

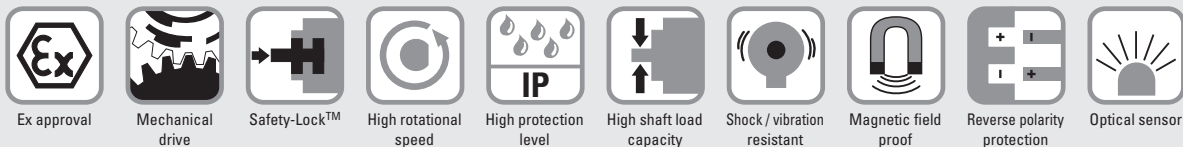
# Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining mechanical multiturn, optical**      **Sendix 7168 / 7188 (shaft / hollow shaft)**      **CANopen**



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Absolute encoders multiturn

|   |  |   |
|---|--|---|
| <b>Order code</b>                         | <b>8.7168</b>  | <b>. 2 X 2 X . 21 21 . XXXX</b>                   |
| <b>Shaft version</b>                      | Type   | a b c d e f <sup>1)</sup>                         |
| <b>a Flange</b>                           | 2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]   |   |
| <b>b Shaft (ø x L)</b>                    | 2 = 10 x 20 mm [0.39 x 0.79"], with flat<br>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key                                   |   |
| <b>c Interface / power supply</b>         | 2 = CANopen DS301 V4.02 / 10 ... 30 V DC   |   |
| <b>d Type of connection</b>               | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   |
| <b>e Fieldbus profile</b>                 | 21 = CANopen   |   |
| <b>f Cable length in dm <sup>1)</sup></b> | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |   |
|   |  | <i>Optional on request - special cable length</i> |

|  |  |   |
|--|--|---|
| <b>Order code</b>  | <b>8.7188</b>  | <b>. XX 2 X . 21 21 . XXXX</b>                    |
| <b>Hollow shaft</b>  | Type   | a b c d e f <sup>1)</sup>                         |
| <b>a Flange</b>  | 2 = with spring element, short<br>6 = with stator coupling, IP67, ø 65 mm [2.56"]  |   |
| <b>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])</b> | 1 = ø 12 mm [0.47"]<br>2 = ø 14 mm [0.55"]   |   |
| <b>c Interface / power supply</b>                                  | 2 = CANopen DS301 V4.02 / 10 ... 30 V DC   |   |
| <b>d Type of connection</b>  | 1 = axial cable, 2 m [6.56'] PUR<br>2 = radial cable, 2 m [6.56'] PUR<br>A = axial cable, length > 2 m [6.56']<br>B = radial cable, length > 2 m [6.56'] |   |
| <b>e Fieldbus profile</b>  | 21 = CANopen   |   |
| <b>f Cable length in dm <sup>1)</sup></b>                          | 0050 = 5 m [16.40']<br>0100 = 10 m [32.81']<br>0150 = 15 m [49.21']  |   |
|  |  | <i>Optional on request - special cable length</i> |

1) Not applicable with connection types 1 and 2.

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|--|--|----------------|

## Technical data

| Explosion protection 7168              |  |
|--|--|
| <b>ATEX</b>                            |  |
| <b>EC type-examination certificate</b> | IBExU 14 ATEX 1047 X   |
| <b>Category</b>                        | ⊕ I M2 Ex d I/IIC T4 - T6 Mb                                 |
| <b>Relevant standards</b>              | EN 60079-0:2012;<br>ATEX guideline 94/9/EC EN 60079-1:2007   |
| <b>IECEX</b>                           |  |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 14.0023 X  |
| <b>Category</b>                        | Ex d I/IIC T4 - T6 Mb  |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>ATEX guideline 94/9/EC IEC 60079-1:2007 |

