

# Absolute encoders – singleturn

**Standard  
optical**

**Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)**

**Safety over EtherCAT (FSoE)**



The optical absolute Sendix S58 Safety over EtherCAT encoders are based on the new Kübler Industrial Ethernet encoder platform and are therefore already designed today for future Industry 4.0 concepts.

They are characterized by high-resolution position values, gear factors, variable integration times and many other functionalities and, in combination with Cyber Security, are suitable for the flexible requirements of state-of-the-art industrial environments.

As certified SIL2 / PLd encoders with redundant design and EtherCAT interface, they support the EtherCAT–FSoE profile and are predestined for safety applications.



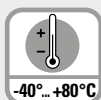
Safety over  
**EtherCAT®**



Safety-Lock™



High rotational  
speed



Temperature  
range



High protection  
level



High shaft load  
capacity



Shock / vibration  
resistant



Magnetic field  
proof



Reverse polarity  
protection



Optical sensor

## Reliable and safe

- **Robust**  
Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- **High resolution**  
- Singleturn 15 bit (safe) or 24 bit (non safe).
- **Safe**  
- SIL2, performance level PLd, safety category Cat. 3.
- **100 % future-proof**  
- FoE (File over EtherCAT) without required web server.  
- Cyber Security / high system availability, protection against misuse (in accordance with IEC 62443).

## Latest EtherCAT functionality

- Can be implemented in networks for hard real-time requirements with clock cycles of up to 350 µs (non-safe) thanks to DC mode support.
- Ideal for highly synchronous applications, such as axis synchronization.
- Equipped for a wide range of applications thanks to versatile encoder functions such as transmission factors (safe/non-safe) or limit value switches etc.

## Absolute encoders – singleturn

|                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                          |  |                                                                   |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------|--|
| Standard optical                                                                                                                                                                                                                                                                                                                              |  | Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)                                                        |  | Safety over EtherCAT (FSoE)                                       |  |
| Order code<br>Shaft version                                                                                                                                                                                                                                                                                                                   |  | 8.S5858FS2<br>Type                                                                                       |  | .X.X.B.N.B131<br>a b c d e f                                      |  |
| <b>a</b> Flange<br>1 = clamping flange, IP65 ø 58 mm [2.28"]<br>3 = clamping flange, IP67 ø 58 mm [2.28"]<br>2 = synchro flange, IP65 ø 58 mm [2.28"]<br>4 = synchro flange, IP67 ø 58 mm [2.28"]<br>5 = square flange, IP65 □ 63.5 mm [2.5"]<br>7 = square flange, IP67 □ 63.5 mm [2.5"]                                                     |  | <b>c</b> Interface / Supply voltage<br>B = EtherCAT / 10 ... 30 V DC                                     |  | <b>d</b> Type of connection<br>N = 3 x axial M12 connector, 4-pin |  |
| <b>b</b> Shaft (ø x L), with flat<br>2 = 10 x 20 mm [0.39 x 0.79"]<br>5 = 12 x 20 mm [0.47 x 0.79"]<br>4 = 3/8" x 7/8"<br>Shaft (ø x L), with feather key<br>A = 10 x 20 mm [0.39 x 0.79"] (feather key DIN 6885 A-3x3x10)<br>D = 12 x 20 mm [0.47 x 0.79"] (feather key DIN 6885 A-4x4x10)<br>C = 3/8" x 7/8"(feather key DIN 6885 A-3x3x10) |  | <b>e</b> Fieldbus profile<br>B1 = EtherCAT – FSoE                                                        |  | <b>f</b> Cyber Security<br>3 = with Cyber Security                |  |
|                                                                                                                                                                                                                                                                                                                                               |  | Optional on request<br>- Ex 2/22 (only for variants with IP67)<br>- surface protection salt spray tested |  |                                                                   |  |

