Absolute Singleturn Encoders | **Sendix absolut** | **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.

Safety-Lock™ | High rotational speed | Temperature -40° +90° | High IP value | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN / COS

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 ≤ 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 up to 10 MHz

Order code Shaft version

8.F3653 . X X X X . X X 1 X
Type ❶❷❸❹ ❺❻ ❼

❶ Synchro flange
2 = IP67, ø 36 mm
4 = IP65, ø 36 mm

❷ 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

❸ 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

❹ 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)

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

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

❼ Inputs/Outputs
2 = SET, DIR inputs / Status output

Preferred types are underlined

Order code Hollow shaft

8.F3673 . X X X X . X X 1 X
Type ❶❷❸❹ ❺❻ ❼

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

❷ Hollow shaft (ø x L)
1 = 6 mm
2 = 6,35 mm
3 = 8 mm
4 = 10 mm (Blind hollow shaft)

❸ 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

❹ 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)

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

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

❼ Inputs/Outputs
2 = SET, DIR inputs / Status output

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.

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 ... +90°C
Cable type:	fixed flexible	-30°C -20°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^2, 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6		>100 m/s^2, 55 ... 2000 Hz

General electrical characteristics:

Supply voltage		5 V DC + 5% od. 10 ... 30 V DC
Current consumption (no load)	5 V DC 24 V DC	max. 70 mA max. 20 mA
Reverse connection of the supply voltage		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

Interfaces

General interface characteristics

Output driver		RS 485 transceiver type
Permissible load/channel		max. + 30 mA
Signal level	high low with ILast = 20 mA	typ 3,8 V typ 1,3 V
Short-circuit proof outputs		yes [1]

SSI interface

Resolution, singleturn		10 ... 17 bit
Code		Binary or Gray
SSI clock rate	< 14 bit > 15 bit	50 kHz ... 2 MHz 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	up to 14 bit up to 15 ... 17 bit	< 1 µs 4 µs
Status and Parity Bit		on request

BiSS interface

Resolution, singleturn	10 ... 17 bit
Code	Binary
BiSS 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, programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Incremental outputs (A/B), 2048 ppr

	Sine/Cosine	RS 422 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 [1]	yes [1]

SET input

Input		active high
Input type		comparator
Signal level (V+ = supply voltage)	high low	min. 60 % of V+, max: V+ max. 30 % of V+
Input current		< 0,5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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.

Response time (DIR input)		1 ms

Status output

Output driver		Open collector, internal pull up resistor 22 kOhm
Permissible load		-20 mA
Signal level	high low	+V < 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 delay

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

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

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Terminal assignment

Interface	Type of connection	Features	Cable										
1, 2	1,2	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	1,2	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	1,2	SSI or BiSS, SET, DIR, Sensor outputs	Signal:	GND	+V	+C	-C	+D	-D	SET	DIR	0 V_{sens}	+V_{sens}	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	RD-BU	VT	Shield

Interface	Type of connection	Features	Cable													
6	1,2	SSI or BiSS, SET DIR, 2048 Sin/Cos Sensor outputs	Signal:	GND	+V	+C	-C	+D	-D	0 V_{sens}	+V_{sens}	A	A inv	B	B inv	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield

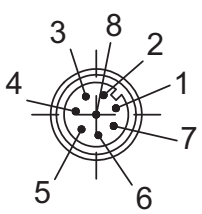
Interface	Type of connection	Features	Cable											
7,8	1,2	SSI or BiSS, SET, DIR, 2048 Sin/Cos	Signal:	GND	+V	+C	-C	+D	-D	A	A inv	B	B inv	PE
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	VT	RD	RD-BU	Shield

