



## DFS60

HIGH RESOLUTION, PROGRAMMABLE ENCODERS  
FOR SOPHISTICATED APPLICATIONS

Incremental encoder

**SICK**  
Sensor Intelligence.



# DFS60 – THE FLEXIBLE ALL-ROUNDER

## Connects anywhere

Thanks to the plug-in cable connection and broad portfolio of matching adapter cables, the DFS60 incremental encoder can be adapted to fit a wide variety of electrical connection types. Cables of various lengths and with different plug connectors offer the user a wide range of connection options.

## An array of program options

Resolution, counting direction and zero pulse are only a few examples of settings that the user can program individually with the DFS60. Both the compact PGT-10-Pro hand-held programming device and the PGT-08-S PC-based tool are available for this purpose.



## Mechanical flexibility

The hollow shaft version of the DFS60 can be adapted to different shaft diameters using collets. In addition to metal collets, plastic inserts can also be used to achieve an insulated shaft connection.

## For rough environments

The DFS60 incremental encoder with enclosure rating IP 65 is resistant to dust and humidity and operates reliably even at temperatures ranging from -40 °C to +100 °C.



# HIGH-RESOLUTION, PROGRAMMABLE ENCODER FOR SOPHISTICATED APPLICATIONS



## Product description

The DFS60 is a high-resolution incremental encoder with a diameter of 60mm. It offers a wide variety of mechanical and electric interfaces and can also be programmed by the customer if required. Programming of the output signal and zero pulse is a unique feature

for the market. The high enclosure rating, wide temperature range and large ball bearing distance ensure extreme robustness, making the DFS60 the ideal encoder for industrial applications in harsh environments

## At a glance

- Compact installation depth
- High resolution up to 16 bits
- Optionally programmable: Output voltage, zero pulse position, zero pulse width and number of pulses
- Connection: Radial or axial cable outlet, M23 or M12 connector, axial or radial
- Electrical interfaces: 5V & 24V TTL/RS-422, 24 V HTL/push pull
- Mechanical interfaces: face mount or servo flange, blind or through hollow shaft
- Remote zero set possible

## Your benefits

- Reduced storage costs and downtime due to customer-specific programming
- Variety of different mechanical and electrical interfaces enable the encoder to be optimally adjusted to fit the installation situation
- Excellent concentricity even at high speeds
- High resolution of up to 16 bits ensures precise measurements
- Permanent and safe operation due to a high enclosure rating, temperature resistance and a long bearing lifetime
- Programmability via the PGT-08 programming software and the PGT-10-Pro display programming tool allow the encoder to be adapted flexibly and quickly according to customer needs
- Programmable zero pulse position simplifies installation



## Additional information

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→ [www.sick.com/DFS60](http://www.sick.com/DFS60)

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



## Fields of application

- Applications in factory and logistics automation for measuring of position, speed and distance: e.g. in printing machines, textile machines, wood processing, packaging machinery

## Detailed technical data

### Performance

|                                                               | Eco                                            | Basic                                         | Advanced                                      |
|---------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| <b>Pulses per revolution</b>                                  | 100 ... 2048 <sup>1)</sup> (depending on type) | 1 ... 10000 <sup>1)</sup> (depending on type) | 1 ... 65536 <sup>1)</sup> (depending on type) |
| <b>Pulses per revolution Sin/Cos 1,0 V<sub>PP</sub></b>       | –                                              | 1024                                          | –                                             |
| <b>Measuring step</b>                                         | 90° electronically/ppr                         |                                               |                                               |
| <b>Measuring step deviation at non binary number of lines</b> |                                                |                                               |                                               |
| Pulses 1 ... 99                                               | –                                              | ± 0.08°                                       | ± 0.04°                                       |
| Pulses 100 ... 10,000                                         | ± 0.2°                                         | ± 0.01°                                       | ± 0.008°                                      |
| Pulses > 10,000                                               | –                                              |                                               | ± 0.002°                                      |
| <b>Measuring step deviation at binary number of lines</b>     |                                                |                                               |                                               |
| Pulses 1 ... 64                                               | –                                              | ± 0.05°                                       | ± 0.03°                                       |
| Pulses 128 ... 8,192                                          | ± 0.15°                                        | ± 0.008°                                      | ± 0.008°                                      |
| Pulses 16,384 ... 65,536                                      | –                                              |                                               | ± 0.0015°                                     |
| <b>Error limits</b>                                           | ± 0.3°                                         | ± 0.05°                                       | ± 0.03°                                       |

<sup>1)</sup> See maximum revolution range.

### Electrical data

|                                              | Eco                                                                                               | Basic                                                                                                                                                                                                                                       | Advanced |
|----------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>Electrical interface</b>                  | 4,5 V ... 5,5 V, TTL/RS422,<br>10 V ... 32 V HTL/Push pull,<br>10 V ... 32 V, TTL/RS422<br>–<br>– | 4,5 V ... 32 V, HTL/Push pull, 0-SET<br>4,5 V ... 32 V, TTL/RS422, 0-SET<br>4,5 V ... 32 V, TTL/HTL programmable <sup>1)</sup><br>4,5 V ... 32 V, TTL/HTL programmable, 0-SET <sup>1)</sup><br>4,5 V ... 5,5 V, Sin/Cos 1,0 V <sub>SS</sub> |          |
| <b>Initialization time</b>                   |                                                                                                   |                                                                                                                                                                                                                                             |          |
| 4.5 V ... 5.5 V, TTL/RS422                   | 40 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 10 V ... 32 V, HTL/Push pull                 | 40 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 10 V ... 32 V, TTL/RS422                     | 40 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 4.5 V ... 32 V, HTL/Push pull, 0-SET         | 30 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 4.5 V ... 5.5 V, TTL/RS422, 0-SET            | 30 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 4.5 V ... 32 V, TTL/RS422, 0-SET             | 30 ms                                                                                             |                                                                                                                                                                                                                                             |          |
| 4.5 V ... 32 V, TTL/HTL programmable         | –                                                                                                 | 32 ms <sup>2)</sup><br>30 ms                                                                                                                                                                                                                |          |
| 4.5 V ... 32 V, TTL/HTL programmable, 0-SET  | –                                                                                                 | 32 ms <sup>2)</sup><br>30 ms                                                                                                                                                                                                                |          |
| 4,5 V ... 5,5 V, Sin/Cos 1,0 V <sub>PP</sub> | –                                                                                                 | 40 ms                                                                                                                                                                                                                                       | –        |
| <b>0-SET function</b>                        | –                                                                                                 | H-active (L = 0 - 3 V, H = 4,0 - U <sub>S</sub> )                                                                                                                                                                                           |          |

|                                              | Eco                                                                                                                                                                                                                                                                                         | Basic                                                                                            | Advanced                                    |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------|
| Connection type                              | Cable, 8-wire, universal, 1.5 m<br>Cable, 8-wire, universal, 3 m<br>Cable, 8-wire, universal, 5 m<br>Cable, 8-wire, universal, 10 m<br>Male connector, M12, 8-pin, radial<br>Male connector, M12, 8-pin, axial<br>Male connector, M23, 12-pin, radial<br>Male connector, M23, 12-pin, axial |                                                                                                  |                                             |
| Operating current                            | 40 mA (without load)                                                                                                                                                                                                                                                                        |                                                                                                  |                                             |
| Power consumption                            |                                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 5.5 V, TTL/RS422                   | ≤ 0.5 W (without load)                                                                                                                                                                                                                                                                      |                                                                                                  |                                             |
| 10 V ... 32 V, HTL/Push pull                 | ≤ 0.5 W (without load)                                                                                                                                                                                                                                                                      |                                                                                                  |                                             |
| 10 V ... 32 V, TTL/RS422                     | ≤ 0.5 W (without load)                                                                                                                                                                                                                                                                      |                                                                                                  |                                             |
| 4.5 V ... 32 V, HTL/Push pull, 0-SET         |                                                                                                                                                                                                                                                                                             | ≤ 0.7 W (without load)                                                                           |                                             |
| 4.5 V ... 5.5 V, TTL/RS422, 0-SET            |                                                                                                                                                                                                                                                                                             | ≤ 0.7 W (without load)                                                                           |                                             |
| 4.5 V ... 32 V, TTL/RS422, 0-SET             |                                                                                                                                                                                                                                                                                             | ≤ 0.7 W (without load)                                                                           |                                             |
| 4.5 V ... 32 V, TTL/HTL programmable         | –                                                                                                                                                                                                                                                                                           | ≤ 0.7 W (without load)                                                                           |                                             |
| 4.5 V ... 32 V, TTL/HTL programmable, 0-SET  | –                                                                                                                                                                                                                                                                                           | ≤ 0.7 W (without load)                                                                           |                                             |
| Load resistance                              |                                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 5.5 V, Sin/Cos 1.0 V <sub>pp</sub> | –                                                                                                                                                                                                                                                                                           | ≤ 120 Ω                                                                                          |                                             |
| Load current                                 | ≤ 30 mA                                                                                                                                                                                                                                                                                     |                                                                                                  |                                             |
| Output frequency                             |                                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| TTL/RS422                                    | ≤ 300 kHz                                                                                                                                                                                                                                                                                   | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| HTL/Push pull                                | ≤ 300 kHz                                                                                                                                                                                                                                                                                   | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| HTL/Push pull, 0-SET                         | ≤ 300 kHz                                                                                                                                                                                                                                                                                   | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| TTL/RS422, 0-SET                             | ≤ 300 kHz                                                                                                                                                                                                                                                                                   | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| TTL/HTL programmable                         | –                                                                                                                                                                                                                                                                                           | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| TTL/HTL programmable, 0-SET                  | –                                                                                                                                                                                                                                                                                           | ≤ 600 kHz                                                                                        | ≤ 820 kHz                                   |
| Sin/Cos 1,0 V <sub>pp</sub>                  | –                                                                                                                                                                                                                                                                                           | ≤ 200 kHz                                                                                        | –                                           |
| Reference signal, number                     | 1                                                                                                                                                                                                                                                                                           |                                                                                                  |                                             |
| Reference signal, position                   | 90°, electric, logically gated with A and B                                                                                                                                                                                                                                                 | 90°, electric, logically gated with A and B<br>90°, electronically, gated with Sinus and Cosinus | 90°, electric, logically gated with A and B |
| Reverse polarity protection                  |                                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 5.5 V, TTL/RS422                   | –                                                                                                                                                                                                                                                                                           |                                                                                                  |                                             |
| 10 V ... 32 V, HTL/Push pull                 | ✓                                                                                                                                                                                                                                                                                           |                                                                                                  |                                             |
| 10 V ... 32 V, TTL/RS422                     | ✓                                                                                                                                                                                                                                                                                           |                                                                                                  |                                             |
| 4.5 V ... 32 V, HTL/Push pull, 0-SET         | –                                                                                                                                                                                                                                                                                           | ✓                                                                                                |                                             |
| 4.5 V ... 32 V, TTL/RS422, 0-SET             | –                                                                                                                                                                                                                                                                                           | ✓                                                                                                |                                             |
| 4.5 V ... 32 V, TTL/HTL programmable         | –                                                                                                                                                                                                                                                                                           | –                                                                                                | –                                           |
| 4.5 V ... 5.5 V, Sin/Cos 1.0 V <sub>pp</sub> | –                                                                                                                                                                                                                                                                                           | ✓                                                                                                |                                             |
| 4.5 V ... 32 V, TTL/HTL programmable, 0-SET  | –                                                                                                                                                                                                                                                                                           | ✓                                                                                                | ✓                                           |
| Short-circuit protection of the outputs      |                                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 5.5 V, TTL/RS422                   | ✓ <sup>3)</sup>                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 10 V ... 32 V, HTL/Push pull                 | ✓ <sup>3)</sup>                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 10 V ... 32 V, TTL/RS422                     | ✓ <sup>4)</sup>                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 32 V, HTL/Push pull, 0-SET         | ✓ <sup>3)</sup>                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |
| 4.5 V ... 32 V, TTL/RS422, 0-SET             | ✓ <sup>4)</sup>                                                                                                                                                                                                                                                                             |                                                                                                  |                                             |