|                                                                                                                                                                                                                                                                                                                                                 |  |                                                                                                          |  |                                                                   |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------|--|
| Order code<br>Hollow shaft                                                                                                                                                                                                                                                                                                                      |  | 8.S5878FS2<br>Type                                                                                       |  | .X.X.B.N.B131<br>a b c d e f                                      |  |
| <b>a</b> Flange<br>1 = with torque stop FS, flexible, IP65<br>2 = with torque stop FS, flexible, IP67<br>5 = with stator coupling FS, ø 63 mm [2.48"] , IP65<br>6 = with stator coupling FS, ø 63 mm [2.48"] , IP67<br>7 = with torque stop FS, rigid, IP65 (incl. torque pin FS)<br>8 = with torque stop FS, rigid, IP67 (incl. torque pin FS) |  | <b>c</b> Interface / Supply voltage<br>B = EtherCAT / 10 ... 30 V DC                                     |  | <b>d</b> Type of connection<br>N = 3 x axial M12 connector, 4-pin |  |
| <b>b</b> Blind hollow shaft, with feather keyway<br>(insertion depth max. 30 mm [1.18"])<br>A = ø 10 mm [0.39"]<br>B = ø 12 mm [0.47"]<br>C = ø 14 mm [0.55"]<br>D = ø 15 mm [0.59"]<br>E = ø 3/8"<br>F = ø 1/2"                                                                                                                                |  | <b>e</b> Fieldbus profile<br>B1 = EtherCAT – FSoE                                                        |  | <b>f</b> Cyber Security<br>3 = with Cyber Security                |  |
|                                                                                                                                                                                                                                                                                                                                                 |  | Optional on request<br>- Ex 2/22 (only for variants with IP67)<br>- surface protection salt spray tested |  |                                                                   |  |

## Absolute encoders – singleturn

| Standard optical                      | Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)                                                          |                 | Safety over EtherCAT (FSoE) |
|---------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|
| Mounting accessory for shaft encoders |                                                                                                            |                 | Order no.                   |
| Bellows coupling FS                   | bellows coupling FS ø 25 mm [0.98"] for shaft 10 mm [0.39"]                                                |                 | 8.0000.15FS.1010            |
|                                       | bellows coupling FS ø 25 mm [0.98"] for shaft 12 mm [0.47"]                                                |                 | 8.0000.15FS.1212            |
| Accessories                           |                                                                                                            |                 | Order no.                   |
| Screw retention                       | Loctite 243, 5 ml                                                                                          |                 | 8.0000.4G05.0000            |
| Cables and connectors                 |                                                                                                            |                 | Order no.                   |
| Preassembled cables                   | M12 male connector with external thread, 4-pin, D coded, straight single-ended<br>2 m [6.56'] PUR cable    | port 1 + port 2 | 05.00.6031.4411.002M        |
|                                       | M12 male connector with external thread, 4-pin, D coded, right-angle single-ended<br>2 m [6.56'] PUR cable | port 1 + port 2 | 05.00.6031.4511.002M        |
|                                       | M12 female connector with coupling nut, 4-pin, A coded, straight single-ended<br>2 m [6.56'] PUR cable     | power supply    | 05.00.6061.6211.002M        |
|                                       | M12 female connector with coupling nut, 4-pin, A coded, right-angle single-ended<br>2 m [6.56'] PUR cable  | power supply    | 05.00.6061.6311.002M        |
| Connectors                            | M12 male connector with external thread, 4-pin, D coded, straight (metal)                                  | port 1 + port 2 | 05.WASCSY4S                 |
|                                       | M12 male connector with external thread, 4-pin, D coded, right-angle (metal)                               | port 1 + port 2 | 8.0000.5128.0000            |
|                                       | M12 female connector with coupling nut, 4-pin, A coded, straight (plastic)                                 | power supply    | 05.B8141-0                  |
|                                       | M12 female connector with coupling nut, 4-pin, A coded, right-angle (plastic)                              | power supply    | 05.B8241-0                  |

Further Kübler accessories can be found at: [kuebler.com/accessories](https://www.kuebler.com/accessories)

Further Kübler cables and connectors can be found at: [kuebler.com/connection-technology](https://www.kuebler.com/connection-technology)

