

Absolute Encoders – Singleturn

Compact, optical

Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS

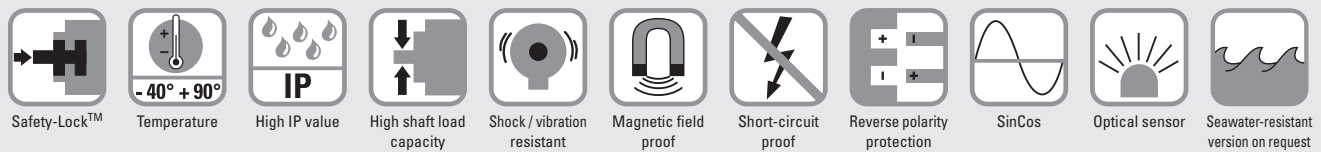


The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS. interface boasts exceptional ruggedness and compact dimensions. With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.

Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.



Recipients of the MessTec & Sensor Master 2010 Award and the Golden Mousetrap Award 2009.



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 41 bits and 100% magnetic field insensitiveness

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 8.F3653 . XXXX . XX 12
Shaft version Type

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.



- a** Flange, ø 36 mm
 1 = clamping flange, IP67
 2 = synchro flange, IP67
 3 = clamping flange, IP65
4 = synchro flange, IP65
- b** Shaft (ø x L), with flat
 1 = ø 6 x 12,5 mm
 2 = ø 6,35 (1/4") x 12,5 mm
3 = ø 8 x 15 mm
 4 = ø 9,5 x 15,875 mm (3/8" x 5/8")
 5 = ø 10 x 20 mm

- c** SSI or BiSS Interface / Power supply
 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

- d** Type of connection
1 = cable, tangential (1 m PUR)
 3 = cable, tangential (5 m PUR)
 8 = M12 connector, 8-pin, axial ¹⁾

- e** Code
 B = SSI, Binary
 C = BiSS, Binary
G = SSI, Gray

- f** Resolution
 A = 10 bit ST
 2 = 12 bit ST
3 = 13 bit ST
 4 = 14 bit ST
 7 = 17 bit ST

optional on request
 - Ex 2/22
 - seawater-resistant
 - special cable length

Order code 8.F3673 . XXXX . XX 12
Hollow shaft Type

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.



- a** Flange, ø 36 mm, IP65
 1 = with torque stop, short
2 = with stator coupling
 3 = with torque stop, long
- b** Hollow shaft
 1 = ø 6 mm
 2 = ø 6.35 mm (1/4")
 3 = ø 8 mm
4 = ø 10 mm
 (Blind hollow shaft)

- c** SSI or BiSS Interface / Power supply
 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
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G = SSI, Gray

- f** Resolution
 A = 10 bit ST
 2 = 12 bit ST
3 = 13 bit ST
 4 = 14 bit ST
 7 = 17 bit ST

optional on request
 - Ex 2/22
 - seawater-resistant
 - special cable length

1) Only with output circuits 1 and 2

2) Only with output circuits 1 and 2 in combination with blind hollow shaft 10 mm

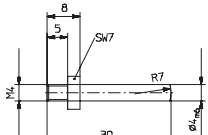
Absolute Encoders – Singleturn

| | | |
|-------------------------|--|-------------------|
| Compact, optical | Sendix F3653 / F3673 (Shaft / Hollow shaft) | SSI / BiSS |
|-------------------------|--|-------------------|

Mounting accessory for shaft encoders

| | | |
|-----------------|---|-------------------------|
| Coupling | Bellows coupling \varnothing 19 mm for shaft 8 mm | 8.0000.1101.0808 |
|-----------------|---|-------------------------|

Mounting accessory for hollow shaft encoders

| | | |
|--|---|-------------------------|
| Cylindrical pin, long for torque stops |  | 8.0010.4700.0000 |
|--|---|-------------------------|

Connection Technology

| | | |
|--|-------------------------------------|-----------------------|
| Connector, self-assembly (straight) | M12, suitable for connection type 8 | 05.CMB 8181-0 |
| Cordset, pre-assembled with 2 m PVC cable | M12, suitable for connection type 8 | 05.WAKS8-2/P00 |

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.

| 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 (IP67) or hollow shaft version (IP65) 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. IP67) |
| EX approval for hazardous areas | | optional Zone 2 and 22 |
| Working temperature range | | -40°C ... +90°C |
| Materials | shaft / hollow shaft flange housing cable | stainless steel aluminium zinc die-cast 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 |

| General electrical characteristics | | |
|---|--------------------------|---|
| Supply voltage | | 5 V DC \pm 5% or 10 ... 30 V DC |
| Current consumption (no load) | 5 V DC 10 ... 30 V DC | max. 60 mA max. 30 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 | | EU guideline 2002/95/EG |

