Rotary Position Technology
Absolute Encoders, Singleturn

TURCK Industrial Automation

Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS-C

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS | Optical sensor | Seawater-resistant version on request

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure **eliminates machine downtime and repairs.**
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- Die cast housing and protection up to IP67: **Remains sealed even when subjected to harsh everyday use.**
- Wide temperature range of -40 to +194°F (-40 to +90°C).
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.

Sendix® absolute

SSI

BiSS INTERFACE

RoHS cULus pending Ex 2/22

Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz for a max. jitter of 1 µs (real-time).
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS-C up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

Versatile

- **Connections for every application:** Tangential cable or M12 connector.
- **Open interfaces ensure flexibility and independence:** SSI or BiSS-C with Sine-Cosine-Option incremental track RS422.
- Multiple mounting brackets for easy installation.
- **Compact design.**
- **Fast and easy start-up on site:** Preset and reversal of rotation direction by control inputs.
- **Direct mounting on standard diameter shafts up to 10 mm** through hollow shaft up to 8 mm.

Mechanical characteristics:

Max. speed: Shaft or blind hollow shaft version without shaft sealing (IP65): Shaft version (IP67) or blind hollow shaft (IP65) with shaft sealing:	12,000 RPM, continuous operation 10,000 RPM 10,000 RPM, continuous operation 8,000 RPM
Starting torque without shaft sealing:	< 1 oz-in (< 0.007 Nm)
Starting torque with shaft sealing:	< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:	9 lbs (40 N)
Axial load capacity of shaft:	4.5 lbs (20 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +194°F (-40 to +90°C)
Materials:	Shaft/Hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	> 250g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (>100 m/s²), 55-2,000 Hz

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General electrical characteristics:

Supply voltage:	5 VDC ± 5 % or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 60 mA, 10-30 VDC: max. 30 mA
Reverse polarity protection at power supply (+V):	yes
Conforms to CE requirements according to EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3	
RoHS compliant according 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
Signal level low at I_{load} = 20 mA:	typ. 1.3 V
Short-circuit proof outputs:	yes [1]

Interface characteristics SSi:

Singleturn resolution:	10-17 bit
Code:	Binary or Gray
SSI clock rate:	≤ 14 bit: 50 kHz-2 MHz ≥ 15 bit: 50 kHz-125 kHz
Monoflop time:	≤ 15 µs
Note: If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Max. update rate is dependent on clock speed, data length and monoflop time.	
Time jitter (data request to position latch):	≤ 1 µs up to 14 bits, 4 µs up to 15-17 bits
Status and Parity bit:	optional on request

Interface characteristics BiSS-C:

Singleturn resolution:	10-17 bit
Code:	Binary
Clock rate:	up to 10 MHz
Max. update rate:	< 10 µs, depending on clock speed and data length
Time jitter (data request to position latch):	≤ 1 µs

Note:
- Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Incremental output (A/B). 2048 ppr:

	Sin/Cos	RS 422 (TTL compatible)
Max. -3dB frequency:	400 kHz	400kHz
Signal level:	1 Vpp (± 20%)	high: min. 2.5 V low: max. 0.5 V
Short-circuit proof:	yes [1]	yes [1]

[1] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied

SET input:

Input characteristics:	active HIGH
Input type:	comparator
Signal level high:	min. 60 % of V+ (supply voltage), max: V+
Signal level low:	max. 30 % of V+ (supply voltage)
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 delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 200 ms before the new position data can be read. During this time the supply voltage must not be switched off. The set function should only be carried out when 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 LED will come ON and the status output will switch to LOW.

Status output:

Output driver:	Open collector, internal pull up resistor 22 kOhm
Permissible load:	max 20 mA
Signal level high:	+V
Signal level low:	< 1 V
Active at:	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 22k).

An active status output (LOW) indicates:
- LED error (failure or aging)
- 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. Hot swapping of the encoder should be avoided.

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Pin configuration:

Interface 1 and 2 (SSI or BiSS-C, SET, DIR, Status) (Connection 1, 3)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Status	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	Shield

Interface 1 and 2 (SSI or BiSS-C, SET, DIR) (Connection 8)

Signal:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Sheild/PE
M12 pin:	1	2	3	4	5	6	7	8	PH

Interface 3 and 4 (SSI or BiSS-C, SET, DIR, 2048 Sin/Cos) (Connection 1, 3)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 5 (SSI or BiSS-C, SET, DIR, voltage sense outputs) (Connection 1, 3)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	0 V sens	+V sens	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD/BU	Shield

Interface 6 (SSI or BiSS-C, SET, DIR, 2048 Sin/Cos, voltage sense outputs) (Connection 1, 3)

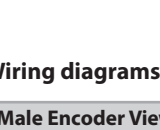
Output:	GND	+V	+Clock	-Clock	+Data	-Data	0 V sens	+V sens	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 7 and 8 (SSI or BiSS-C, SET, DIR, 2048 inc. RS422) (Connection 1, 3)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BK	VT	GY/PK	RD/BU	Shield

Wiring diagrams:

Male Encoder View



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-264-*

* Length in meters.