# Absolute encoders – singleturn

|                         |                                                          |                                    |
|-------------------------|----------------------------------------------------------|------------------------------------|
| <b>Standard optical</b> | <b>Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)</b> | <b>Safety over EtherCAT (FSoE)</b> |
|-------------------------|----------------------------------------------------------|------------------------------------|

## Technical data

|                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Notes regarding “Functional Safety”</b>                                                                                                                                                                                                        |
| These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61508 / EN 61800-5-2 / EN IEC 62061 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. |
| Additional functions can be found in the operating manual.                                                                                                                                                                                        |

| Safety characteristics               |                                          |
|--------------------------------------|------------------------------------------|
| Classification                       | PLd / SIL2                               |
| System structure                     | 2 channel (Kat. 3)                       |
| PFH <sub>d</sub> value <sup>1)</sup> | < 1,0 x 10 <sup>-6</sup> h <sup>-1</sup> |
| Mission time / Proof test interval   | 20 years                                 |
| Relevant standards                   |                                          |
| Safety Integrity Level (SIL) acc. to | EN 61508<br>EN 61800-5-2<br>EN IEC 62061 |
| Performance Level (PL) acc. to       | EN ISO 13849-1                           |

| Mechanical characteristics             |                            |                                                                                     |
|----------------------------------------|----------------------------|-------------------------------------------------------------------------------------|
| Max. speed                             |                            | 9000 min <sup>-1</sup> (short-term – 10 min)<br>6000 min <sup>-1</sup> (continuous) |
| Starting torque at 20 °C [68 °F]       |                            | < 0.01 Nm                                                                           |
| Moment of inertia                      |                            |                                                                                     |
|                                        | shaft version              | 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                                             |
|                                        | blind hollow shaft version | 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>                                             |
| Load capacity of shaft                 |                            |                                                                                     |
|                                        | radial                     | 80 N                                                                                |
|                                        | axial                      | 40 N                                                                                |
| Weight                                 |                            | approx. 0.45 kg [15.87 oz]                                                          |
| Protection acc. to EN 60529            |                            | IP65, IP67                                                                          |
| Ambient temperature                    |                            | -40 °C ... +80 °C [-40 °F ... +176 °F]                                              |
| Material                               |                            |                                                                                     |
|                                        | shaft/hollow shaft         | stainless steel                                                                     |
|                                        | flange                     | aluminum                                                                            |
|                                        | housing                    | aluminum                                                                            |
| Shock resistance acc. EN 60068-2-27    |                            | 1000 m/s <sup>2</sup> , 6 ms                                                        |
| Vibration resistance acc. EN 60068-2-6 |                            |                                                                                     |
| Frequency range                        |                            | 5 Hz ... 2000 Hz                                                                    |
| Amplitude                              |                            | 5 ... 8,7 Hz<br>±0,35 mm                                                            |
| Acceleration                           |                            | 8,7 ... 200 Hz<br>30 m/s <sup>2</sup> , (3 g)                                       |
|                                        | 200 ... 2000 Hz            | 220 m/s <sup>2</sup> , (22 g)                                                       |

| Electrical characteristics                             |                                      |
|--------------------------------------------------------|--------------------------------------|
| Supply voltage                                         | 10 ... 30 V DC                       |
| Power consumption (no load)                            | max. 250 mA                          |
| Reverse polarity protection of the supply voltage (+V) | yes                                  |
| Smallest safe measuring step                           | 158,4 arcsec (0,044° / 4 increments) |
| Lowest safe speed                                      | 8 rpm ( $\sigma_v < 1 \%$ )          |

| Approvals                               |                                                               |
|-----------------------------------------|---------------------------------------------------------------|
| UL compliant in accordance with         | File no. E224618                                              |
| CE compliant in accordance with         |                                                               |
| EMC Directive                           | 2014/30/EU                                                    |
| RoHS Directive                          | 2011/65/EU                                                    |
| ATEX Directive                          | 2014/34/EU (for Ex 2/22 variants)                             |
| Machinery Directive                     | 2006/42/EG                                                    |
| Cyber Security                          |                                                               |
| the encoder complies with the standards | IEC 62443-4-1 and IEC 62443-4-2 according to Security Level 1 |

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.  
The encoder evaluation unit must meet at least the requirements for SIL2.