| Mechanical characteristics              |  |
|---|--|
| <b>Maximum speed</b>                    | shaft 6000 min <sup>-1</sup> (continuous)<br>hollow shaft 3000 min <sup>-1</sup> (continuous)                                |
| <b>Starting torque – at 20°C [68°F]</b> | < 0.05 Nm  |
| <b>Mass moment of inertia</b>           | 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>  |
| <b>Load capacity of shaft</b>           | radial 80 N<br>axial 40 N  |
| <b>Weight</b>                           | approx. 2.8 kg [98.77 oz]  |
| <b>Protection acc. to EN 60529</b>      | IP67   |
| <b>Ambient temperature</b>              | -40°C ... +60°C [-40 ... +140°F]<br>Please note the specifications for temperature class in EC type-examination certificate! |
| <b>Material</b>                         | shaft stainless steel<br>flange / housing stainless steel<br>cable PUR   |
| <b>Shock resistance</b>                 | acc. to EN/IEC 60068-2-27 1000 m/s <sup>2</sup> , 6 ms   |
| <b>Vibration resistance</b>             | acc. to EN/IEC 60068-2-6 100 m/s <sup>2</sup> , 55 ... 2000 Hz   |

| Explosion protection 7188              |  |
|--|--|
| <b>ATEX</b>                            |  |
| <b>EU type-examination certificate</b> | IBExU 15 ATEX 1057 X   |
| <b>Category</b>                        | ⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb                                   |
| <b>Relevant standards</b>              | EN 60079-0:2012 + A11:2013;<br>ATEX guideline 2014/34/EU EN 60079-1:2014 |
| <b>IECEX</b>                           |  |
| <b>Certificate of Conformity (CoC)</b> | IECEX IBE 15.0019 X  |
| <b>Category</b>                        | Ex db I/IIC T4/120°C (T4)/T6 Mb  |
| <b>Relevant standards</b>              | IEC 60079-0:2011;<br>IEC 60079-1:2014                                    |

| Electrical characteristics                          |   |
|---|---|
| <b>Power supply</b>                                 | 10 ... 30 V DC  |
| <b>Current consumption (no load)</b>                | max. 100 mA   |
| <b>Reverse polarity protection for power supply</b> | yes   |
| <b>CE compliant acc. to</b>                         | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| EMC                       |  |
|---------------------------|--|
| <b>Relevant standards</b> | EN 55011 class B:2009 / A1:2010<br>EN 61000-6-2:2005 / AC:2005<br>EN 61000-6-3:2007 / A1:2011<br>EN 61326-1:2013 |

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| Interface characteristics CANopen        |  |
|--|--|
| <b>Resolution singleturn</b>             | 1 ... 65535 (16 bit), scalable<br>default: 8192 (13 bit)                             |
| <b>Number of revolutions (multiturn)</b> | max. 4096 (12 bit)<br>scalable only via the total resolution                         |
| <b>Total resolution</b>                  | 1 ... 268.435.456 (28 bit), scalable<br>default: 33.554.432 (25 bit)                 |
| <b>Code</b>                              | binary   |
| <b>Interface</b>                         | CAN high-speed acc. to ISO 11898,<br>Basic- and Full-CAN,<br>CAN specification 2.0 B |
| <b>Protocol</b>                          | CANopen profile DS406 V3.2<br>with manufacturer-specific add-ons                     |
| <b>Baud rate</b>                         | 10 ... 1000 kbit/s<br>software configurable  |
| <b>Node address</b>                      | 1 ... 127 software configurable  |
| <b>Switchable termination</b>            | software configurable  |

### General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

### CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

### CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min<sup>-1</sup>).
- Factor for speed calculation (e.g. measuring wheel circumference)  
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

### Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

### Terminal assignment

| Interface | Type of connection | Cable (isolate unused wires individually before initial start-up) |     |    |       |       |         |       |       |         |
|-----------|--------------------|---|-----|----|-------|-------|---------|-------|-------|---------|
|           |                    | Signal:   | 0 V | +V | CAN_H | CAN_L | CAN_GND | CAN_H | CAN_L | CAN_GND |
| 2         | 1, 2, A, B         | Cable marking:  | 1   | 2  | 4     | 5     | 6       | 7     | 8     | 9       |

