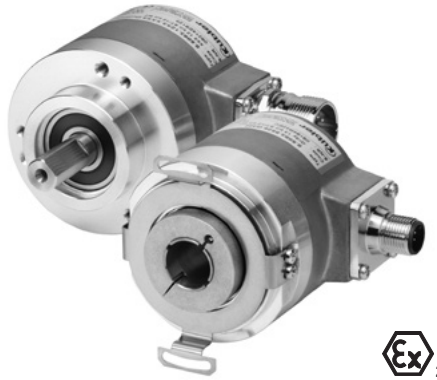
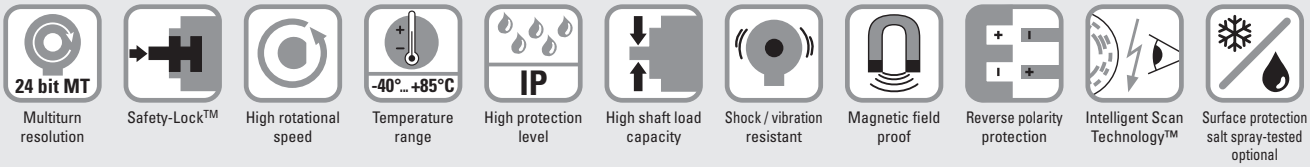
Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

41 bits total resolution, through hollow shaft up to 15 mm and versions with additional SinCos or RS422 incremental track.



Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and 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 +85°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F5863 . X X X X . X X X X
Type — a b c d — e f g h

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

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
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 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin 3)
6 = radial M12 connector, 8-pin 3)

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5863.122A.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)* 4)
B = 9 bit ST
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn)* 4)
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 5)
- surface protection salt spray tested
- other singleturn resolutions

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) Can be combined only with interface 1 and 2.
4) Resolution, preset value and counting direction factory-programmable.
5) For the cable connection type, cable material PUR.

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.F5883 . X X X X . X X X X
Type — a b c d — e f g h

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

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65, ø 65 mm [2.56"]
4 = with stator coupling, IP67, ø 65 mm [2.56"]
5 = with stator coupling, IP65, ø 63 mm [2.48"]
6 = with stator coupling, IP67, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
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 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin [2)]

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5883.542B.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

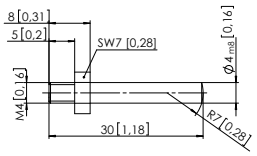
f *Resolution (singleturn) [1)]*
B = 9 bit ST
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn) [1)]*
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [3)]
- surface protection salt spray tested
- other singleturn resolutions

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

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.

1) Resolution, preset value and counting direction factory-programmable.
2) Can be combined only with Interface 1 and 2.
3) For the cable connection type, cable material PUR.

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] [1]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
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

Electrical characteristics

Power supply		5 V DC (+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 (at 10 ... 30 V DC)
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 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.

BiSS interface

Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary
BiSS clock rate	50 kHz ... 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

Status output and LED

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 optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm).

An active status output (LOW) displays:
- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 2048 ppr

	SinCos	**RS422 TTL-compatible**
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes [2]	yes [2]

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 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 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.

1) Cable version: -30°C ... + 75°C [-22°F ... +167°F].
2) Short circuit to 0 V or to output; if power supply correctly applied.

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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.

Response time (DIR input) 1 ms

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.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
1, 2	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
5	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
3, 4, 7, 8	3, 4	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	1, 2, A, B, E, F	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

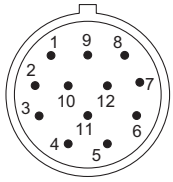
Interface	Type of connection	Features	M23 connector, 12-pin													
6	3, 4	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector, 8-pin										
1, 2	5, 6	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚	
			Pin:	1	2	3	4	5	6	7	8	PH	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: 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, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

