**Compact electronic Multiturn, optical** | **Sendix F3663 / F3683 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

**The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.**
**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.**


Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor | Seawater-resistant version on request

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors
- Reduced number of components ensures magnetic insensitivity
- IP67 protection and wide temperature range -40°C ... +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 data refresh rate of the position value ≤ 1µs
- 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-C up to 10 MHz

## Order code Shaft version

8.F3663 . X X X X . X X X 2
Type
a b c d e f g

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, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
**4 = synchro flange, IP65, ø 36 mm [1.42"]**

**b** *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
**3 = ø 8 x 15 mm [0.32 x 0.59"]**
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

**c** *Interface / Power supply*
1 = SSI or BiSS-C / 5 V DC
**2 = SSI or BiSS-C / 10 ... 30 V DC**
3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

**d** *Type of connection*
**1 = cable, tangential, 1 m [3.28'] PUR**
3 = cable tangential, 5 m [16.40'] PUR
5 = cable, tangential, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin [1)]

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

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

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

optional on request
- seawater-resistant
- special cable length

1) Only with interface 1 and 2

# Absolute Encoders – Multiturn

**Compact electronic Multiturn, optical** | **Sendix F3663 / F3683 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

## Order code Hollow shaft

8.F3683 . X X X X . X X X 2
Type
a b c d e f g

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 short, IP65
3 = with spring element long, IP65
**2 = with stator coupling, ø 46 mm [1.81"]**

**b** *Hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
**4 = ø 10 mm [0.39"], blind hollow shaft**
2 = ø 1/4"

**c** *Interface / Power supply*
1 = SSI or BiSS-C / 5 V DC
**2 = SSI or BiSS-C / 10 ... 30 V DC**
3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

**d** *Type of connection*
**1 = cable, tangential, 1 m [3.28'] PUR**
3 = cable tangential, 5 m [16.40'] PUR
5 = cable, tangential, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin [1)]

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

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

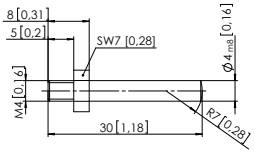
**g** *Resolution (Multiturn)*
**2 = 12 bit MT**
6 = 16 bit MT
4 = 24 bit MT

optional on request
- seawater-resistant
- special cable length

## Mounting accessory for shaft encoders

| | | Order No. |
|---|---|---|
| **Coupling** | Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"] | **8.0000.1101.0808** |

## Mounting accessory for hollow shaft encoders

| | | | Order No. |
|---|---|---|---|
| **Cylindrical pin, long**<br>for torque stops |  | With fixing thread | **8.0010.4700.0000** |

## Connection technology

| | | Order No. |
|---|---|---|
| **Connector, self-assembly (straight)** | M12 female connector with coupling nut | **05.CMB 8181-0** |
| **Cordset, pre-assembled** | M12 female connector with coupling nut, 2 m [6.56'] PUR cable | **05.00.6051.8211.002M** |

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

## Technical data

### Mechanical characteristics

| | | |
|---|---|---|
| **Maximum speed** | | |
| Shaft- or blind hollow shaft version without shaft seal (IP65) | | 12 000 min$^{-1}$<br>10 000 min$^{-1}$ (continuous) |
| Shaft version (IP67) or hollow shaft version (IP65) with shaft seal | | 10 000 min$^{-1}$<br>8 000 min$^{-1}$ (continuous) |
| **Starting torque** at 20°C [68°F] | without shaft seal<br>with shaft seal (IP67) | < 0.007 Nm<br>< 0.01 Nm |
| **Shaft load capacity** | radial<br>axial | 40 N<br>20 N |
| **Weight** | | approx. 0.2 kg [7.06 oz] |

| | | |
|---|---|---|
| **Protection** acc. to EN 60529 | housing side<br>shaft side | IP67<br>IP65<br>(solid shaft version opt. IP67) |
| **Working temperature range** | | -40°C ... +90°C<br>[-40°F ... +194°F] |
| **Materials** | shaft / hollow shaft<br>flange<br>housing<br>cable | stainless steel<br>aluminium<br>zinc die-cast<br>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 |