|                                              | Eco                                      | Basic              | Advanced |
|----------------------------------------------|------------------------------------------|--------------------|----------|
| 4.5 V ... 32 V, TTL/HTL programmable         | –                                        | ✓ <sup>5) 6)</sup> |          |
| 4.5 V ... 5.5 V, Sin/Cos 1.0 V <sub>pp</sub> | –                                        | ✓ <sup>3)</sup>    | –        |
| 4.5 V ... 32 V, TTL/HTL programmable, 0-SET  | –                                        | ✓ <sup>5) 6)</sup> |          |
| <b>MTTFd: mean time to dangerous failure</b> | 300 years (EN ISO 13849-1) <sup>7)</sup> |                    |          |

<sup>1)</sup> Only with devices with M23 connector in connection with electrical interfaces M, U, V and W.

<sup>2)</sup> With mechanical zero pulse width.

<sup>3)</sup> Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

<sup>4)</sup> Short-circuit opposite to another channel or GND permissible for maximum 30 s.

<sup>5)</sup> Programming TTL with  $\geq 5.5$  V: short-circuit opposite to another channel or GND permissible for maximum 30 s.

<sup>6)</sup> Programming HTL or TTL with  $< 5.5$  V: short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

<sup>7)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40°C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

## Mechanical data

|                                                          | Eco                                                                                                       | Basic | Advanced             |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------|----------------------|
| <b>Mechanical interface</b>                              | Solid shaft, face mount flange<br>Solid shaft, Servo flange<br>Blind hollow shaft<br>Through hollow shaft |       |                      |
| <b>Shaft diameter</b>                                    |                                                                                                           |       |                      |
| Solid shaft, face mount flange                           | 10 mm x 19 mm                                                                                             |       |                      |
| Solid shaft, Servo flange                                | 6 mm x 10 mm                                                                                              |       |                      |
| Blind hollow shaft, Through hollow shaft                 | 6 mm<br>8 mm<br>3/8"<br>10 mm<br>12 mm<br>1/2"<br>14 mm<br>15 mm<br>5/8"                                  |       |                      |
| <b>Weight</b>                                            |                                                                                                           |       |                      |
| Blind hollow shaft, Through hollow shaft                 | 0.2 kg                                                                                                    |       |                      |
| Solid shaft                                              | 0.3 kg                                                                                                    |       |                      |
| <b>Shaft material</b>                                    | Stainless steel                                                                                           |       |                      |
| <b>Flange material</b>                                   | Aluminum                                                                                                  |       |                      |
| <b>Housing material</b>                                  | Aluminum die cast                                                                                         |       |                      |
| <b>Start up torque</b>                                   |                                                                                                           |       |                      |
| Blind hollow shaft, Through hollow shaft                 | 0.8 Ncm (+20 °C)                                                                                          |       |                      |
| Solid shaft                                              | 0.5 Ncm (+20 °C)                                                                                          |       |                      |
| <b>Operating torque</b>                                  |                                                                                                           |       |                      |
| Blind hollow shaft, Through hollow shaft                 | 0.6 Ncm (+20 °C)                                                                                          |       |                      |
| Solid shaft                                              | 0.3 Ncm (+20 °C)                                                                                          |       |                      |
| <b>Permissible shaft movement, axial static/dynamic</b>  |                                                                                                           |       |                      |
| Blind hollow shaft, Through hollow shaft                 | ± 0.5 mm / ± 0.2 mm                                                                                       |       | ± 0.5 mm / ± 0.01 mm |
| <b>Permissible shaft movement, radial static/dynamic</b> |                                                                                                           |       |                      |
| Blind hollow shaft, Through hollow shaft                 | ± 0.3 mm / ± 0.1 mm                                                                                       |       | ± 0.3 mm / ± 0.05 mm |
| <b>Permissible shaft loading radial/axial</b>            |                                                                                                           |       |                      |

|                                          | Eco                                                            | Basic | Advanced                                                       |
|------------------------------------------|----------------------------------------------------------------|-------|----------------------------------------------------------------|
| Solid shaft                              | 80 N (radial)<br>40 N (axial)                                  |       |                                                                |
| <b>Operating speed</b>                   |                                                                |       |                                                                |
| Blind hollow shaft, Through hollow shaft | $\leq 6,000 \text{ min}^{-1}$ <sup>1)</sup>                    |       |                                                                |
| Solid shaft                              | $\leq 9,000 \text{ min}^{-1}$ <sup>1)</sup>                    |       |                                                                |
| <b>Moment of inertia of the rotor</b>    | 40 gcm <sup>2</sup> / 6.2 gcm <sup>2</sup> (depending on type) |       | 40 gcm <sup>2</sup> / 6.2 gcm <sup>2</sup> (depending on type) |
| <b>Bearing lifetime</b>                  | $3.6 \times 10^{10}$ revolutions                               |       |                                                                |
| <b>Angular acceleration</b>              | $\leq 500,000 \text{ rad/s}^2$                                 |       |                                                                |

<sup>1)</sup> Take into account self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

## Ambient data

|                                               | Eco                                                       | Basic                                                                | Advanced                                 |
|-----------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------|
| EMC                                           |                                                           |                                                                      |                                          |
| 4,5 V ... 5,5 V, TTL/RS422                    | According to EN 61000-6-2 and EN 61000-6-3                |                                                                      |                                          |
| 10 V ... 32 V, HTL/Push pull                  | According to 61000-6-2 and EN 61000-6-4                   |                                                                      |                                          |
| 10 V ... 32 V, TTL/RS422                      | According to EN 61000-6-2 and EN 61000-6-4                |                                                                      |                                          |
| 4,5 V ... 32 V, HTL/Push pull, 0-SET          | –                                                         | According to EN 61000-6-2 and EN 61000-6-3                           |                                          |
| 4,5 V ... 32 V, TTL/RS422, 0-SET              | –                                                         | According to EN 61000-6-2 and EN 61000-6-3                           |                                          |
| 4,5 V ... 32 V, TTL/HTL programmierbar        | –                                                         | According to EN 61000-6-2 and EN 61000-6-3                           |                                          |
| 4,5 V ... 5,5 V, Sin/Cos 1,0 V <sub>SS</sub>  | –                                                         | According to EN 61000-6-2 and EN 61000-6-3                           | –                                        |
| 4,5 V ... 32 V, TTL/HTL programmierbar, 0-SET | –                                                         | According to EN 61000-6-2 and EN 61000-6-3                           |                                          |
| Enclosure rating                              |                                                           |                                                                      |                                          |
| shaft side                                    | IP65                                                      |                                                                      |                                          |
| Housing side, connector outlet                | IP67, Through hollow shaft IP65 (according to IEC 60529)  |                                                                      |                                          |
| Housing side, cable outlet                    | IP67, Through hollow shaft IP65 (according to IEC 60529)  |                                                                      |                                          |
| Permissible relative humidity                 | 90 % (condensation of the optical scanning not permitted) |                                                                      |                                          |
| Operating temperature range                   |                                                           |                                                                      |                                          |
|                                               | 0 °C ... +85 °C                                           | –40 °C ... +100 °C <sup>2)</sup><br>–30 °C ... +100 °C <sup>3)</sup> |                                          |
| Storage temperature range                     | –40 °C ... +100 °C, without package                       |                                                                      |                                          |
| Resistance to shocks                          | 50 g, 6 ms (according to EN 60068-2-27)                   | 70 g, 6 ms (according to EN 60068-2-27)                              | 100 g, 6 ms (according to EN 60068-2-27) |
| Resistance to vibration                       | 20 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)      | 30 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)                 |                                          |