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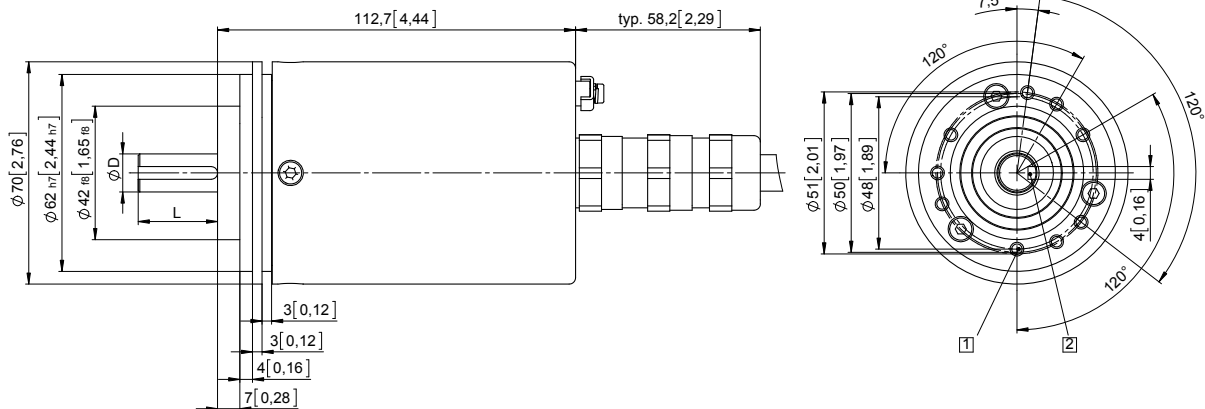
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## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

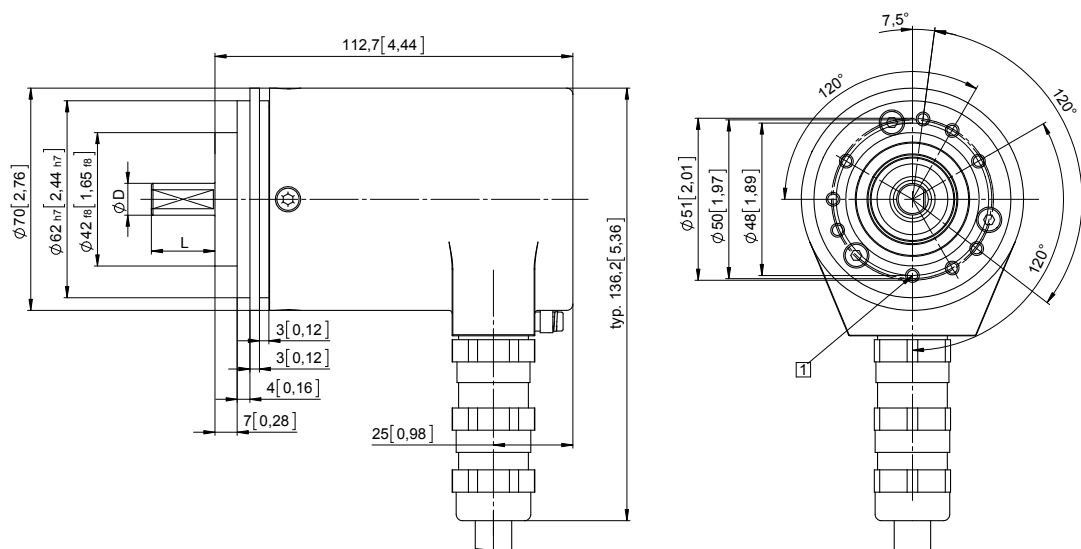
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | g6  | 25 [0.98] |