# Absolute encoders – singleturn

|                         |                                                          |                                    |
|-------------------------|----------------------------------------------------------|------------------------------------|
| <b>Standard optical</b> | <b>Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)</b> | <b>Safety over EtherCAT (FSoE)</b> |
|-------------------------|----------------------------------------------------------|------------------------------------|

## Interface characteristics EtherCAT

| Resolution                                                                                                                                                                                                                                                                                                            | EtherCAT FSoE characteristics                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Resolution Singleturn (MUR)</b><br>scalable safe 1 ... 32 768 (15 bit)<br>scalable non-safe 1 ... 16 777 216 (24 bit)<br>default 8 192 (13 bit)                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• FSoE</li> <li>• CoE</li> <li>• FoE</li> <li>• Free Run Mode</li> <li>• DC Mode - Non Safe up to 350 µs</li> <li>• Hot Connect</li> </ul>                             |
| Adjustable parameters                                                                                                                                                                                                                                                                                                 | Process data                                                                                                                                                                                                  |
| Safe and non-safe in each case:<br><ul style="list-style-type: none"> <li>• Preset</li> <li>• Counting direction</li> <li>• Resolution per revolution - MUR</li> <li>• Total resolution - TMR</li> <li>• Unit Speed</li> <li>• Speed integration time</li> <li>• Gear factor</li> <li>• Limit value switch</li> </ul> | <ul style="list-style-type: none"> <li>• Position</li> <li>• Speed</li> <li>• Acceleration</li> <li>• Working range channel 1 / channel 2</li> <li>• Status</li> <li>• Failure</li> <li>• Warnings</li> </ul> |

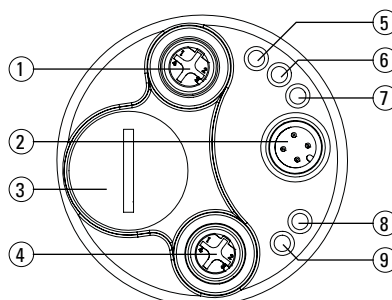
## Terminal assignment bus

| Interface | Type of connection       | Function     | M12 connector, 4-pin |                |               |                 |                |                                                                                               |
|-----------|--------------------------|--------------|----------------------|----------------|---------------|-----------------|----------------|-----------------------------------------------------------------------------------------------|
| B         | N<br>(3 x M12 connector) | Bus Port 1   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |  D coded |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |                                                                                               |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |                                                                                               |
|           |                          | Power supply | Signal:              | Voltage +      | –             | Voltage –       | –              |          |
|           |                          |              | Abbreviation:        | + V            | –             | 0 V             | –              |                                                                                               |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |                                                                                               |
|           |                          | Bus Port 2   | Signal:              | Transmit data+ | Receive data+ | Transmit data - | Receive data - |  D coded |
|           |                          |              | Abbreviation:        | TxD+           | RxD+          | TxD-            | RxD-           |                                                                                               |
|           |                          |              | Pin:                 | 1              | 2             | 3               | 4              |                                                                                               |

## Rear side connections and display elements

|   |                        |                               |
|---|------------------------|-------------------------------|
| ① | EtherCAT Port – Link 2 |                               |
| ② | Supply voltage         |                               |
| ③ | Cover screw            |                               |
| ④ | EtherCAT Port – Link 1 |                               |
| ⑤ | L/A - Link Activity    | flashes yellow when connected |
| ⑥ | ERR - Error            | displays network errors *)    |
| ⑦ | SF – System Failure    | displays system errors *)     |
| ⑧ | ENC                    | shows status of encoder *)    |
| ⑨ | L/A - Link Activity    | flashes yellow when connected |