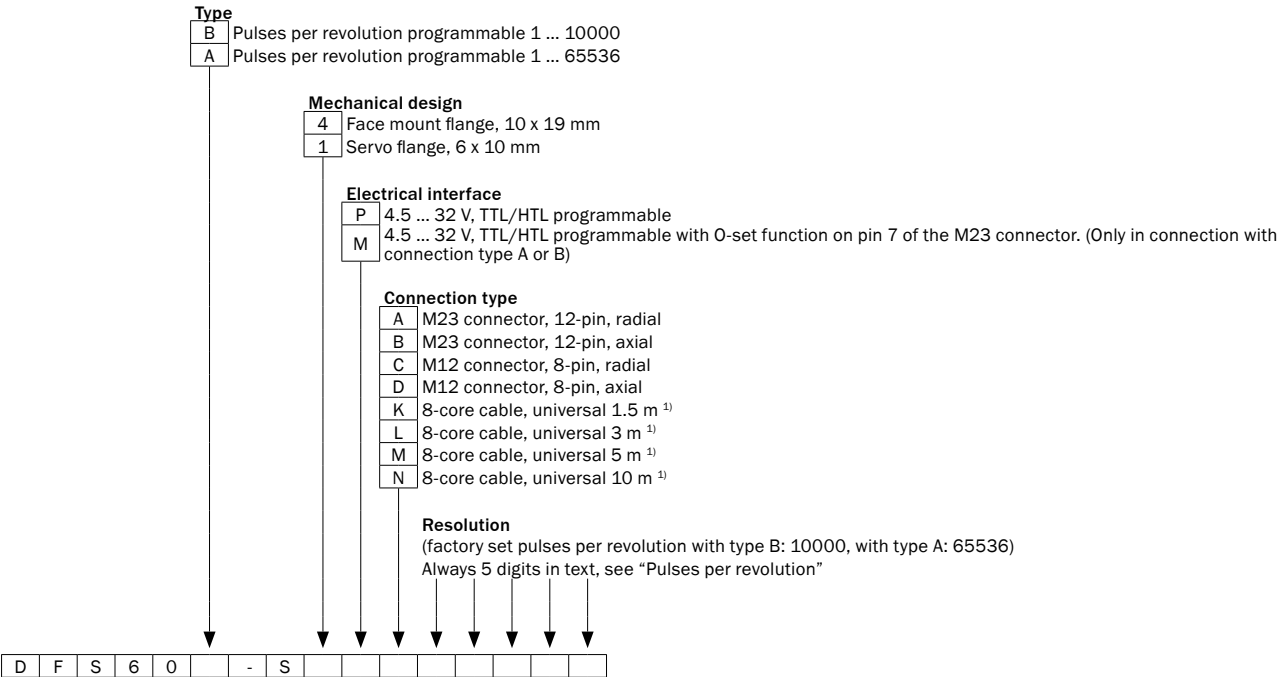
<sup>1)</sup> With mating connector fitted.

<sup>2)</sup> Stationary position of the cable.

<sup>3)</sup> Flexible position of the cable.

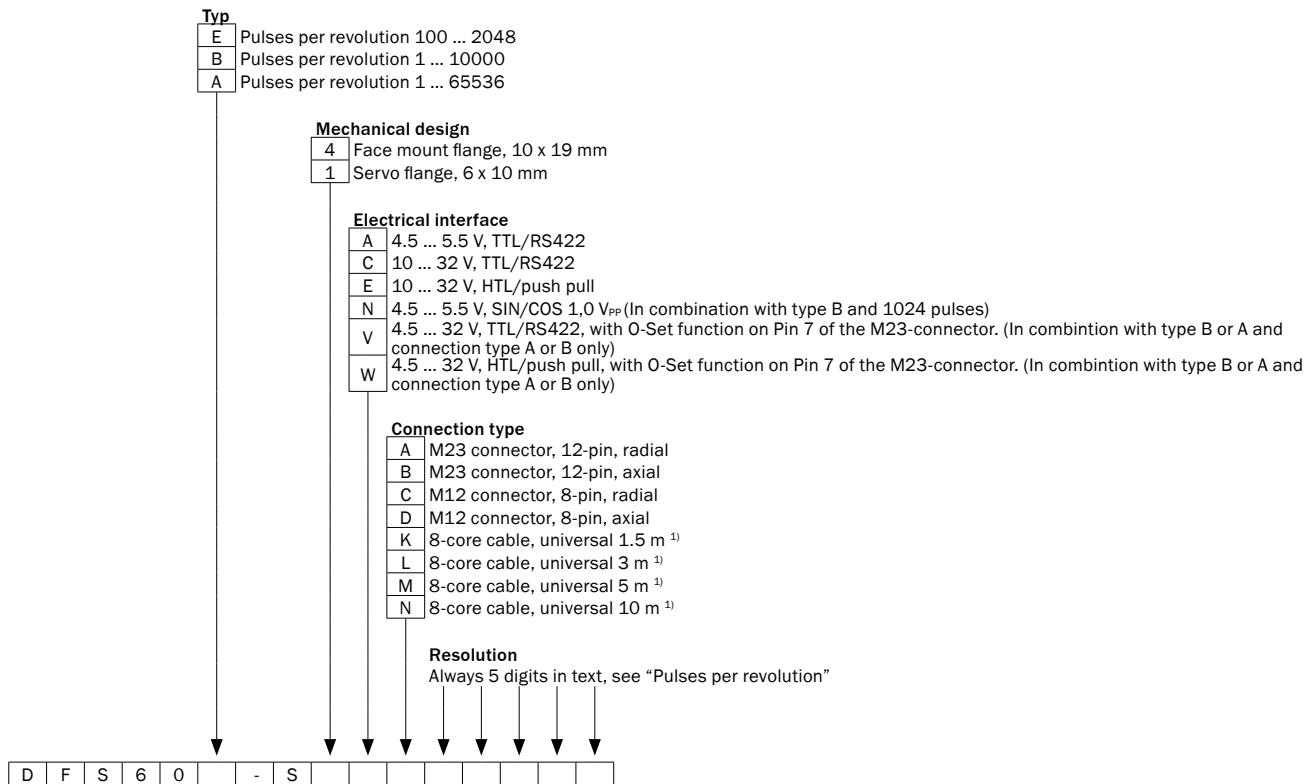
Type code

Solid shaft, programmable



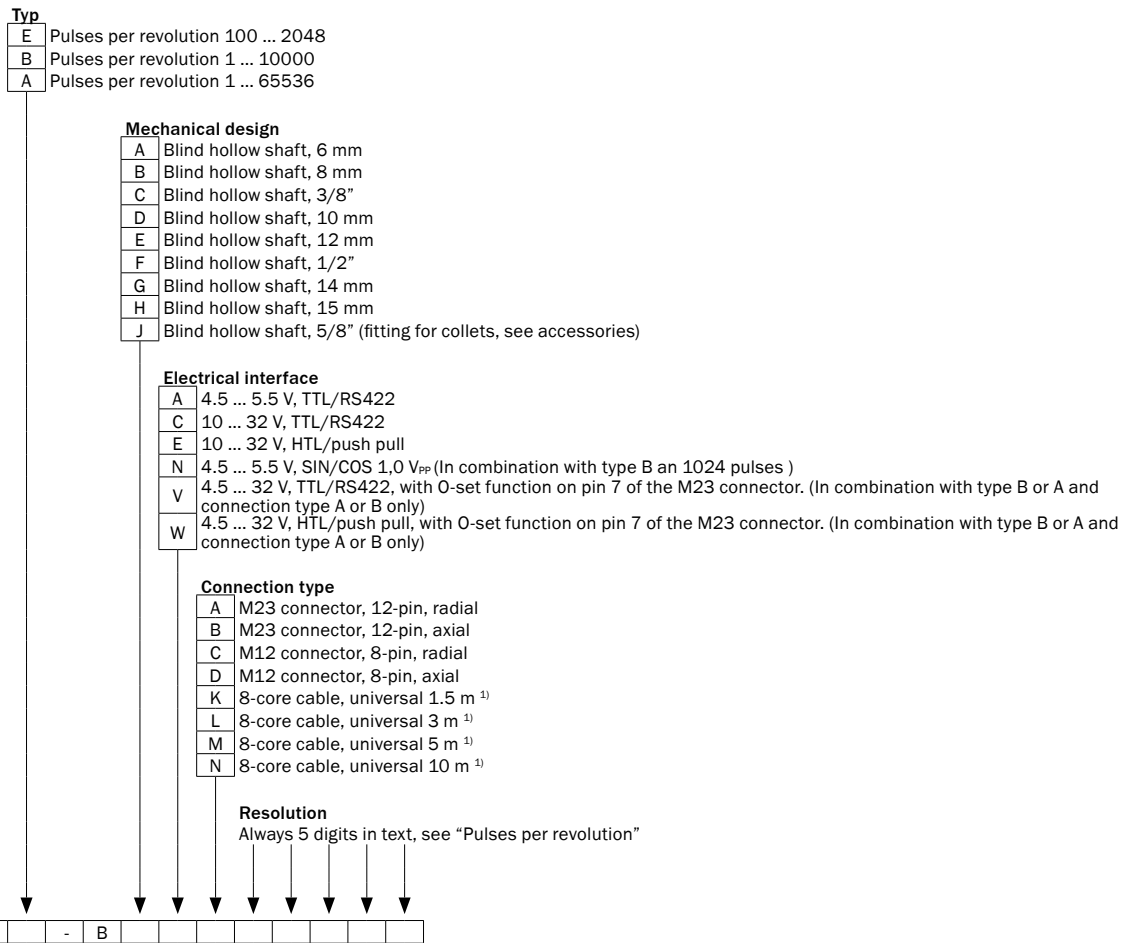
<sup>1)</sup> The universal cable outlet is positioned in such a way that knick-free laying in radial or axial direction is possible.