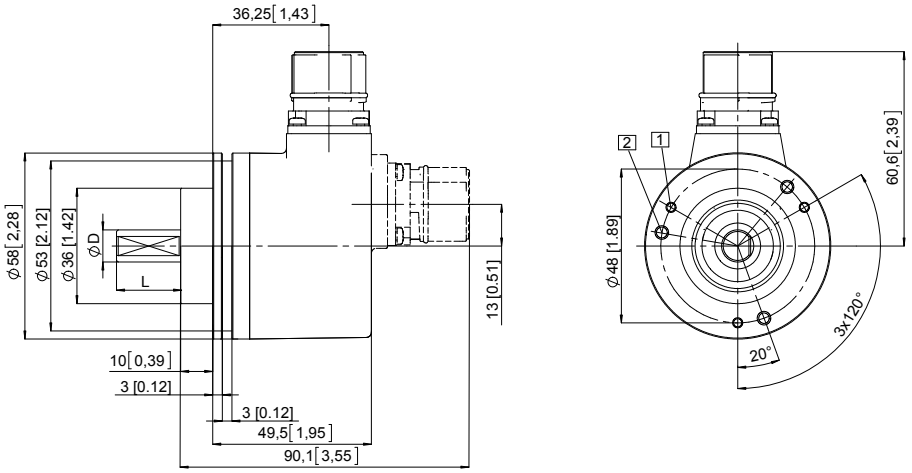
Standard electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with M23 connector)

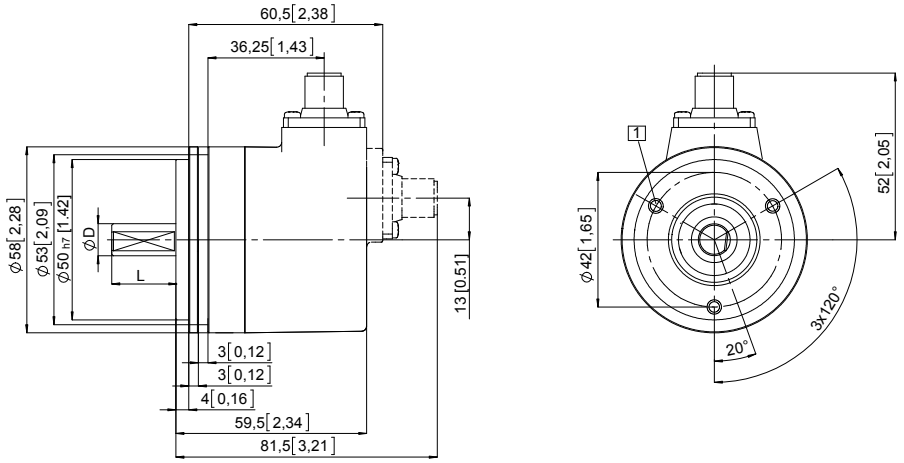
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep



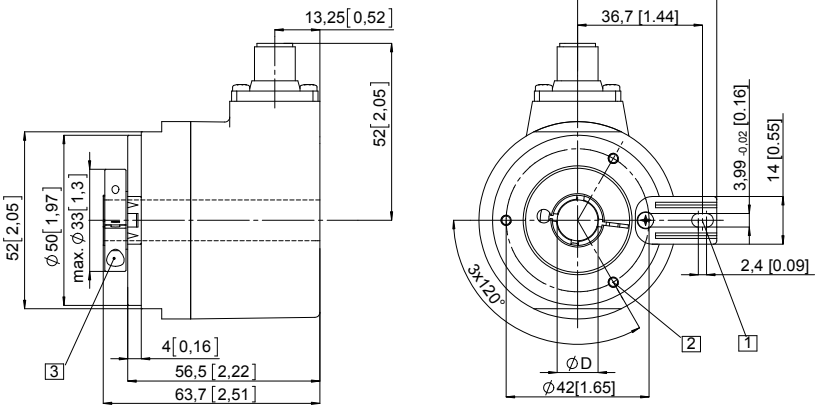
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Standard electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

