



# Absolute encoders - singleturn

<b>Compact optical</b>	<b>Sendix F3653 / F3673 (shaft / hollow shaft)</b>	<b>SSI / BiSS</b>
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<b>Order code</b>	<b>8.F3673</b>	<b>.XXXXX.XX12</b>	If for each parameter of an encoder the <u>underlined preferred option</u> 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.						
<b>Hollow shaft</b>	Type	<table border="1" style="font-size: x-small; border-collapse: collapse;"> <tr> <td style="text-align: center;">a</td><td style="text-align: center;">b</td><td style="text-align: center;">c</td><td style="text-align: center;">d</td><td style="text-align: center;">e</td><td style="text-align: center;">f</td> </tr> </table>	a	b	c	d	e	f	
a	b	c	d	e	f				
<b>a Flange</b>	1 = with spring element, short, IP65 3 = with spring element, long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u>	<b>c Interface / power supply</b>							
<b>b Hollow shaft</b>	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"	1 = SSI, BiSS / 5 V DC <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC 5 = SSI, BiSS / 5 V DC, with sensor output 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output 7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC 8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC	<b>e Code</b> B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>						
		<b>d Type of connection</b>	<b>f Resolution</b>						
		<u>1 = tangential cable, 1 m [3.28] PUR</u> 3 = tangential cable, 5 m [16.40] PUR F = tangential cable, special length PUR *) 8 = axial M12 connector, 8-pin <sup>1)</sup>	A = 10 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit						
		*) Available special lengths (connection type F): 2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.F3673.242F.G312.0030 (for cable length 3 m)	Optional on request - surface protection salt spray tested - other resolutions						

Mounting accessory for shaft encoders	Order no.
<b>Coupling</b> bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	<b>8.0000.1102.0606</b>
Mounting accessory for hollow shaft encoders	Order no.
<b>Cylindrical pin, long</b> for torque stops	<b>8.0010.4700.0000</b>
	with fixing thread
Connection technology	Order no.
<b>Connector, self-assembly (straight)</b>	<b>05.CMB 8181-0</b>
M12 female connector with coupling nut (suitable for connection type 8)	
<b>Cordset, pre-assembled</b>	<b>05.00.6041.8211.002M</b>
M12 female connector with coupling nut, 2 m [6.56'] PVC cable (suitable for connection type 8)	

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://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](http://www.kuebler.com/connection_technology).

Technical data	
Mechanical characteristics	
<b>Maximum speed</b>	
shaft version without shaft seal (IP65)	12000 min <sup>-1</sup>
or blind hollow shaft version	10000 min <sup>-1</sup> (continuous)
shaft version with shaft seal (IP67)	10000 min <sup>-1</sup>
or hollow shaft version	8000 min <sup>-1</sup> (continuous)
<b>Starting torque at 20°C [68°F]</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>	approx. 0.2 kg [7.06 oz]
Protection and Materials	
<b>Protection</b>	housing side IP67
acc. to EN 60529	shaft side IP65 (solid shaft version opt. IP67)
<b>Working temperature range</b>	-40°C ... +90°C [-40°F ... +194°F]
<b>Materials</b>	shaft / hollow shaft stainless steel
	flange aluminium
	housing zinc die-cast
	cable PUR
<b>Shock resistance</b> acc. to EN 60068-2-27	2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance</b> acc. to EN 60068-2-6	100 m/s <sup>2</sup> , 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	
<b>Power supply</b>	5 V DC ( $\pm 5\%$ ) or 10 ... 30 V DC
<b>Current consumption</b> (no load)	5 V DC max. 60 mA 10 ... 30 V DC max. 30 mA
<b>Reverse polarity protection of the power supply</b>	yes (only with 10 ... 30 V DC)
<b>Short-circuit proof outputs</b>	yes <sup>1)</sup>
<b>UL approval</b>	file 224618
<b>CE compliant</b> acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface	
<b>Output driver</b>	RS485 transceiver type
<b>Permissible load / channel</b>	max. +/- 30 mA
<b>Signal level</b>	HIGH typ. 3.8 V LOW with $I_{Load} = 20\text{ mA}$ typ. 1.3 V
<b>Resolution</b>	10 ... 17 bit
<b>Code</b>	binary or gray
<b>SSI clock rate</b>	50 kHz ... 2 MHz
<b>Data refresh rate</b>	resolution $\leq 14$ bit $\leq 1\ \mu\text{s}$ resolution $\geq 15$ bit $4\ \mu\text{s}$
<b>Monoflop time</b>	$\leq 15\ \mu\text{s}$
<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.	