1) Only with output circuits 1 and 2

**Compact electronic Multiturn, optical** | **Sendix F3663 / F3683 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

## 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 (only with 10 ...30 V DC) |
| **Short-circuit proof outputs** | | yes [1] |
| **UL approval** | | File 224618 |
| **CE compliant** acc. to | | EMC guideline 2004/108/EC |
| **RoHS compliant** acc. to | | 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 with $I_{Load}$ = 20 mA | typ 1.3 V |
| **Resolution singleturn** | | 10 ... 17 bit |
| **Number of revolutions** | | max. 24 bit |
| **Code** | | Binary or Gray |
| **SSI clock rate** | | 50 kHz ... 2 MHz |
| **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** | ST resolution ≤ 14 bit | ≤ 1 µs |
| | ST resolution ≥ 15 bit | 4 µs |
| **Status and Parity bit** | | on request |

## BiSS-C interface

| | |
|---|---|
| **Resolution, singleturn** | 10 ... 17 bit |
| **Number of revolutions** | max. 24 bit |
| **Code** | Binary |
| **BiSS-C 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

## 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<br>LOW: max. 0.5 V |
| **Short circuit proof** | yes [1] | yes [1] |

## SET input

| | | |
|---|---|---|
| **Input** | | active HIGH |
| **Input type** | | comparator |
| **Signal level** | HIGH | min. 60 % of +V, max: +V |
| (+V = power supply) | 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-C. 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.

## Power ON delay

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.

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

**Compact electronic Multiturn, optical** | **Sendix F3663 / F3683 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

### Terminal assignment

| Interface | Type of connection | Features | Cable (Isolate unused wires individually before initial start-up) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1, 2 | 1, 3 | 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 |

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

| Interface | Type of connection | Features | Cable (Isolate unused wires individually before initial start-up) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3, 4 | 1, 3 | SET, DIR, 2048 SinCos | Signal: | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A | $\overline{A}$ | B | $\overline{B}$ | ⏚ |
| | | | Cable colour: | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY-PK | RD-BU | Shield |

| Interface | Type of connection | Features | Cable (Isolate unused wires individually before initial start-up) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1, 3 | SET, DIR, Sensor outputs | Signal: | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | 0 Vsens | +Vsens | ⏚ |
| | | | Cable colour: | WH | BN | GN | YE | GY | PK | BU | RD | VT | RD-BU | Shield |

| Interface | Type of connection | Features | Cable (Isolate unused wires individually before initial start-up) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1, 3 | 2048 SinCos, Sensor outputs | Signal: | 0 V | +V | C+ | C- | D+ | D- | 0 Vsens | +Vsens | A | $\overline{A}$ | B | $\overline{B}$ | ⏚ |
| | | | Cable colour: | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY-PK | RD-BU | Shield |

| Interface | Type of connection | Features | Cable (Isolate unused wires individually before initial start-up) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7, 8 | 1, 3 | 2048 incr. RS422 | Signal: | 0 V | +V | C+ | C- | D+ | D- | A | $\overline{A}$ | B | $\overline{B}$ | ⏚ |
| | | | 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 $V_{sens}$ / +$V_{sens}$: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
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
PH ⏚: Plug connector housing (Shield)