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



| D         | Fit | L         |
|-----------|-----|-----------|
| 10 [0.39] | f7  | 20 [0.79] |

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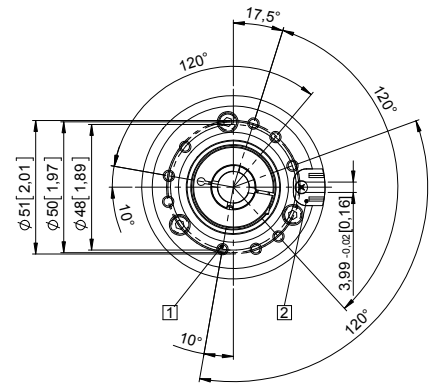
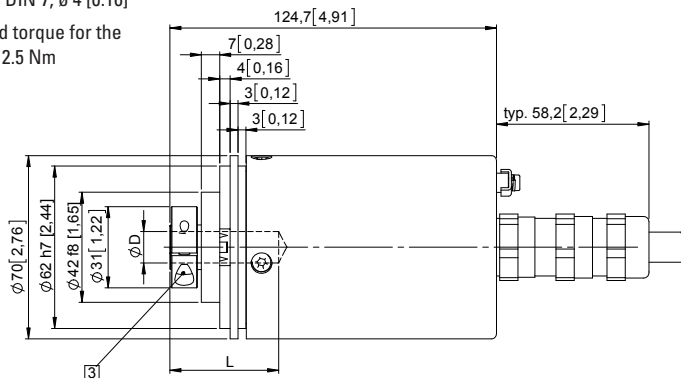
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|--|--|----------------|

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



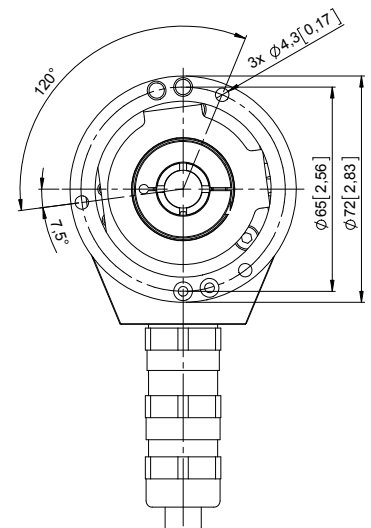
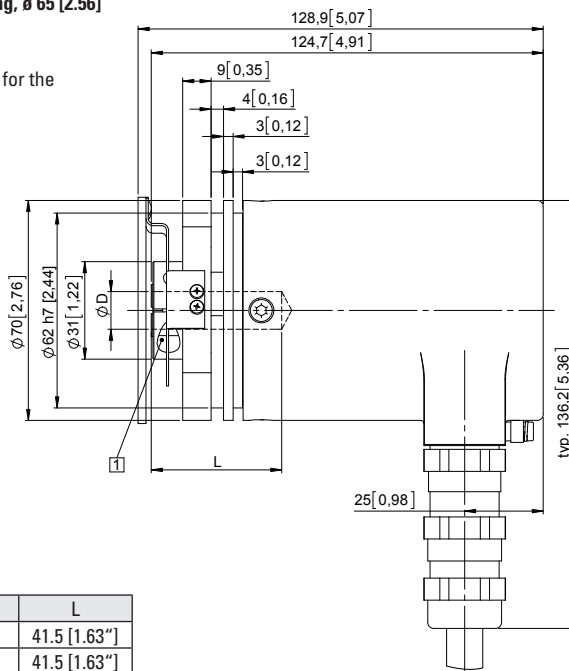
| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft

### Flange with stator coupling, $\varnothing 65$ [2.56]

#### Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



| D         | Fit | L            |
|-----------|-----|--------------|
| 12 [0.47] | H7  | 41.5 [1.63"] |
| 14 [0.55] | H7  | 41.5 [1.63"] |

L = insertion depth max. blind hollow shaft