+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

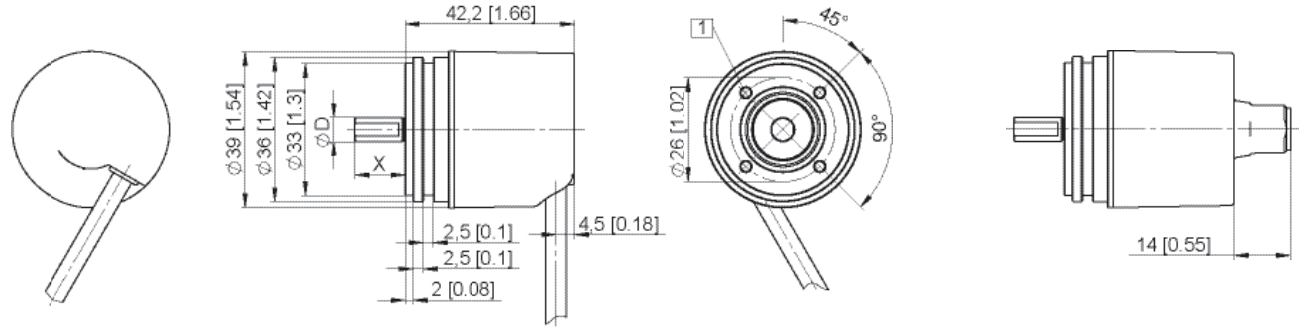
Top view of mating side, male contact base: 8-pin M12 connector



Corresponding mating connector: 05.CMB-8181-0

Dimensions shaft version:

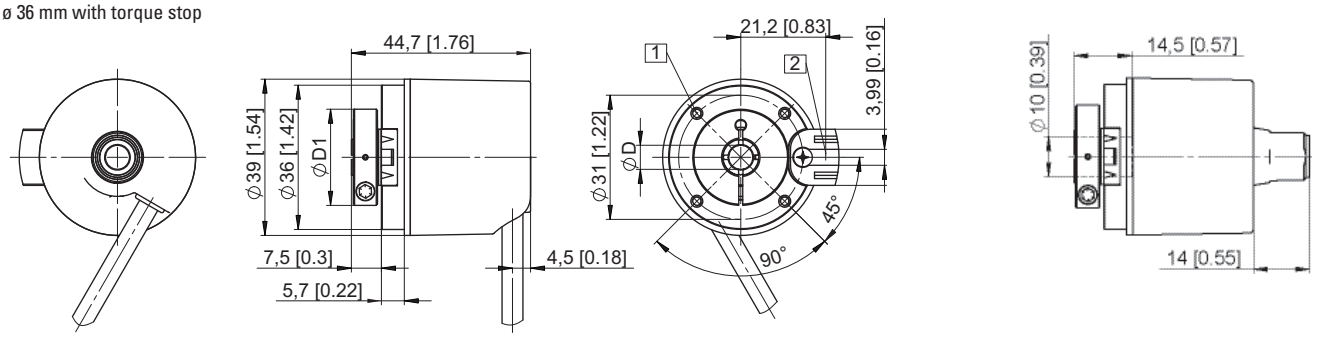
Synchro flange, ø 36 mm, cable or connector version



1 4 x M3, 6 [0.24] deep

Dimensions hollow shaft version:

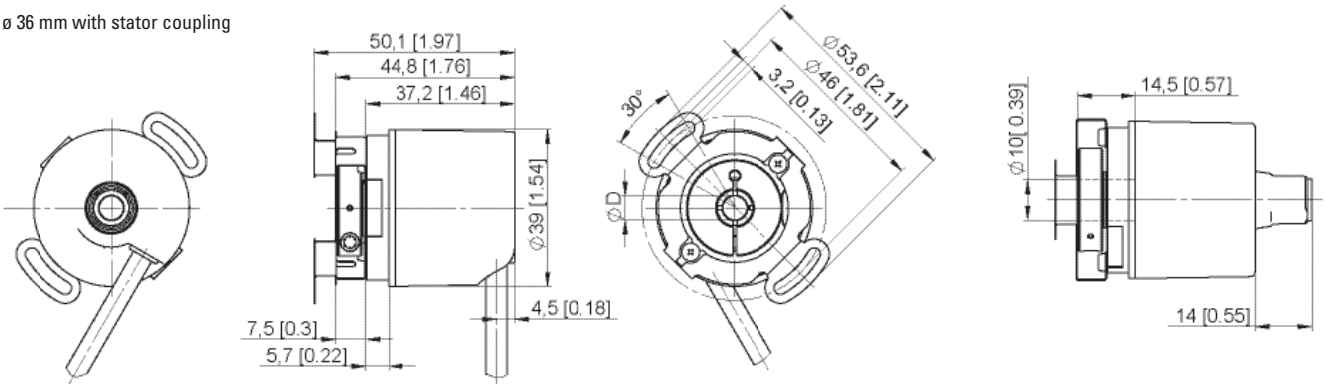
ø 36 mm with torque stop



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

1 4 x M3, 6 [0.24] deep

ø 36 mm with stator coupling



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