**Top view of mating side, male contact base**


M12 connector, 8-pin

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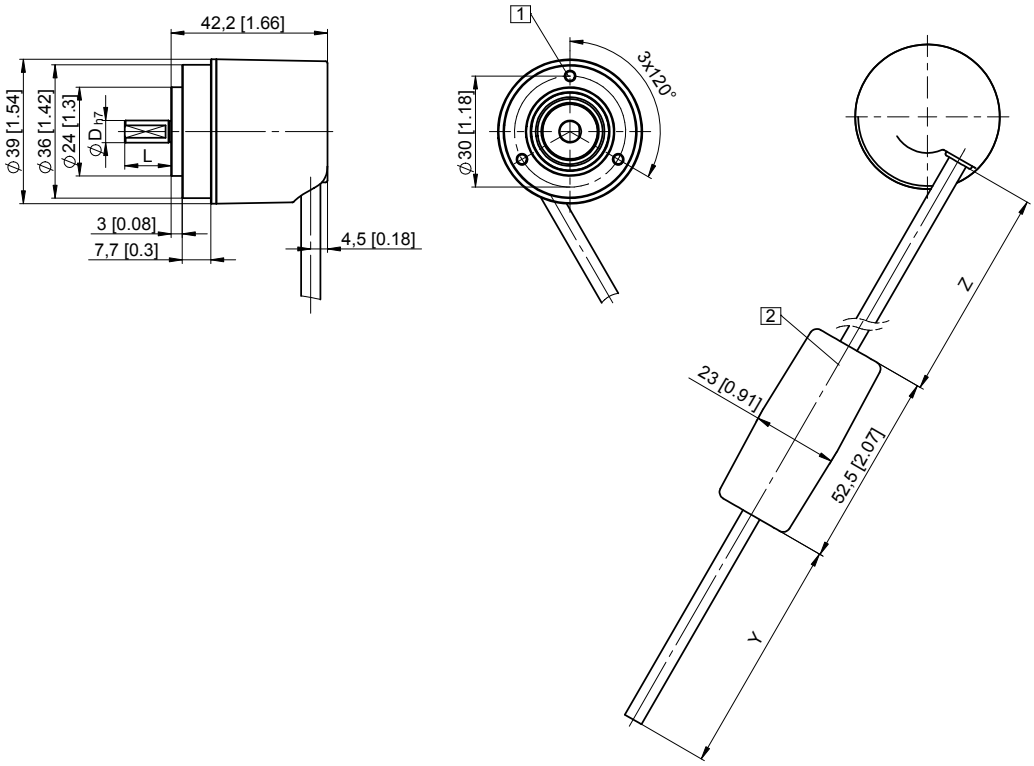
## Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange, ø 36 [1.42]**
**Flange type 1 and 3**