Solid shaft, not programmable



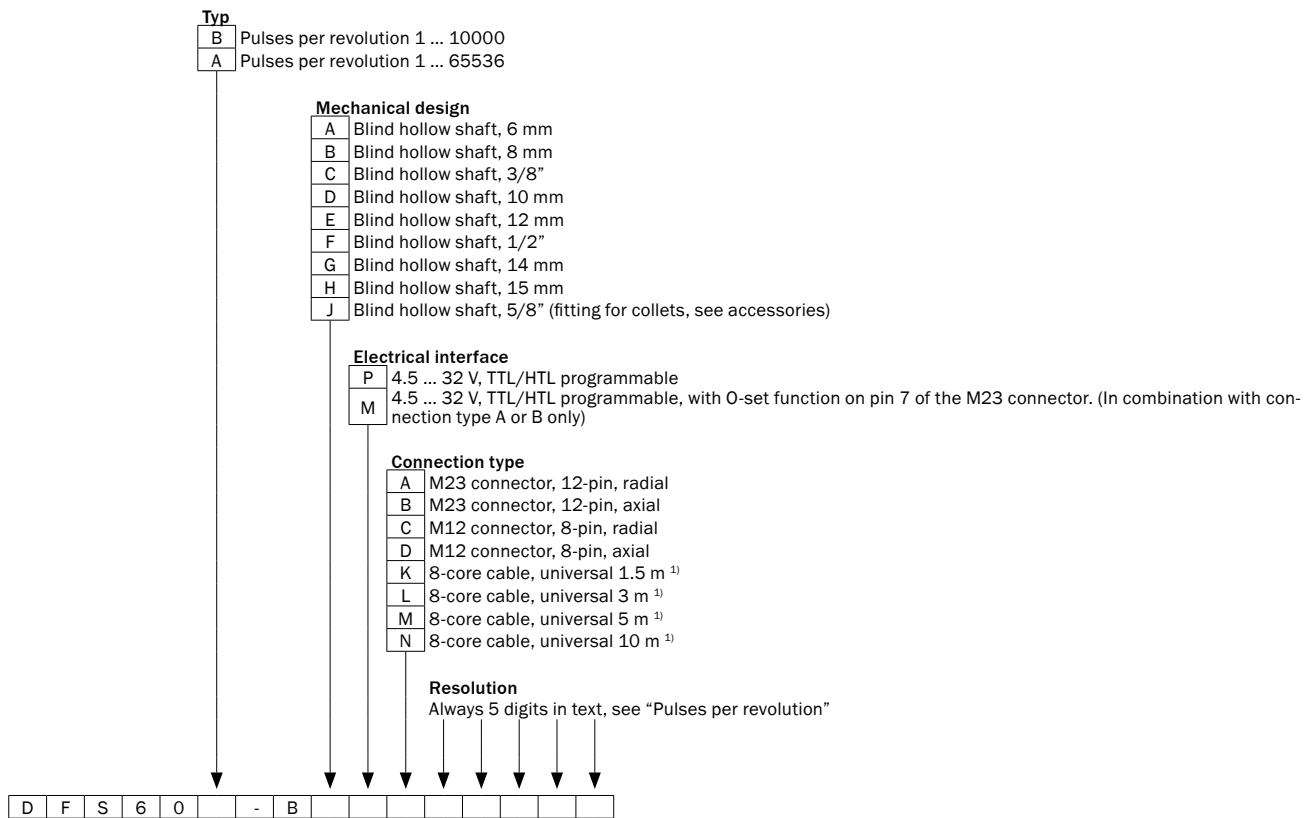
<sup>1)</sup> The universal cable outlet is positioned in such a way that kink-free laying in radial or axial direction is possible.

Blind hollow shaft, not programmable



<sup>1)</sup> The universal cable outlet is positioned in such a way that kink-free laying in radial or axial direction is possible.

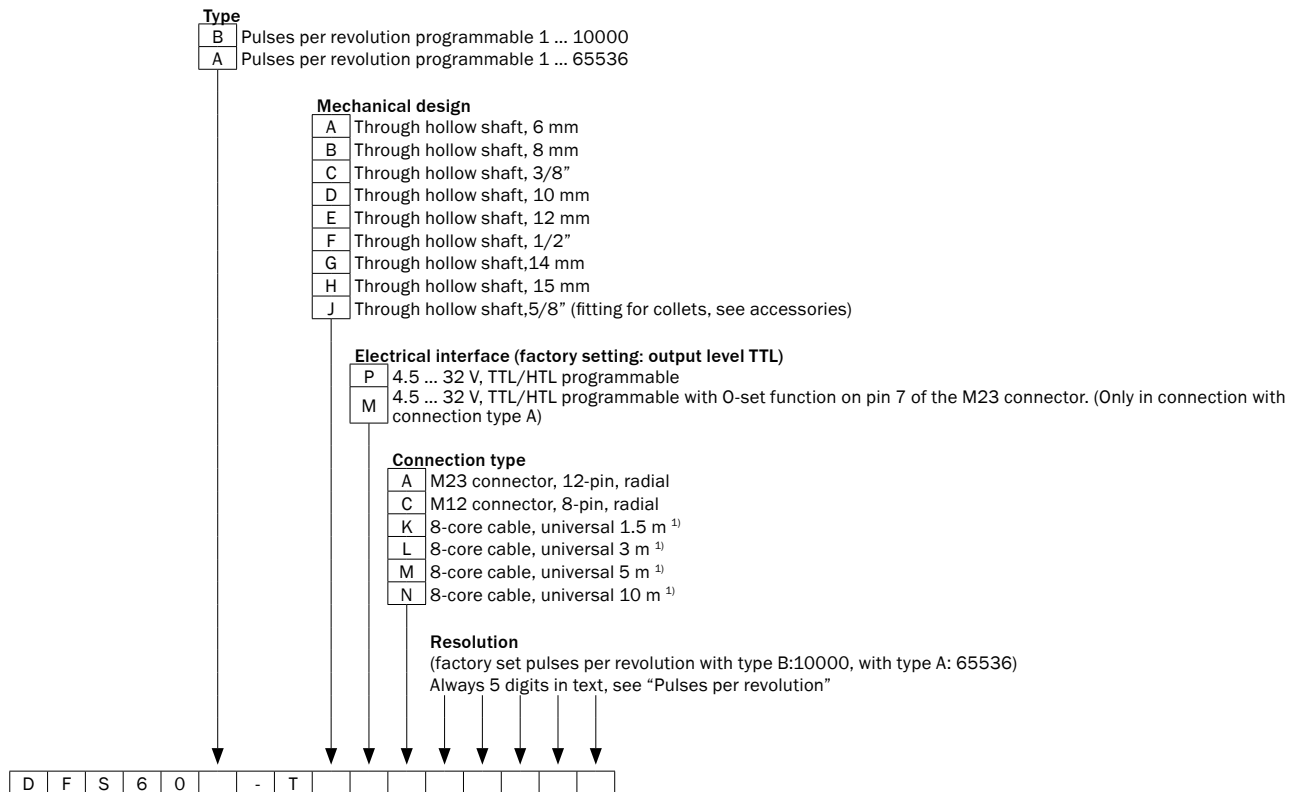
## Blind hollow shaft, programmable



<sup>1)</sup> The universal cable outlet is positioned in such a way that kink-free laying in radial or axial direction is possible.



## Through hollow shaft, programmable



<sup>1)</sup> The universal cable outlet is positioned in such a way that kink-free laying in radial or axial direction is possible.

Pulses per revolution<sup>1)</sup>

|                       | E     | B <sup>2)</sup> | A <sup>2)</sup> |
|-----------------------|-------|-----------------|-----------------|
| Pulses per revolution | 00100 | 00100           | 00100           |
|                       | 00200 | 00200           | 00200           |
|                       | 00250 | 00250           | 00250           |
|                       | 00256 | 00300           | 00300           |
|                       | 00314 | 00314           | 00314           |
|                       | 00360 | 00360           | 00360           |
|                       | 00500 | 00500           | 00500           |
|                       | 00512 | 00512           | 00512           |
|                       | 00720 | 00720           | 00720           |
|                       | 01000 | 01000           | 01000           |
|                       | 01024 | 01024           | 01024           |
|                       | 01250 | 01250           | 01250           |
|                       | 02000 | 02000           | 02000           |
|                       | 02048 | 02048           | 02048           |
|                       |       | 02500           | 02500           |
|                       |       | 03600           | 03600           |
|                       |       | 04000           | 04000           |
|                       |       | 04096           | 04096           |
|                       |       | 05000           | 05000           |
|                       |       | 07200           | 07200           |
|                       |       | 08192           | 08192           |
|                       |       | 10000           | 10000           |
|                       |       |                 | 16384           |
|                       |       |                 | 32768           |
|                       |       |                 | 65536           |

<sup>1)</sup>The electrical interface N (Sin/Cos 1.0 V<sub>pp</sub>) can only be ordered with 1024 pulses per revolution.