BiSS interface	
<b>Resolution</b>	10 ... 17 bit
<b>Code</b>	binary
<b>BiSS clock rate</b>	50 kHz ... 10 MHz
<b>Max. update rate</b>	$< 10\ \mu\text{s}$ , depends on the clock rate and the data length
<b>Data refresh rate</b>	$\leq 1\ \mu\text{s}$
<b>Note:</b>	<ul style="list-style-type: none"> <li>– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings</li> <li>– CRC data verification</li> </ul>

Status output	
<b>Output driver</b>	open collector, internal pull up resistor 22 kOhm
<b>Permissible load</b>	max. 20 mA
<b>Signal level</b>	HIGH +V LOW $< 1\text{ V}$
<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.	

Incremental outputs (A/B)		
	SinCos	RS422 TTL compatible
<b>Max. frequency</b> -3dB	400 kHz	400 kHz
<b>Signal level</b>	1 Vpp ( $\pm 20\%$ )	HIGH: min. 2.5 V LOW: max. 0.5 V
<b>Short circuit proof</b>	yes <sup>1)</sup>	yes <sup>1)</sup>
<b>Pulse rate</b>	2048 ppr	2048 ppr

SET input	
<b>Input</b>	active HIGH
<b>Input type</b>	comparator
<b>Signal level</b>	HIGH min. 60 % of +V, max: +V (+V = power supply) LOW max. 30 % of +V
<b>Input current</b>	$< 0,5\text{ mA}$
<b>Min. pulse duration</b> (SET)	10 ms
<b>Input delay</b>	1 ms
<b>New position data readable after</b>	1 ms
<b>Internal processing time</b>	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. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction 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.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
<b>Response time</b> (DIR input)	1 ms

Power-ON Time	
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.	

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

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## Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 3, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥			
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	shield			
1, 2	8	SET, DIR	M12 connector, 8-pin													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥				
			Pin:	1	2	3	4	5	6	7	8	PH				
3, 4	1, 3, F	SET, DIR, 2048 SinCos	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\bar{A}$	B	$\bar{B}$	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
5	1, 3, F	SET, DIR, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V <sub>sens</sub>	+V <sub>sens</sub>	⊥		
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield		
6	1, 3, F	2048 SinCos, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	0 V <sub>sens</sub>	+V <sub>sens</sub>	A	$\bar{A}$	B	$\bar{B}$	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
7, 8	1, 3, F	2048 incr. RS422	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	A	$\bar{A}$	B	$\bar{B}$	⊥		
			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 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A,  $\bar{A}$ : Incremental output channel A (cosine)
- B,  $\bar{B}$ : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

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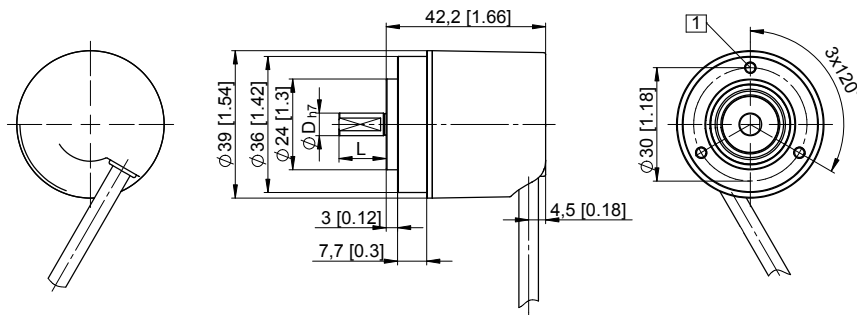
## Dimensions shaft version

Dimensions in mm [inch]