1 M3, 6 [0.24] deep
2 Battery (in the cable)

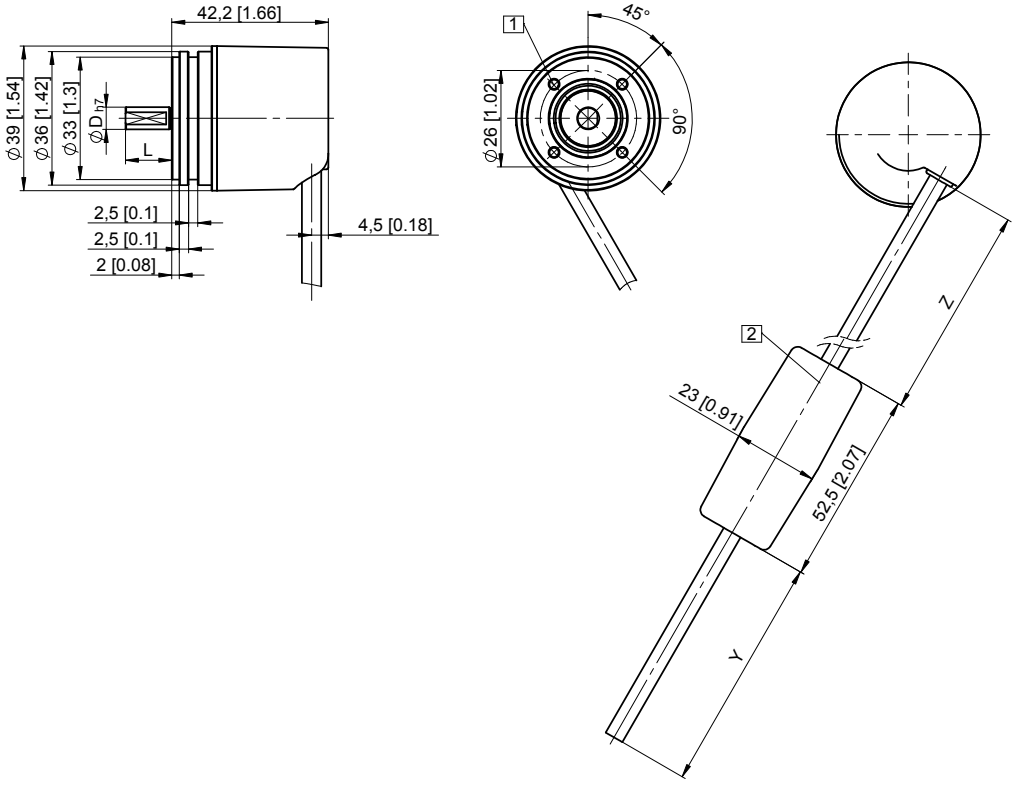



| D | L | Fit |
|---|---|---|
| 6 [0.24] | 12.5 [0.49] | h7 |
| 8 [0.32] | 15 [0.59] | h7 |
| 10 [0.39] | 20 [0.79] | h7 |
| 1/4" | 12.5 [0.49] | h7 |
| 3/8" | 5/8" | h7 |

| Y | Z |
|---|---|
| 1 m [3.28'] | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

**Synchro flange, ø 36 [1.42]**
**Flange type 2 and 4**
(Drawing with cable)

1 M3, 6 [0.24] deep
2 Battery (in the cable)




| 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 |

| Y | Z |
|---|---|
| 1 m [3.28'] | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

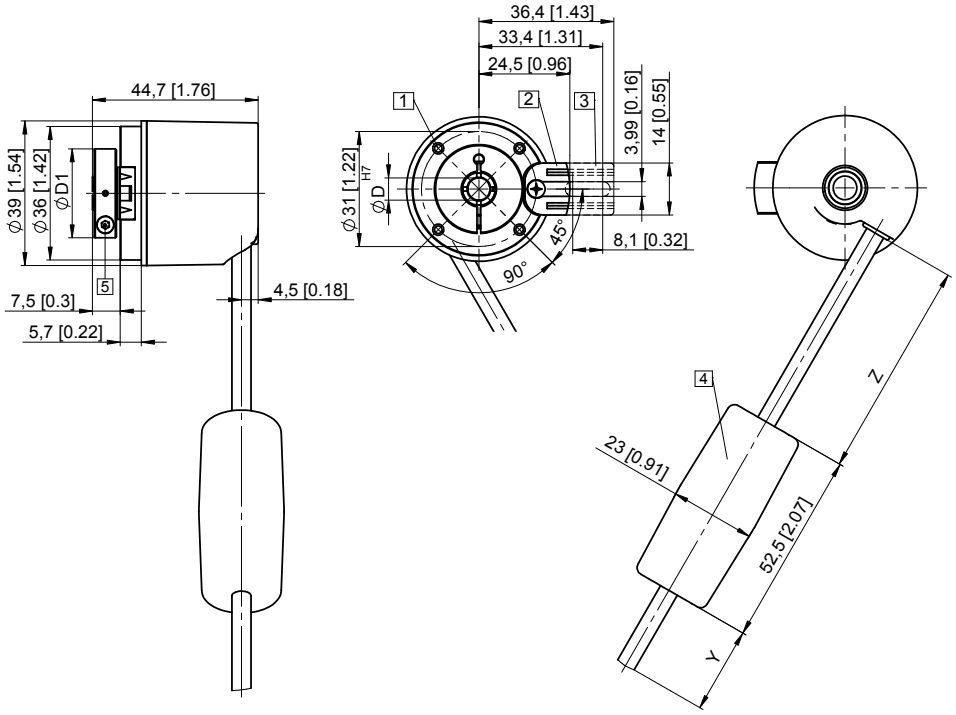
**Compact electronic Multiturn, optical** | **Sendix F3663 / F3683 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