<sup>2)</sup>others on request

## Programmable functions

Pulses per revolution from 1 ... 65536 using programming tools PGT-08-S or PGT-10-Pro

Zero pulse width electrically 90°, 180°, 270° using programming tools PGT-08-S or PGT-10-Pro

Zero pulse width mechanically 1° ... 359° using programming tool PGT-10-Pro

Level of the output voltage TTL/HTL using programming tools PGT-08-S or PGT-10-Pro

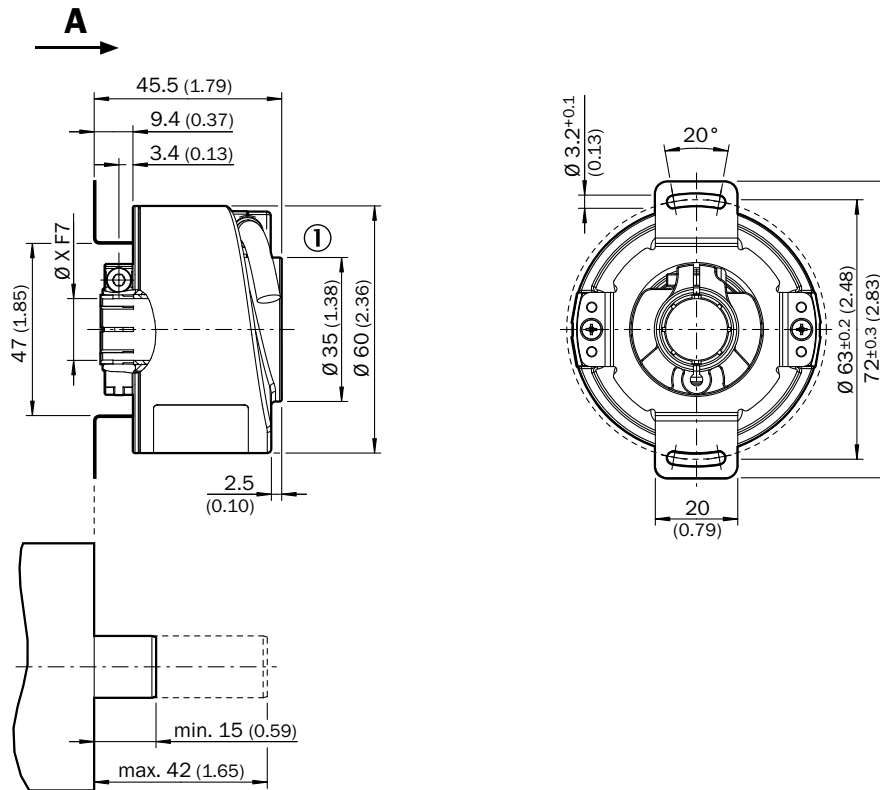
Counting direction CW/CCW using Programming-Tools PGT -08-S or PGT -10-Pro

0-SET function using programming tools PGT-08-S or PGT-10-Pro

0-SET function via PIN 7 of the M23 connector by applying U<sub>s</sub> for at least 250 ms.

**Dimensional drawings** (Dimensions in mm (inch))

Blind hollow shaft, cable outlet

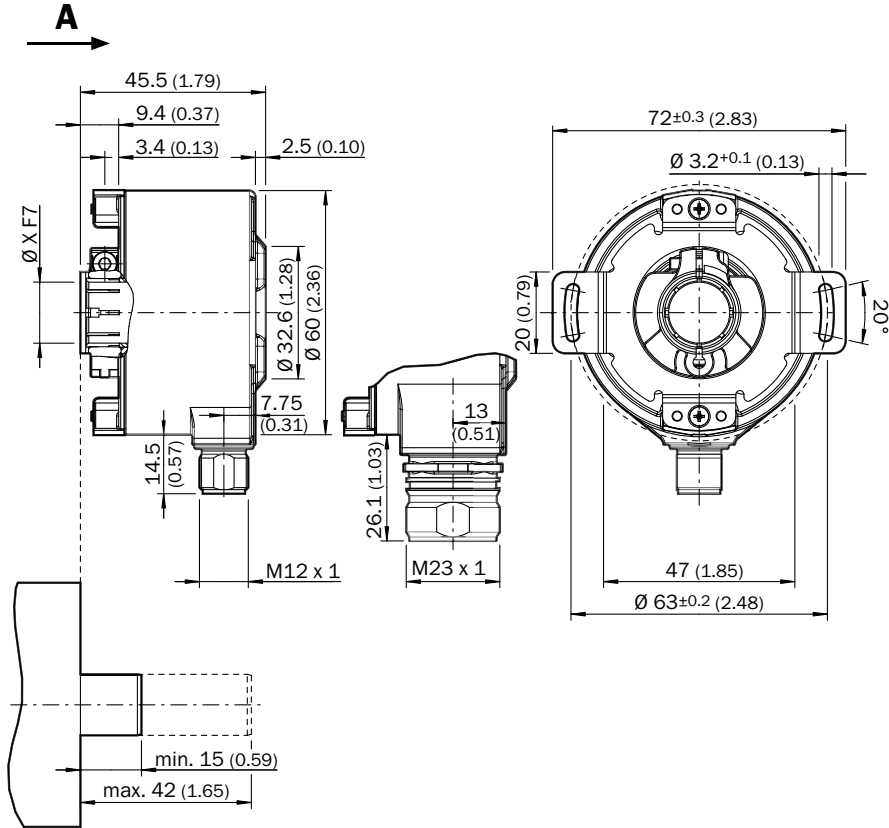


General tolerances according to DIN ISO 2768-mk

① Cable diameter = 5.6 mm  $\pm$  0.2 mm bend radius = 30 mm

| Type                      | Shaft diameter XF7 | Shaft diameter xj7   |
|---------------------------|--------------------|----------------------|
| <b>Blind hollow shaft</b> |                    |                      |
| DFS60x-BAxxxxxxxx         | 6 mm               | Provided by customer |
| DFS60x-BBxxxxxxxx         | 8 mm               |                      |
| DFS60x-BCxxxxxxxx         | 3/8"               |                      |
| DFS60x-BDxxxxxxxx         | 10 mm              |                      |
| DFS60x-BExxxxxxxx         | 12 mm              |                      |
| DFS60x-BFxxxxxxxx         | 1/2"               |                      |
| DFS60x-BGxxxxxxxx         | 14 mm              |                      |
| DFS60x-BHxxxxxxxx         | 15 mm              |                      |
| DFS60x-BJxxxxxxxx         | 5/8"               |                      |

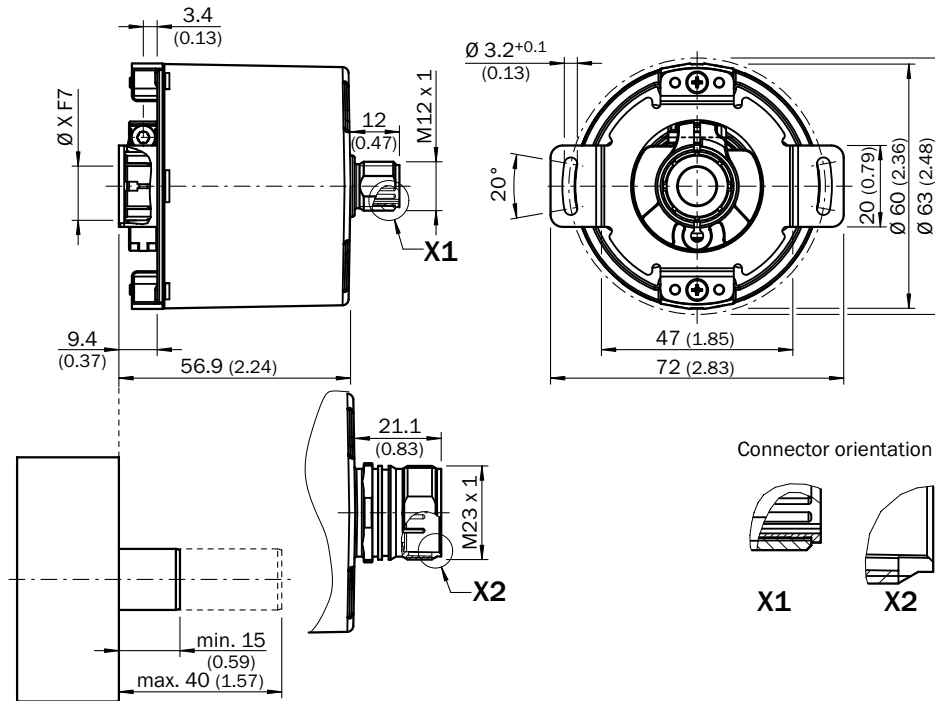
Blind hollow shaft, radial connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

| Type<br>Blind hollow shaft | Shaft diameter XF7 | Shaft diameter xj7   |
|----------------------------|--------------------|----------------------|
| DFS60x-BAxxxxxxx           | 6 mm               | Provided by customer |
| DFS60x-BBxxxxxxx           | 8 mm               |                      |
| DFS60x-BCxxxxxxx           | 3/8"               |                      |
| DFS60x-BDxxxxxxx           | 10 mm              |                      |
| DFS60x-BExxxxxxx           | 12 mm              |                      |
| DFS60x-BFxxxxxxx           | 1/2"               |                      |
| DFS60x-BGxxxxxxx           | 14 mm              |                      |
| DFS60x-BHxxxxxxx           | 15 mm              |                      |
| DFS60x-BJxxxxxxx           | 5/8"               |                      |