Interfaces

General interface characteristics

| | |
|------------------------------------|--|
| 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 |
| Short-circuit proof outputs | yes ¹⁾ |

SSI interface

| | |
|---|--|
| Resolution, singleturn | 10 ... 17 bit |
| Code | Binary or Gray |
| SSI clock rate | \leq 14 bit 50 kHz ... 2 MHz \geq 15 bit 50 kHz ... 125 kHz |
| 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 | up to 14 bit \leq 1 μ s up to 15 ... 17 bit 4 μ s |
| 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 μ s, depends on the clock rate and the data length |
| Data refresh rate | \leq 1 μ s |
| Note: – Bi-directional, 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 V _{pp} (\pm 20%) | high: min. 2.5 V low: max. 0.5 V |
| Short circuit proof | yes ¹⁾ | yes ¹⁾ |

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

Absolute Encoders – Singleturn

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Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS

SET input

| | | |
|--|-------------|--------------------------|
| Input | active high | |
| Input type | comparator | |
| Signal level (+V = supply voltage) | 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. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off. The SET function should be carried out whilst the encoder is at rest.

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.

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).

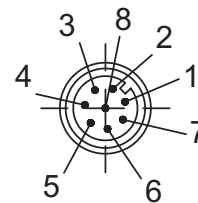
An active status output (LOW) displays:
LED fault (failure or ageing) – over-temperature – undervoltage
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

Terminal assignment

| Interface | Type of connection | Features | Cable |
|-----------|--------------------|---|--|
| 1, 2 | 1, 3 | 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 VT Shield |
| 1, 2 | 8 | SSI or BiSS, SET, DIR | M12 connector |
| | | | M12 connector: 1 2 3 4 5 6 7 8 PH |
| 3, 4 | 1, 3 | SSI or BiSS, SET, DIR, 2048 SinCos | Signal: GND +V +C -C +D -D SET DIR A A inv B B inv PE |
| | | | Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU Shield |
| 5 | 1, 3 | SSI or BiSS, SET, DIR, Sensor outputs | Signal: GND +V +C -C +D -D SET DIR GND _{sens} +V _{sens} PE |
| | | | Cable colour: WH BN GN YE GY PK BU RD VT RD-BU Shield |
| 6 | 1, 3 | SSI or BiSS, 2048 SinCos Sensor outputs | Signal: GND +V +C -C +D -D GND _{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 |
| 7, 8 | 1, 3 | SSI or BiSS, 2048 incr. RS422 | Signal: GND +V +C -C +D -D A A inv B B inv PE |
| | | | Cable colour: WH BN GN YE GY PK BK VT GY-PK 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, A inv: Incremental output channel A
- B, B inv: Incremental output channel B

Top view of mating side, male contact base:



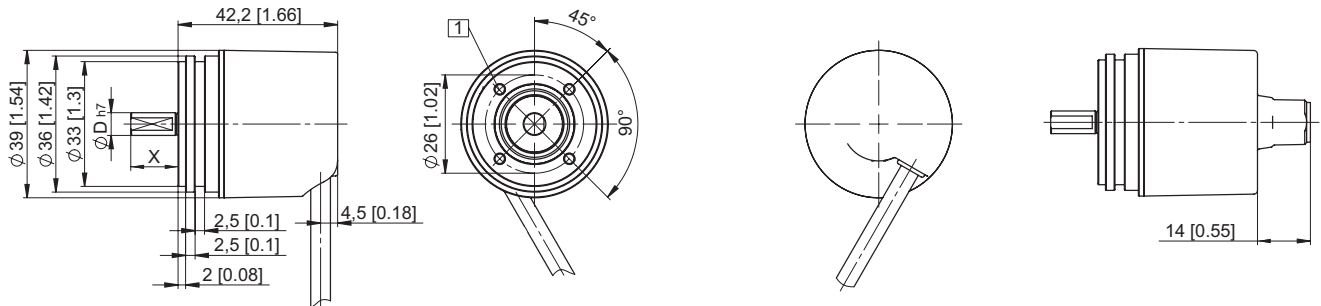
M12 connector, 8-pin

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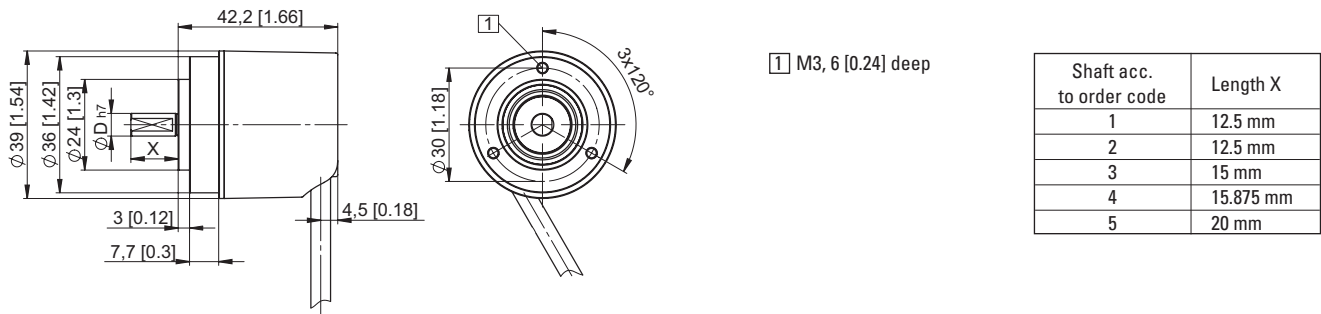
| | | |
|-------------------------|--|-------------------|
| Compact, optical | Sendix F3653 / F3673 (Shaft / Hollow shaft) | SSI / BiSS |
|-------------------------|--|-------------------|

Dimensions shaft version:

Synchro flange, \varnothing 36 mm



Clamping flange, \varnothing 36 mm

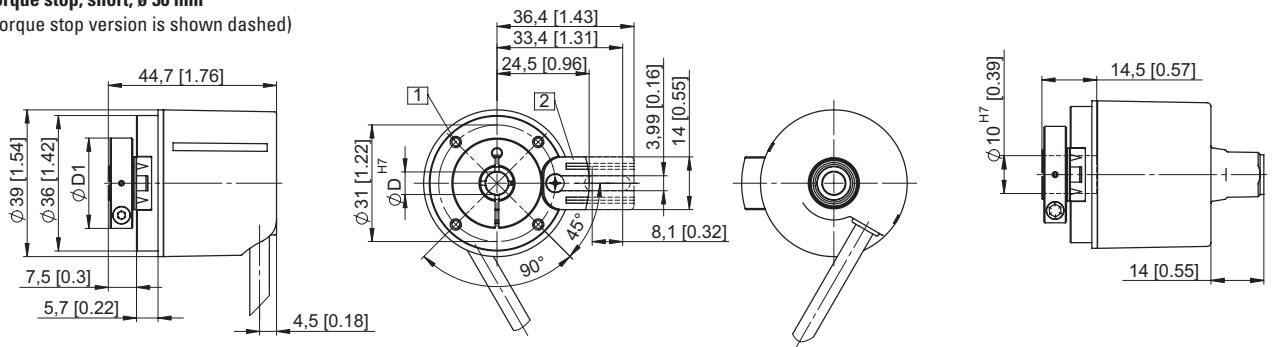


Absolute Encoders
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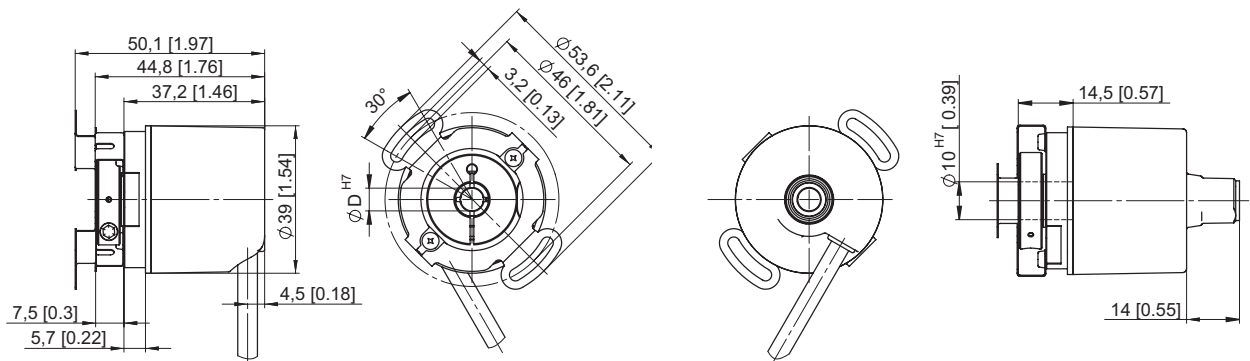
Dimensions hollow shaft version:

With torque stop, short, \varnothing 36 mm

(Long torque stop version is shown dashed)



With stator coupling, \varnothing 36 mm



Insertion depth for blind hollow shaft 14,5 mm

- 1 M2.5, 5 [0.2] deep
- 2 Torque stop slot, Recommendation: Cylindrical pin DIN7, \varnothing 4 mm

| Hollow shaft acc. to order code | D1 |
|---------------------------------|-----------------------|
| 1 | \varnothing 24 mm |
| 2 | \varnothing 24 mm |
| 3 | \varnothing 25.5 mm |
| 4 | \varnothing 25.5 mm |