\*) see manual



# Absolute encoders – singleturn

| Standard optical | Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft) | Safety over EtherCAT (FSoE) |
|------------------|---------------------------------------------------|-----------------------------|
|------------------|---------------------------------------------------|-----------------------------|

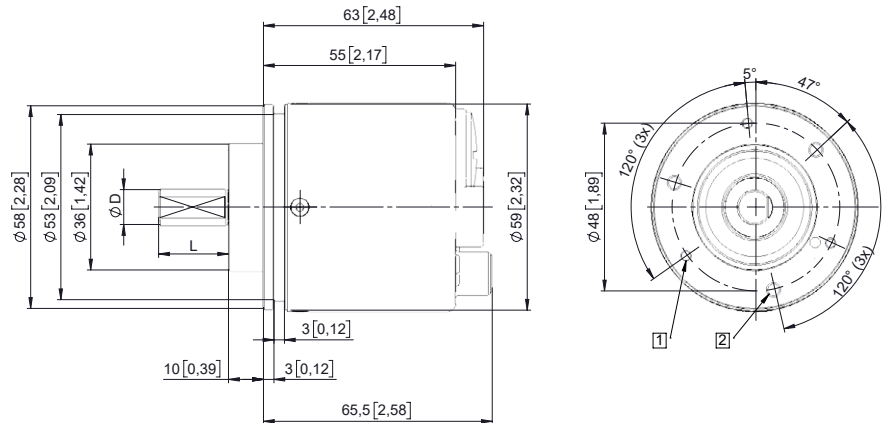
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 1 + 3

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

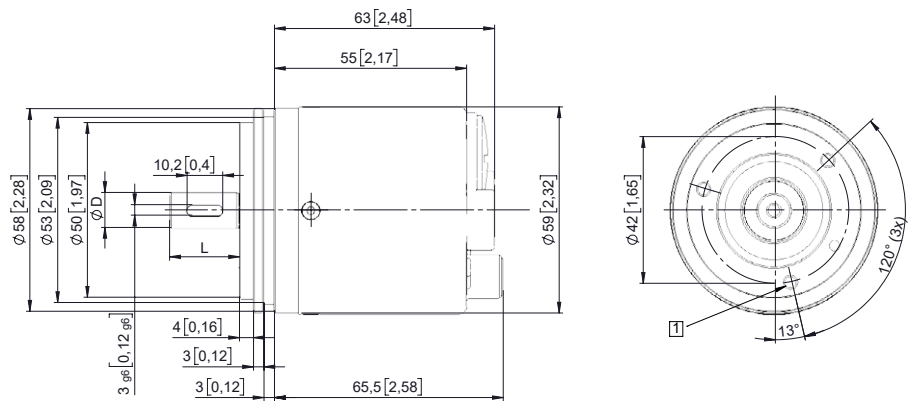


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | h7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 3/8"      | h7  | 7/8"      |

### Synchro flange, ø 58 [2.28]

#### Flange type 2 + 4

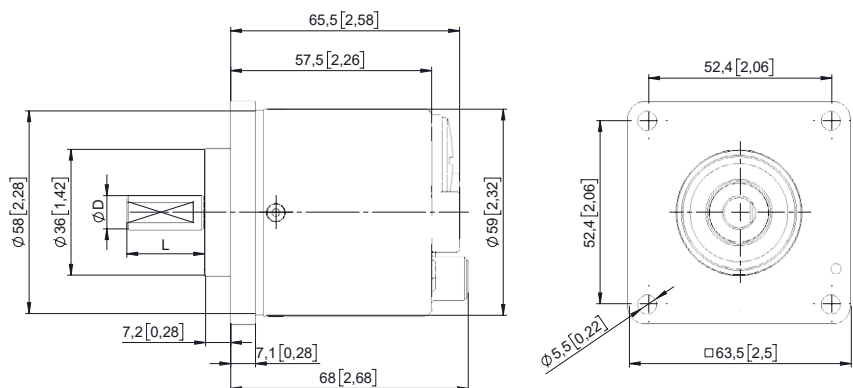
- 1 3 x M4, 8 [0.31] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | h7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 3/8"      | h7  | 7/8"      |