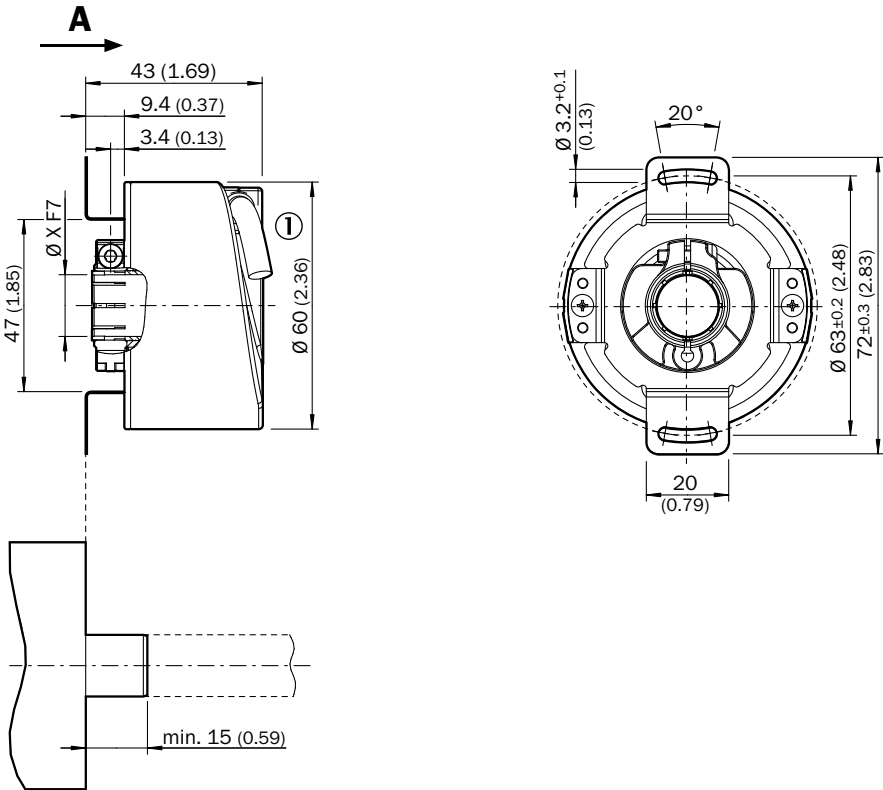
Blind hollow shaft, axial connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

| Type                      | Shaft diameter XF7 | Shaft diameter xj7   |
|---------------------------|--------------------|----------------------|
| <b>Blind hollow shaft</b> |                    |                      |
| DFS60x-BAxxxxxxx          | 6 mm               | Provided by customer |
| DFS60x-BBxxxxxxx          | 8 mm               |                      |
| DFS60x-BCxxxxxxx          | 3/8"               |                      |
| DFS60x-BDxxxxxxx          | 10 mm              |                      |
| DFS60x-BExxxxxxx          | 12 mm              |                      |
| DFS60x-BFxxxxxxx          | 1/2"               |                      |
| DFS60x-BGxxxxxxx          | 14 mm              |                      |
| DFS60x-BHxxxxxxx          | 15 mm              |                      |
| DFS60x-BJxxxxxxx          | 5/8"               |                      |

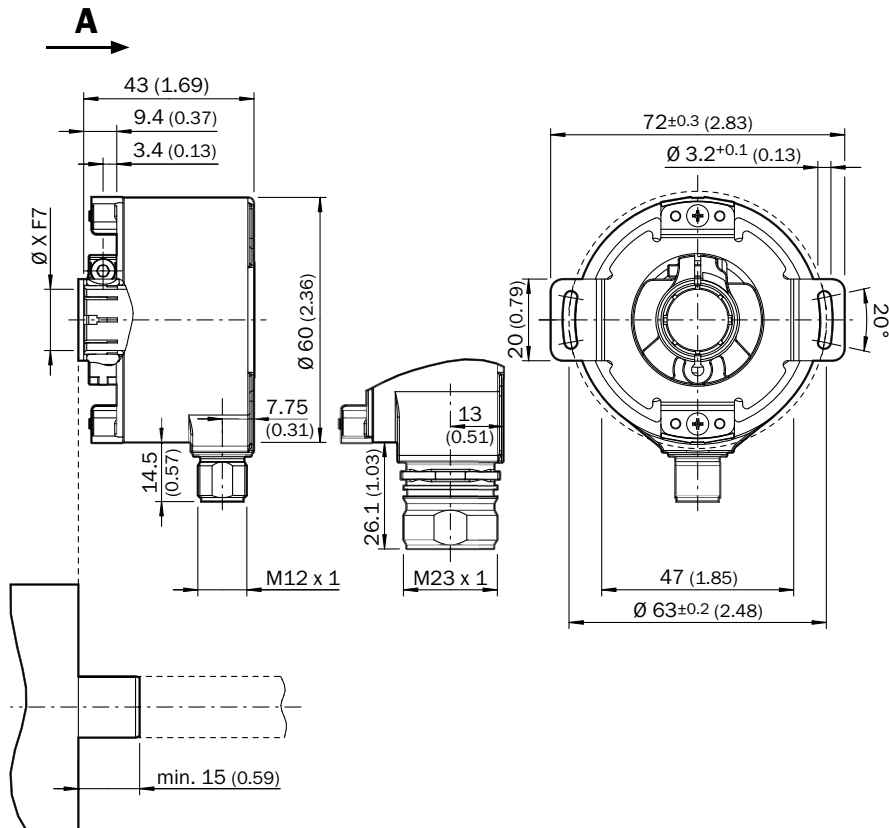
Through hollow shaft, cable outlet



General tolerances according to DIN ISO 2768-mk  
① Cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

| Type<br>Through hollow shaft | Shaft diameter XF7 | Shaft diameter xj7   |
|------------------------------|--------------------|----------------------|
| DFS60x-TAxxxxxxx             | 6 mm               | Provided by customer |
| DFS60x-TBxxxxxxx             | 8 mm               |                      |
| DFS60x-TCxxxxxxx             | 3/8"               |                      |
| DFS60x-TDxxxxxxx             | 10 mm              |                      |
| DFS60x-TExxxxxxx             | 12 mm              |                      |
| DFS60x-TFxxxxxxx             | 1/2"               |                      |
| DFS60x-TGxxxxxxx             | 14 mm              |                      |
| DFS60x-THxxxxxxx             | 15 mm              |                      |
| DFS60x-TJxxxxxxx             | 5/8"               |                      |

Through hollow shaft, radial connector outlet M12 and M23

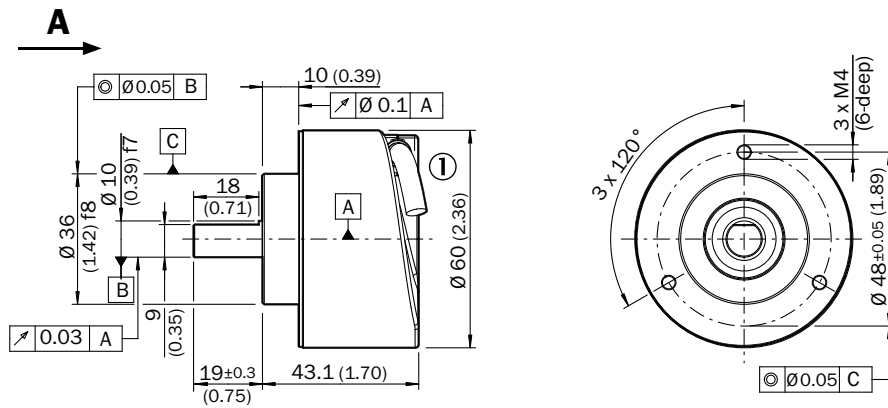


General tolerances according to DIN ISO 2768-mk

① Cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

| Type<br>Through hollow shaft | Shaft diameter XF7 | Shaft diameter xj7   |
|------------------------------|--------------------|----------------------|
| DFS60x-TAxxxxxxx             | 6 mm               | Provided by customer |
| DFS60x-TBxxxxxxx             | 8 mm               |                      |
| DFS60x-TCxxxxxxx             | 3/8"               |                      |
| DFS60x-TDxxxxxxx             | 10 mm              |                      |
| DFS60x-TExxxxxxx             | 12 mm              |                      |
| DFS60x-TFxxxxxxx             | 1/2"               |                      |
| DFS60x-TGxxxxxxx             | 14 mm              |                      |
| DFS60x-THxxxxxxx             | 15 mm              |                      |
| DFS60x-TJxxxxxxx             | 5/8"               |                      |

