft version (IP65) 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. IP67)
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +90°C
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminium zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

General electrical characteristics		
Supply voltage		5 V DC ± 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC 10 ... 30 V DC	max. 60 mA max. 30 mA
Reverse polarity protection of the power supply		yes (only with 10 ... 30 V DC)
UL approval		File 224618
CE compliant acc. to		EN 61 000-6-2, EN 61 000-6-4 and EN 61 000-6-3
RoHS compliant acc. to		EU guideline 2002/95/EG

General interface characteristics	
Output driver	RS485 transceiver type
Permissible load/channel	max. ± 30 mA
Signal level	high typ 3.8 V low with I _{Load} = 20 mA typ 1.3 V
Short-circuit proof outputs	yes ¹⁾

SSI interface	
Resolution, singleturn	10 ... 17 bit
Code	Binary or Gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 µs
Note:	If 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	resolution ≤ 14 bit < 1 µs resolution ≥ 15 bit 4 µs
Status and Parity bit	on request

BiSS-C interface	
Resolution, singleturn	10 ... 17 bit
Code	Binary
BiSS-C Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 V _{pp} (± 20%)	high: min. 2.5 V low: max. 0.5 V
Short circuit proof	yes ¹⁾	yes ¹⁾

1) Short circuit proof to 0V or to output when supply voltage correctly applied

Absolute Encoders – Singleturn

Compact, optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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SET input	
Input	active high
Input type	comparator
Signal level (+V = supply voltage)	high min. 60 % of +V, max: +V low max. 30 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Input Delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms
<p>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, after which the new position data can be read via SSI or BiSS-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.</p> <p>The SET function should be carried out whilst the encoder is at rest.</p>	

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

DIR input	
<p>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.</p>	
Response time (DIR input)	1 ms

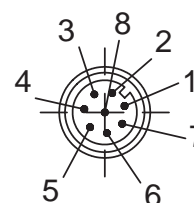
Status output	
Output driver	Open Collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	high +V low < 1 V
Active	low
<p>The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (Open Collector with int. pull-up 22 kOhm).</p> <p>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.</p>	

Terminal assignment

Interface	Type of connection	Features	Cable													
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	Stat	⊥			
1, 2	1, 3	SET, DIR, Status	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	Shield			
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	Stat	⊥			
1, 2	8	SET, DIR	M12 connector													
			Pin:	1	2	3	4	5	6	7	8	PH				
3, 4	1, 3	SET, DIR, 2048 SinCos	Cable													
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
3, 4	1, 3	SET, DIR, 2048 SinCos	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	0 Vsens	+Vsens	A	\bar{A}	B
5	1, 3	SET, DIR, Sensor outputs	Cable													
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	0 Vsens	+Vsens	A	\bar{A}	B
5	1, 3	SET, DIR, Sensor outputs	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	0 Vsens	+Vsens	A	\bar{A}	B
6	1, 3	2048 SinCos, Sensor outputs	Cable													
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	0 Vsens	+Vsens	A	\bar{A}	B
6	1, 3	2048 SinCos, Sensor outputs	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	0 Vsens	+Vsens	A	\bar{A}	B
7, 8	1, 3	2048 inkr. RS422	Cable													
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
7, 8	1, 3	2048 inkr. RS422	Cable colour:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	Shield		
			Signal:	0 V	+V	+C	-C	+D	-D	SET	DIR	A	\bar{A}	B	\bar{B}	⊥

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- +C, -C: Clock signal
- +D, -D: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- Stat: Status output
- PH: Plug connector housing (Shield)
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B

Top view of mating side, male contact base:



M12 connector, 8-pin

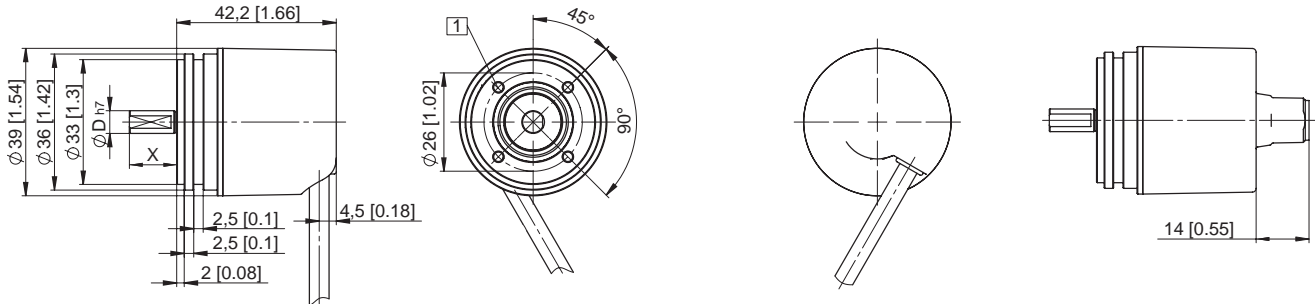
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Compact, optical