### Square flange, □ 63.5 [2.5]

#### Flange type 5 + 7



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | h7  | 20 [0.79] |
| 12 [0.47] | h7  | 20 [0.79] |
| 3/8"      | h7  | 7/8"      |

# Absolute encoders – singleturn

**Standard  
optical**

**Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)**

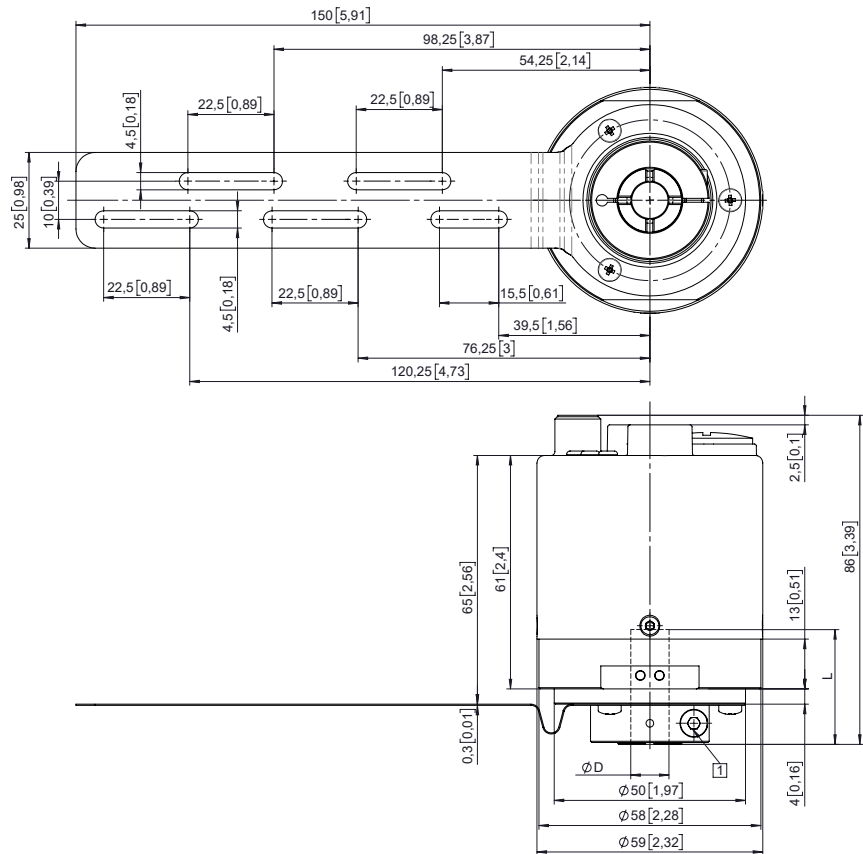
**Safety over EtherCAT (FSoE)**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with torque stop FS, flexible Flange type 1 + 2