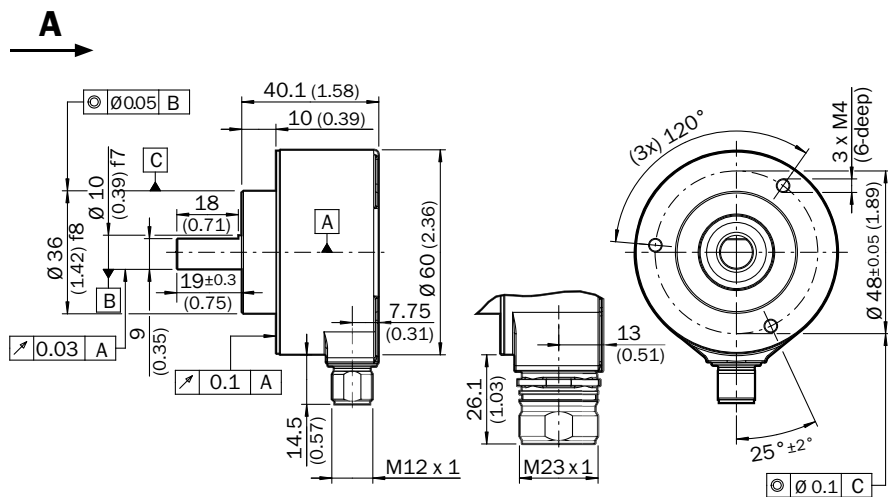
Face mount flange, cable outlet



General tolerances according to DIN ISO 2768-mk

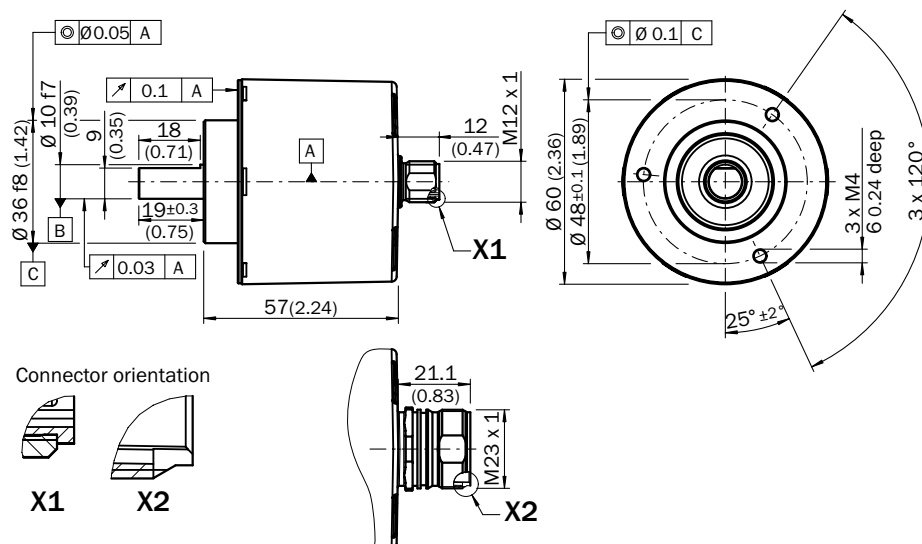
① Cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

Face mount flange, radial connector outlet M12 and M23



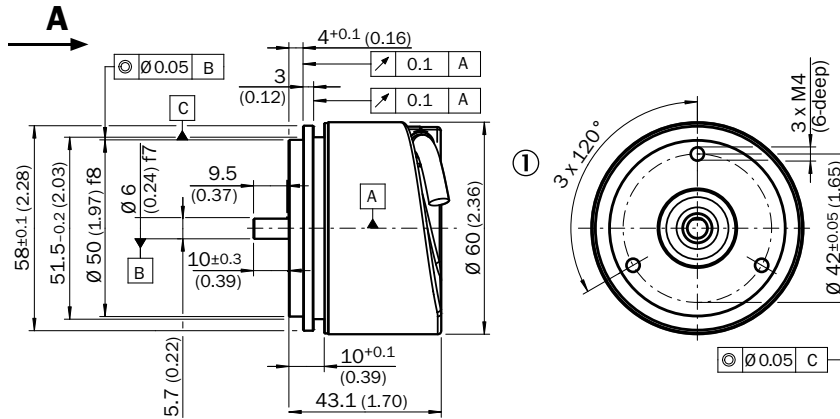
General tolerances according to DIN ISO 2768-mk

Face mount flange, axial connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

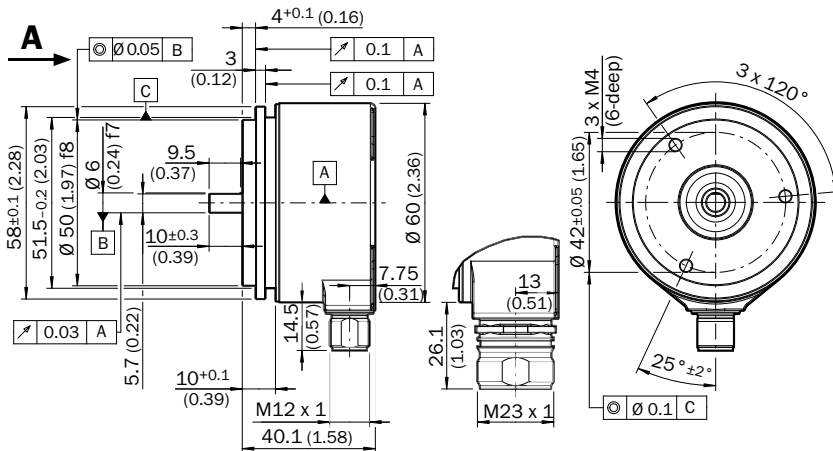
Servo flange, cable outlet



General tolerances according to DIN ISO 2768-mk

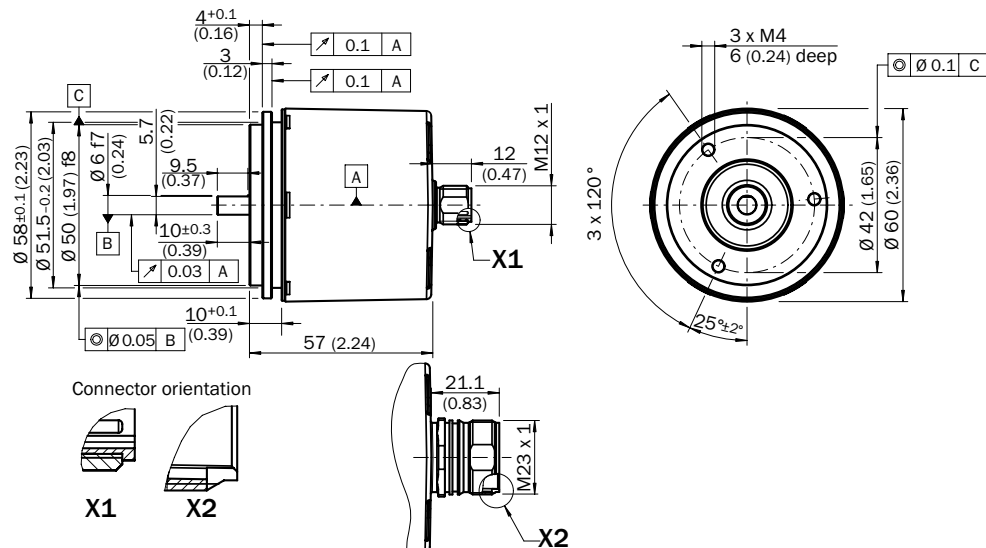
① Cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

Servo flange, radial connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

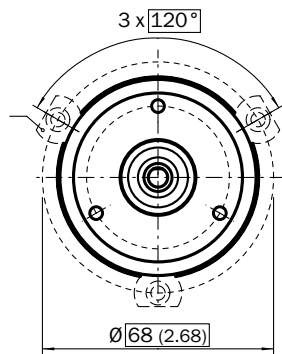
Servo flange, axial connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

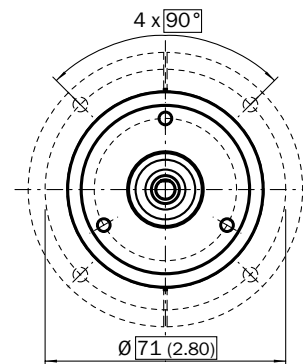
## Proposed fitting

Proposed customer fitting for servo clamp small (part no. 2029166)



All dimensions in mm (inch)

Proposed customer fitting for servo clamp half-shell (part no. 2029165)

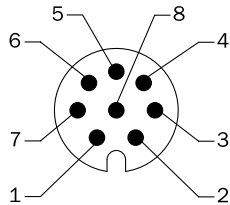


All dimensions in mm (inch)