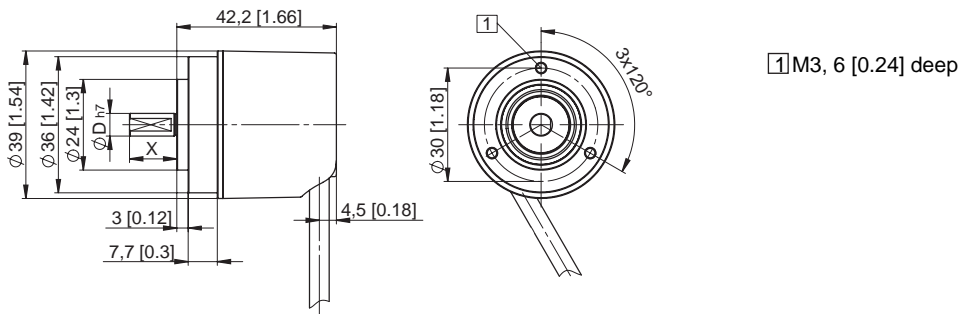
Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS-C

Dimensions shaft version:
Synchro flange, \varnothing 36 mm



Clamping flange, \varnothing 36 mm

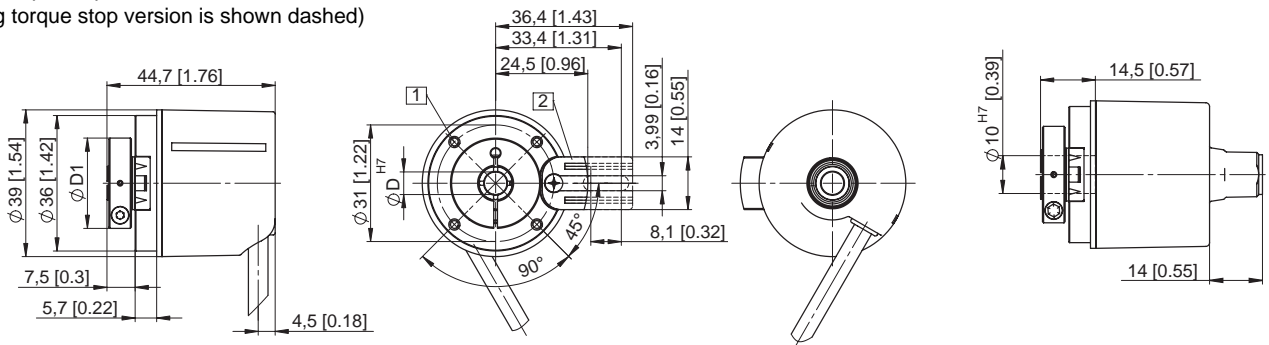


Shaft acc. to order code	Length X
1	12.5 mm
2	12.5 mm
3	15 mm
4	15.875 mm
5	20 mm

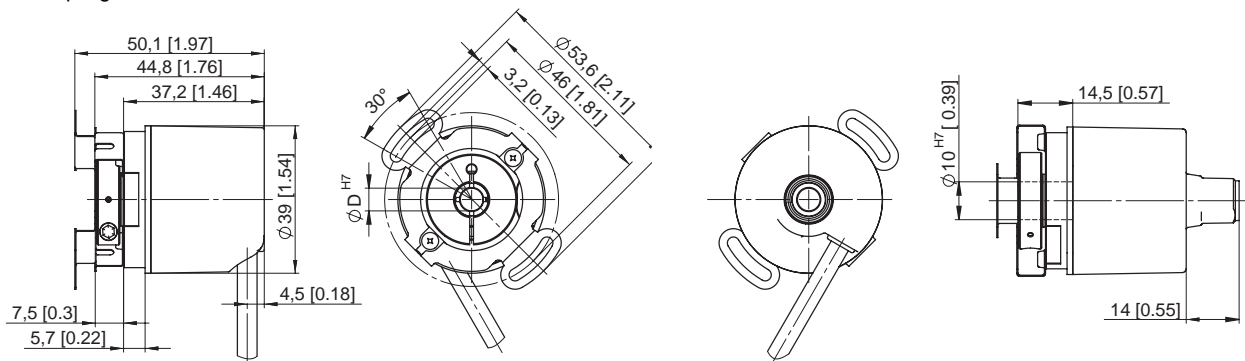
Dimensions hollow shaft version:

With torque stop, short, \varnothing 36 mm

(Long torque stop version is shown dashed)



With stator coupling, \varnothing 36 mm



- 1 M2.5, 5 [0.2] deep
2 Torque stop slot, Recommendation: Cylindrical pin DIN7, \varnothing 4 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

Insertion depth for blind hollow shaft 14.5 mm