

Absolute Encoders - Singleturn

Compact Optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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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.



Absolute Encoders Singleturn

Safety-Lock™	Temperature range -40°...+90°C	High protection level IP	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 17 bits and 100% magnetic field insensitivity

Optimised performance

- High-precision with a data refresh rate of the position value ≤ 1µs
- 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	8.F3653	.XXXX.XX12	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.
Shaft version	Type	a b c d e f	
a Flange			
1 = clamping flange, IP67, ø 36 mm [1.42"]			
3 = clamping flange, IP65, ø 36 mm [1.42"]			
2 = synchro flange, IP67, ø 36 mm [1.42"]			
<u>4 = synchro flange, IP65, ø 36 mm [1.42"]</u>			
b Shaft (ø x L), with flat			
1 = ø 6 x 12.5 mm [0.24 x 0.49"]			
<u>3 = ø 8 x 15 mm [0.32 x 0.59"]</u>			
5 = ø 10 x 20 mm [0.39 x 0.79"]			
2 = ø 1/4" x 12.5 mm [0.49"]			
4 = ø 3/8" x 5/8"			
c Interface / Power supply			
1 = SSI or BiSS-C / 5 V DC			
<u>2 = SSI or BiSS-C / 10 ... 30 V DC</u>			
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			
<u>1 = cable, tangential, 1 m [3.28] PUR</u>			
3 = cable tangential, 5 m [16.40] PUR			
8 = M12 connector, 8-pin, axial ¹⁾			
e Code			
B = SSI, Binary			
C = BiSS-C, Binary			
<u>G = SSI, Gray</u>			
f Resolution			
A = 10 bit ST			
2 = 12 bit ST			
<u>3 = 13 bit ST</u>			
4 = 14 bit ST			
7 = 17 bit ST			
optional on request			
- seawater-resistant			
- special cable length			

1) Only with output circuits 1 and 2

Absolute Encoders - Singleturn

**Compact
Optical**

Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS-C

**Order code
Hollow shaft**

8.F3673 . **XXXXX** . **XX12**
Type **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.

10 by 10

<p>a Flange 1 = with spring element short, IP65 3 = with spring element long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u></p> <p>b Hollow shaft 1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"], blind hollow shaft</u> 2 = ø 1/4"</p>	<p>c Interface / Power supply 1 = SSI or BiSS-C / 5 V DC <u>2 = SSI or BiSS-C / 10 ... 30 V DC</u> 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</p> <p>d Type of connection <u>1 = cable, tangential, 1 m [3.28'] PUR</u> 3 = cable tangential, 5 m [16.40'] PUR 8 = M12 connector, 8-pin, axial ¹⁾</p>	<p>e Code B = SSI, Binary C = BiSS-C, Binary <u>G = SSI, Gray</u></p> <p>f Resolution A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST 7 = 17 bit ST</p> <p>optional on request - seawater-resistant - special cable length</p>
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Mounting accessory for shaft encoders

Order No.

Coupling

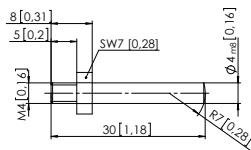
Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]

8.0000.1101.0606

Mounting accessory for hollow shaft encoders

Cylindrical pin, long

for torque stops



With fixing thread

8.0010.4700.0000

Connection technology

Connector, self-assembly (straight)

M12 female connector with coupling nut
(suitable for connection type 8)

05.CMB 8181-0

Cordset, pre-assembled

M12 female connector with coupling nut, 2 m [6.56'] PVC cable
(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 our website at: www.kuebler.com/accessories

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics

Maximum speed	
Shaft- or blind hollow shaft version without shaft seal (IP65)	12 000 min ⁻¹ 10 000 min ⁻¹ (continuous)
Shaft version (IP67) or hollow shaft version (IP65) with shaft seal	10 000 min ⁻¹ 8 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	without shaft seal < 0.007 Nm with shaft seal (IP67) < 0.01 Nm
Load capacity of shaft	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]