## 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 [0.20] deep
2 Spring element short
Recommendation:
Cylindrical pin DIN 7, ø 4 [0.16]
3 Spring element long
Recommendation:
Cylindrical pin DIN 7, ø 4 [0.16]
4 Battery (in the cable)
5 Recommended torque for the clamping ring 0.6 Nm



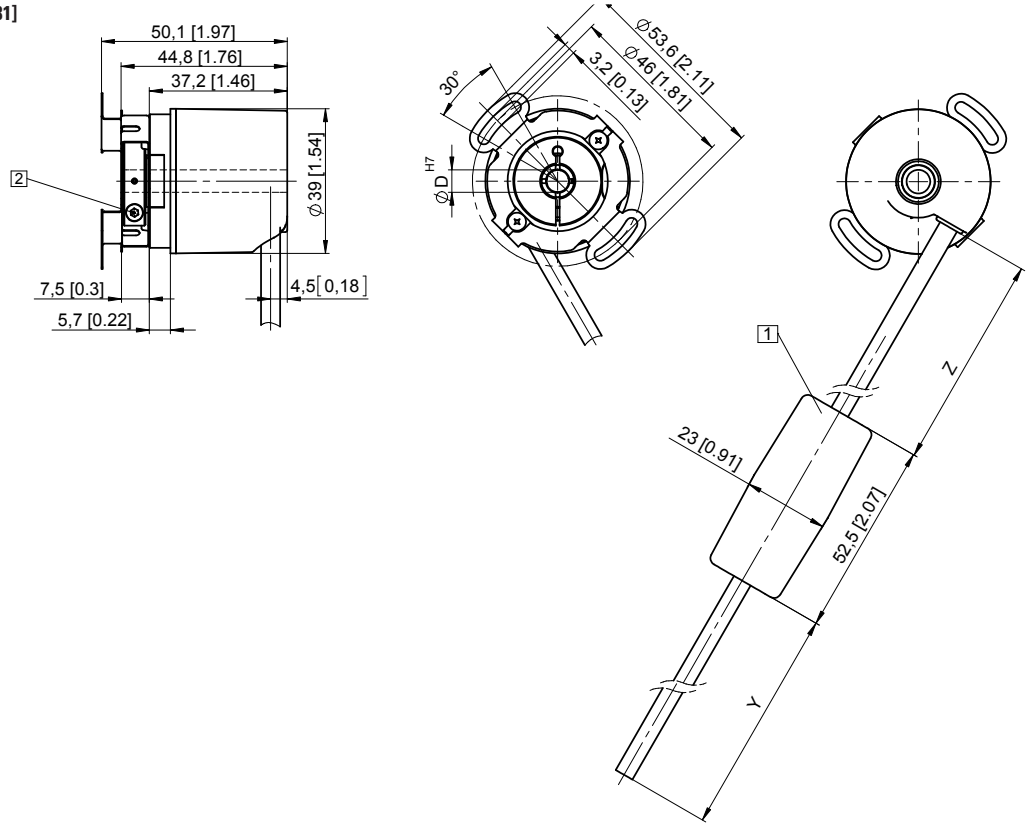

| D | D1 |
|---|---|
| 6 [0.24] | 24 [0.94] |
| 8 [0.32] | 25.5 [1.00] |
| 10 [0.39] | 25.5 [1.00] |
| 1/4" | 24 [0.94] |

| Y | Z |
|---|---|
| 1 m [3.28'] | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

Insertion depth for blind hollow shaft 14.5 [0.57]

**Flange with stator coupling, ø 46 [1.81]**
**Flange type 2**

1 Battery (in the cable)
2 Recommended torque for the clamping ring 0.6 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] |

| Y | Z |
|---|---|
| 1 m [3.28'] | 0.15 m [0.49'] |
| 5 m [16.40'] | 0.15 m [0.49'] |

Insertion depth for blind hollow shaft 14.5 [0.57]