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Part number key: F3653 shaft version

T8.F3653.XXXX.XX12

Type

Flange

1 = clamping flange, IP67
2 = servo flange Ø 36 mm, IP67
3 = clamping flange, IP65
4 = servo flange Ø 36 mm, IP65

Shaft (Ø x L)

1 = Ø 6 mm x 12.5 mm
2 = Ø 6.35 mm (1/4") x 12.5 mm
3 = Ø 8 mm x 15 mm
4 = Ø 9.525 mm (3/8") x 15.875 mm (5/8")
5 = Ø 10 mm x 20 mm

Voltage supply and output

1 = 5 VDC, SSI or BiSS-C-C
2 = 10-30 VDC, SSI or BiSS-C-C
3= 5 VDC, SSI or BiSS-C-C, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS-C-C, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS-C-C with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS-C-C, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS-C-C and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS-C-C and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input (additional status output)

Options (service)

1 = no option

Resolution

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

Code

B = SSI, binary
C = BiSS-C, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)
8 = axial 8-pin M12 ***eurofast*** connector (only for output types 1 and 2)

Part number key: F3673 blind / hollow shaft version

T8.F3673.XXXX.XX12

Type

Flange

1 = torque stop short Ø 36 mm, IP65
2 = slotted flex mount Ø 36 mm, IP65
3 = torque stop long Ø 36 mm, IP65

Hollow shaft

1 = Ø 6 mm
2 = Ø 6.35 mm (1/4")
3 = Ø 8 mm
4 = Ø 10 mm blind hollow shaft (14.5 mm depth)

Voltage supply and output

1 = 5 VDC, SSI or BiSS-C
2 = 10-30 VDC, SSI or BiSS-C
3= 5 VDC, SSI or BiSS-C, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS-C, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS-C with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS-C, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS-C and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS-C and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input (additional status output)

Options (service)

1 = no option

Resolution

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

Code

B = SSI, binary
C = BiSS-C, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)
8*=axial 8-pin M12 ***eurofast*** connector (only for output types 1 and 2)

* Only for the blind hollow shaft, option 4

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

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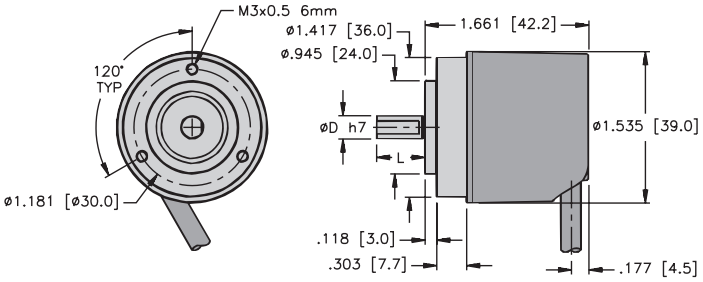
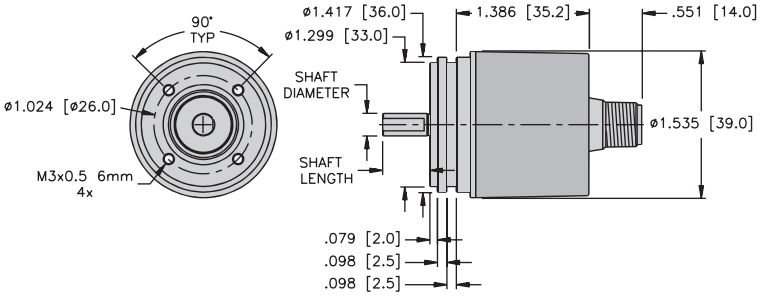
Dimensions: F3653 shaft version

F3653 flange 1 & 3
Cable connection 1 & 3



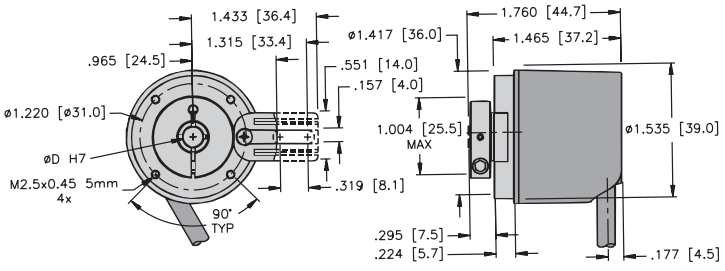
F3653 flange 2 & 4
M12 *eurofast*® connection 8



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

Dimensions: F3673 hollow shaft version

F3673 flange 1 & 3 (dotted)
Cable connection 1 & 3



F3673 flange 2 (blind hollow shaft)
M12 *eurofast* connection 8