Protection acc. to EN 60529	housing side IP67 shaft side IP65 (solid shaft version opt. IP67)
Working temperature range	-40°C ... +90°C [-40°F ... +194°F]
Material	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast cable 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

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"]

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Electrical characteristics	
Power supply	5 V DC \pm 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 60 mA 10 ... 30 V DC max. 30 mA
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)
Short-circuit proof outputs	yes ¹⁾
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2011/65/EU

SSI interface	
Output driver	RS485 transceiver type
Permissible load/channel	max. \pm 30 mA
Signal level	HIGH typ 3.8 V LOW with $I_{Load} = 20$ mA typ 1.3 V
Resolution, singleturn	10 ... 17 bit
Code	Binary or Gray
SSI clock rate	50 kHz ... 2 MHz
Monoflop time	\leq 15 μ s
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 \leq 14 bit \leq 1 μ s resolution \geq 15 bit 4 μ s
Status and parity bit	on request

BiSS-C interface	
Resolution, singleturn	10 ... 17 bit
Code	Binary
BiSS-C clock rate	50 kHz ... 10 MHz
Max. update rate	$<$ 10 μ s, depends on the clock rate and the data length
Data refresh rate	\leq 1 μ s
Note:	<ul style="list-style-type: none"> – 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 Vpp (\pm 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes ¹⁾	yes ¹⁾

SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	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

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 power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest.

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.	
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
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	
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.	

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

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SSI / BiSS-C

Terminal assignment

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)													
1, 2	1, 3	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	\perp			
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	Shield			
Interface	Type of connection	Features	M12 connector													
1, 2	8	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	\perp				
			Pin:	1	2	3	4	5	6	7	8	PH				
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)													
3, 4	1, 3	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)													
5	1, 3	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 Vsens	+Vsens	\perp		
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	Shield		
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)													
6	1, 3	2048 SinCos, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	\perp
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)													
7, 8	1, 3	2048 incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}	\perp		
			Cable colour:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	Shield		

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A, \bar{A} : Incremental output channel A (cosine)
- B, \bar{B} : Incremental output channel B (sine)
- 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 \perp : Plug connector housing (Shield)

Top view of mating side, male contact base



M12 connector, 8-pin

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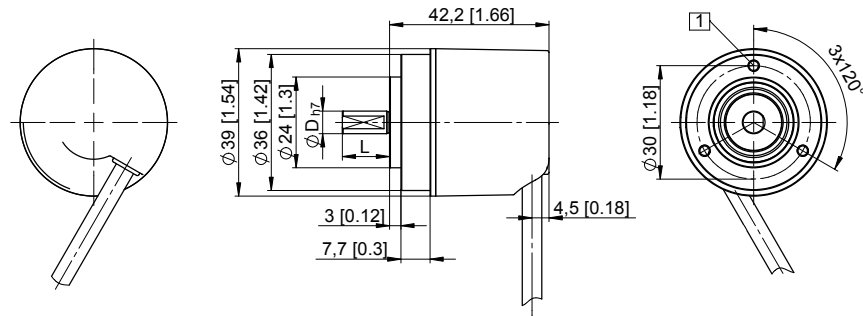
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

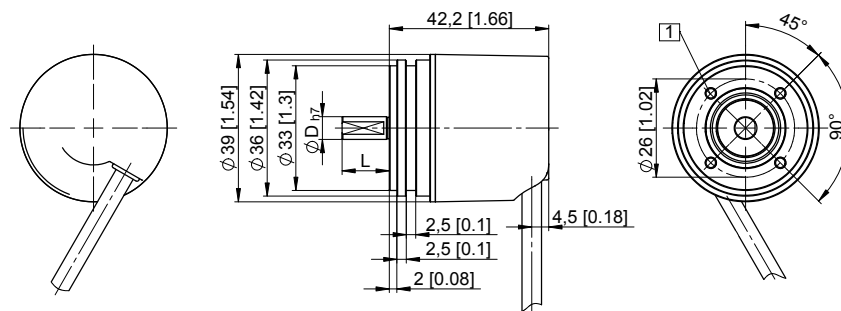
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7