- 1 Recommended torque for the clamping ring 2.5 Nm

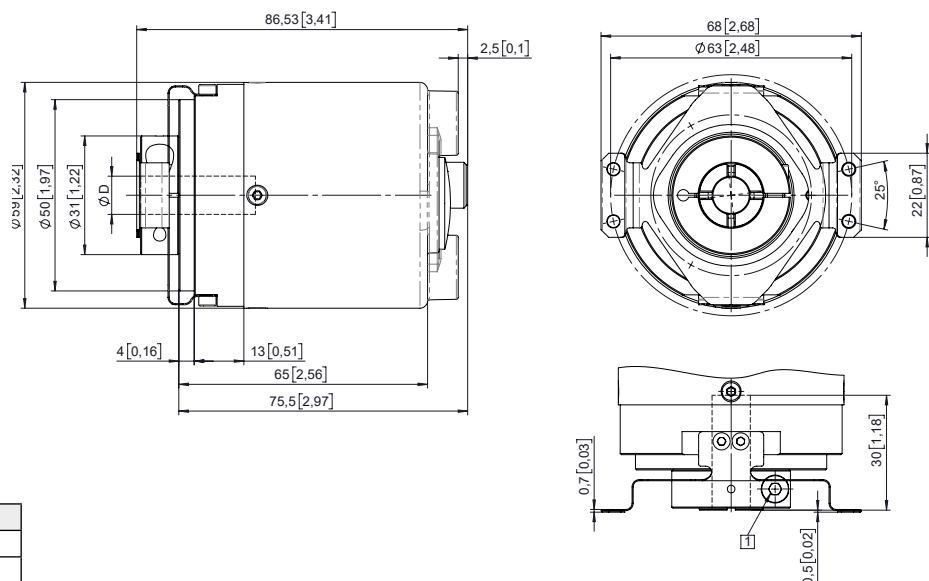


| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling FS, Ø 63 [2.48] Flange type 5 + 6

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

# Absolute encoders – singleturn

**Standard  
optical**

**Sendix S5858FS2 / S5878FS2 (shaft / hollow shaft)**

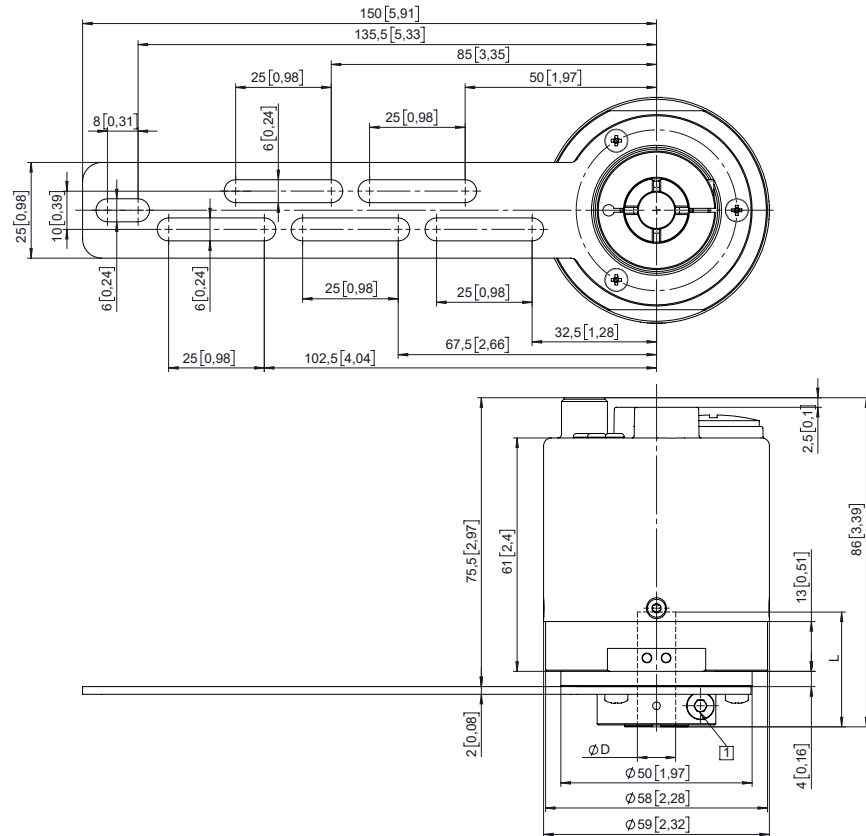
**Safety over EtherCAT (FSoE)**

## Dimensions hollow shaft version

Dimensions in mm [inch]

**Flange with torque stop FS, rigid  
Flange type 7 + 8**

**1** Recommended torque for the  
clamping ring 2.5 Nm



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | H7  | 30 [1.18] |
| 12 [0.47] | H7  | 30 [1.18] |
| 14 [0.55] | H7  | 30 [1.18] |
| 15 [0.59] | H7  | 30 [1.18] |
| 3/8"      | H7  | 30 [1.18] |
| 1/2"      | H7  | 30 [1.18] |

L = insertion depth max. blind hollow shaft

**Torque pin with rectangular sleeve with  
M4 thread  
(included in scope of delivery)**