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

1 3 x M3, 6 [0.24] deep

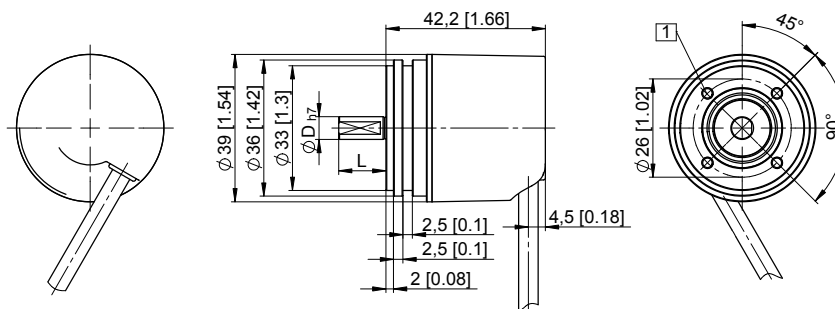
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7



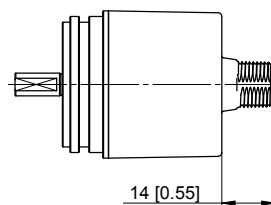
### Synchro flange, $\varnothing$ 36 [1.42]

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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## Dimensions hollow shaft version

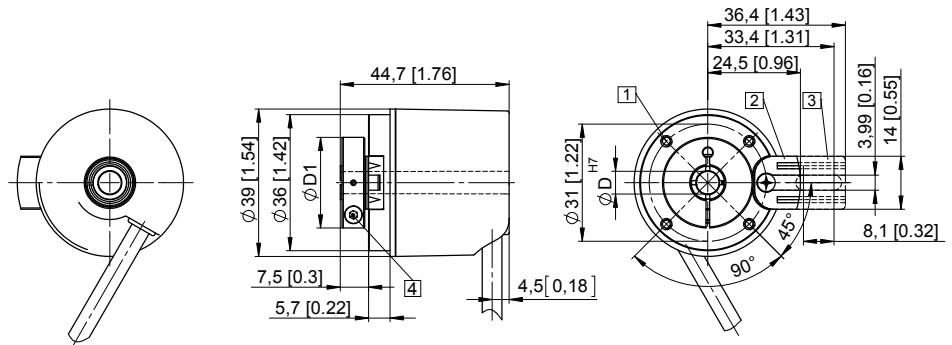
Dimensions in mm [inch]

### Flange with spring element

#### Flange type 1 and 3

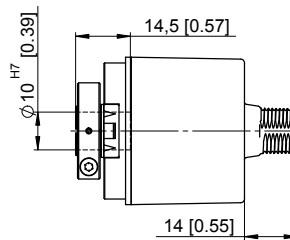
(drawing with spring element short, spring element long is shown dashed)

- 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]

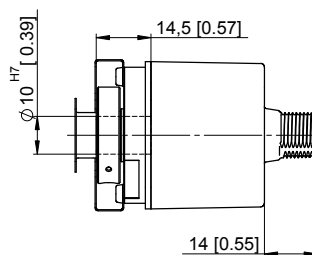
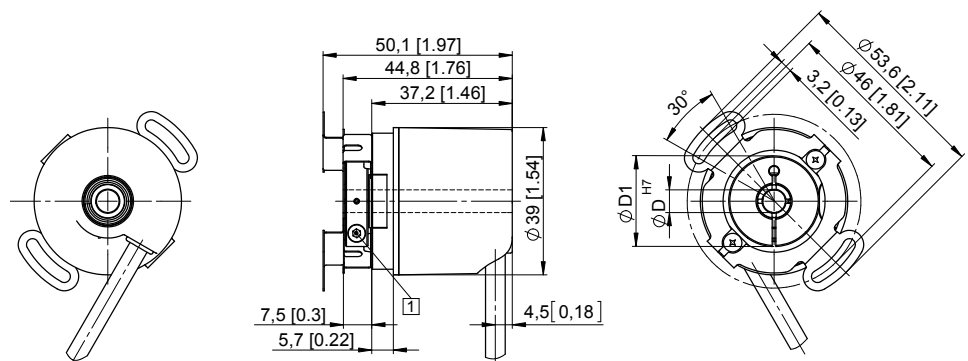


Drawing with M12 connector  
Type of connection 8

### 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]