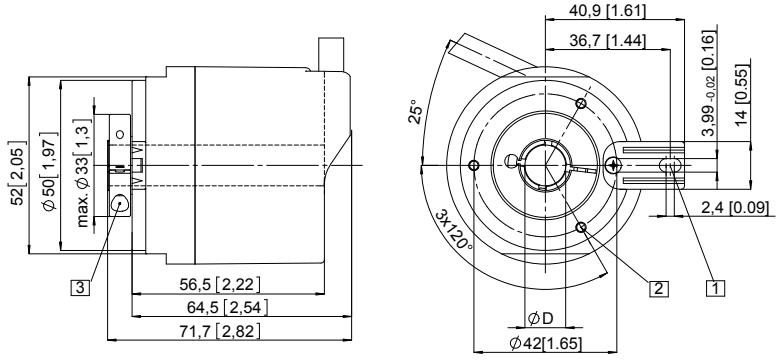
Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)



1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

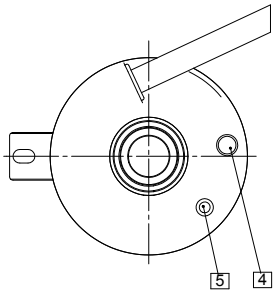
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

(drawing with tangential cable)



1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7



4 Status-LED
5 SET button

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

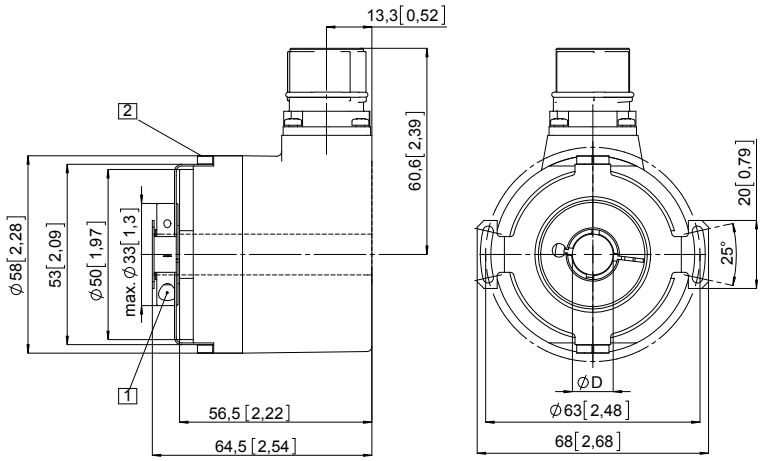
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws
63 mm [2.48]
(drawing with M23 connector)

1 Recommended torque for the clamping ring 0.6 Nm

2 Fixing screws (4x) DIN 912 M3 x 8 (washer included in delivery)



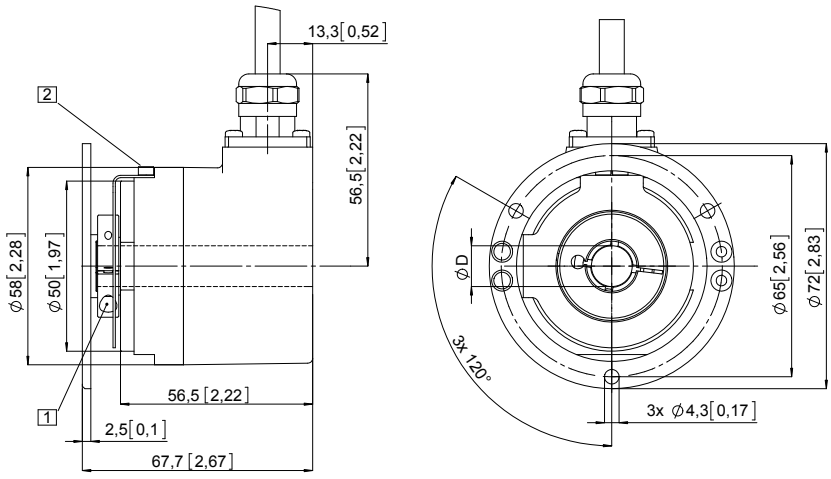
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

Pitch circle diameter for fixing screws
65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm

2 Fixing screws (2x) DIN 912 M3 x 8 (washer included in delivery)



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7