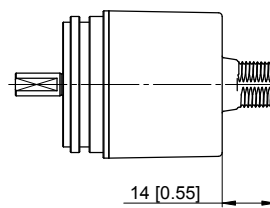
Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4
 (Drawing with cable)

1 3 x M3, 6 [0.24] deep



Drawing with M12 connector
 Type of connection 8



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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SSI / BiSS-C

Dimensions hollow shaft version

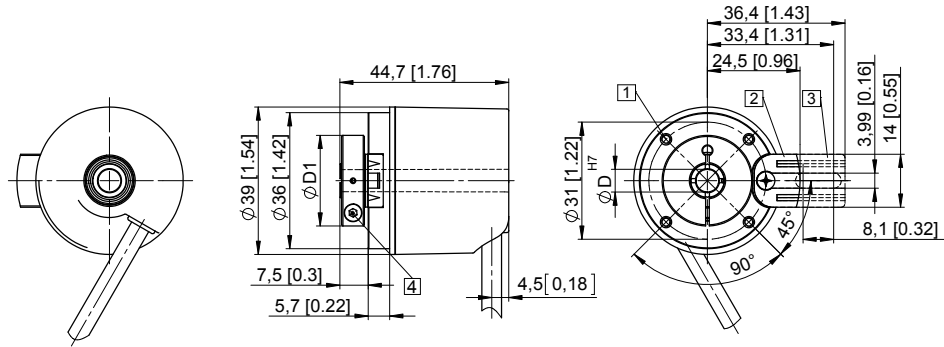
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

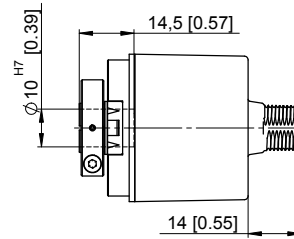
(Drawing with spring element short, spring element long is shown dashed)

- 1 M2.5, 5 [0.2] deep
- 2 Spring element short
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Spring element long
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

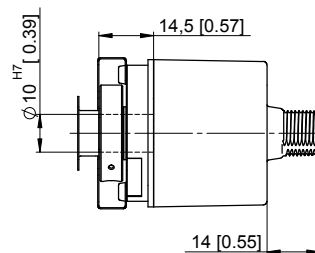
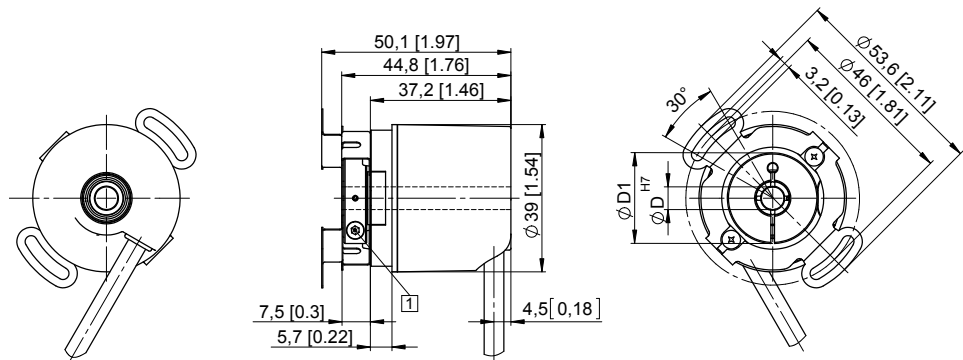


Drawing with M12 connector
Type of connection 8

Flange with stator coupling, \varnothing 46 [1.81]

Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



Drawing with M12 connector
Type of connection 8

D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]