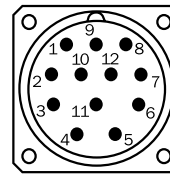
## PIN assignment

### Cable, 8-wire

View of M12 male device connector on encoder



View of M23 male device connector on encoder

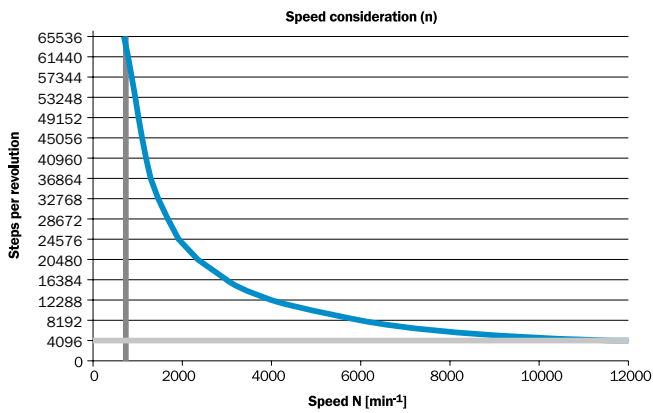


| PIN, 8-pin, M12 male connector | PIN, 12-pin, M23 male connector | Color of the wires for encoders with cable outlet | TTL/HTL signal      | Sin/cos 1.0 V <sub>SS</sub> | Explanation                                                                          |
|--------------------------------|---------------------------------|---------------------------------------------------|---------------------|-----------------------------|--------------------------------------------------------------------------------------|
| 1                              | 6                               | Brown                                             | $\bar{A}$           | COS-                        | Signal wire                                                                          |
| 2                              | 5                               | White                                             | A                   | COS+                        | Signal wire                                                                          |
| 3                              | 1                               | Black                                             | $\bar{B}$           | SIN-                        | Signal wire                                                                          |
| 4                              | 8                               | Pink                                              | B                   | SIN+                        | Signal wire                                                                          |
| 5                              | 4                               | Yellow                                            | $\bar{Z}$           | $\bar{Z}$                   | Signal wire                                                                          |
| 6                              | 3                               | Violet                                            | Z                   | Z                           | Signal wire                                                                          |
| 7                              | 10                              | Blue                                              | GND                 | GND                         | Ground connection of the encoder                                                     |
| 8                              | 12                              | Red                                               | +U <sub>s</sub>     | +U <sub>s</sub>             | Supply voltage (volt-free to housing)                                                |
| -                              | 9                               | -                                                 | n.c.                | n.c.                        | Not assigned                                                                         |
| -                              | 2                               | -                                                 | n.c.                | n.c.                        | Not assigned                                                                         |
| -                              | 11                              | -                                                 | n.c.                | n.c.                        | Not assigned                                                                         |
| -                              | 7 <sup>1)</sup>                 | -                                                 | O-SET <sup>1)</sup> | n.c.                        | Set zero pulse <sup>1)</sup>                                                         |
| Screen                         | Screen                          | Screen                                            | Screen              | Screen                      | Screen connected to housing on encoder side.<br>Connected to ground on control side. |

<sup>1)</sup> For electrical interfaces only: M, U, V, W with O-SET function on PIN 7 on M23 male connector. The O-SET input is used to set the zero pulse on the current shaft position. If the O-SET input is connected to U<sub>s</sub> for longer than 250 ms after it had previously been unassigned for at least 1,000 ms or had been connected to the GND, the current position of the shaft is assigned to the zero pulse signal "Z".

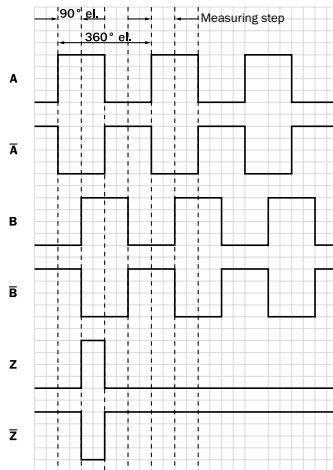
## Maximum revolution range

Maximum revolution range



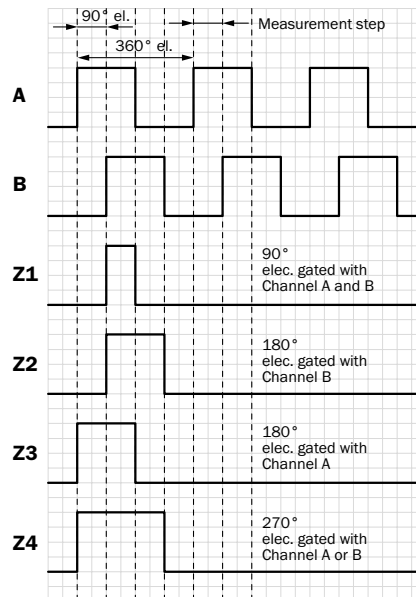
## Signal outputs

Signal outputs



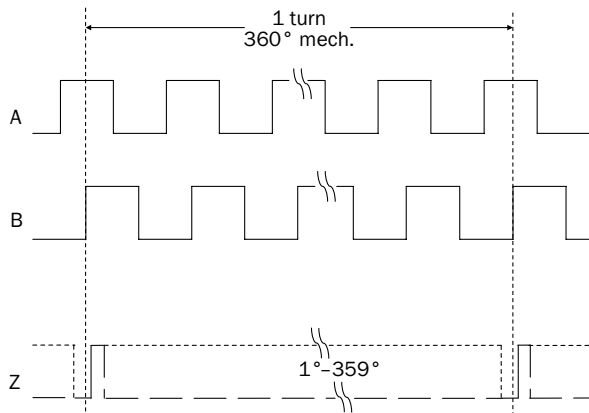
CW with view on the encoder shaft in direction "A", compare dimensional drawing.

Electrical zero pulse width can be configured to 90°, 180°, or 270°. Width of the zero pulse in relation to a pulse period.

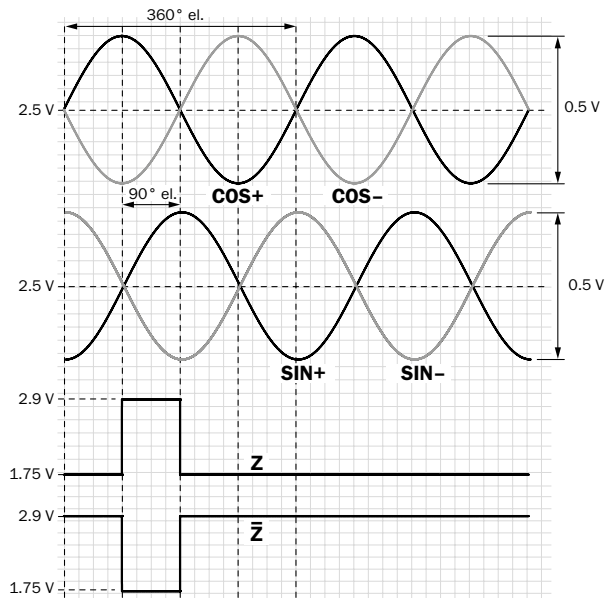


CW with view on the encoder shaft in direction "A", compare dimensional drawing.

Mechanical zero pulse width  $1^\circ$  to  $359^\circ$  programmable. Width of the zero pulse in relation to a mechanical revolution of the shaft.

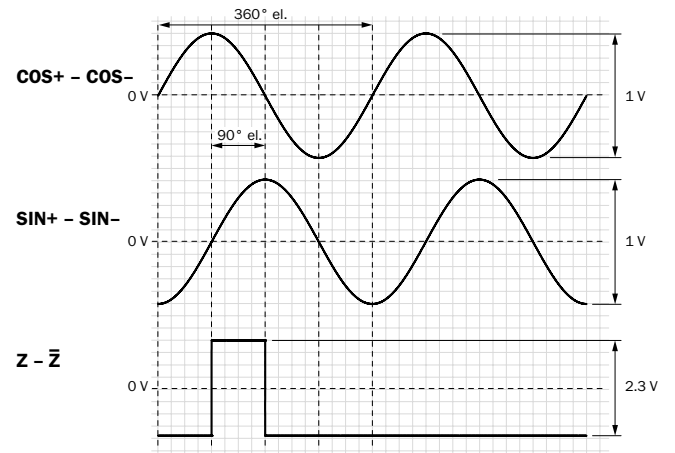


Signal SIN/COS before differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)

Signal SIN/COS after differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)

## Accessories

## Mounting systems

## Flanges

## Flange plates

| Figure                                                                              | Brief description                                                                                                                                                                                         | Type              | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum, Aluminum                                                              | BEF-FA-036-100    | 2029161  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10          | BEF-FA-036-050    | 2029160  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum, Aluminum                                                          | BEF-FA-036-060RSA | 2029163  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10 | BEF-FA-036-060REC | 2029162  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10 | BEF-FA-036-063REC | 2034225  |
|    | One-sided stator coupling, slot, slot radius 32.25 mm to 141.75 mm, slot width 5.1 mm                                                                                                                     | BEF-DS02DFS/VFS   | 2047430  |
|   | One-sided stator coupling, slot, slot radius 33 mm to 211.9 mm, slot width 5.1 mm                                                                                                                         | BEF-DS03DFS/VFS   | 2047431  |
|  | One-sided stator coupling, slot, slot radius 33 mm to 48.5 mm, slot width 5.1 mm                                                                                                                          | BEF-DS01DFS/VFS   | 2047428  |
|  | Standard stator coupling                                                                                                                                                                                  | BEF-DS00XFX       | 2056812  |
|  | Stator coupling with hole circle diameter 63 mm                                                                                                                                                           | BEF-DS07XFX       | 2059368  |
|  | Stator coupling, 16.5 mm high                                                                                                                                                                             | BEF-DS05XFX       | 2057423  |

Dimensional drawings → [page 35](#)

## Mounting brackets and plates

## Mounting brackets

| Figure                                                                              | Brief description                                                                                                          | Type      | Part no. |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------|----------|
|  | Mounting bracket for encoder with spigot 36 mm for face mount flange, mounting kit included                                | BEF-WF-36 | 2029164  |
|  | Mounting angle spring-loaded, for flange with centerring collar 36 mm, working temperature range -40° ... +120°C, Aluminum | BEF-WF36F | 4084775  |

Dimensional drawings → [page 40](#)

## Other mounting accessories

## Measuring wheels and measuring wheel systems

| Figure                                                                              | Brief description                                                                                         | Type           | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------|----------|
|    | Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm                 | BEF-MR010020R  | 2055224  |
|                                                                                     | Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm                 | BEF-MR010030R  | 2049278  |
|                                                                                     | Aluminium measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 200 mm                  | BEF-MR006020R  | 2055222  |
|                                                                                     | Aluminium measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 500 mm                  | BEF-MR006050R  | 2055225  |
|                                                                                     | Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm                           | BEF-MR010050R  | 2055227  |
|                                                                                     | Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 300 mm                            | BEF-MR006030R  | 2055634  |
|    | Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm           | BEF-MR10200AK  | 4084737  |
|    | Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm           | BEF-MR10500AK  | 4084733  |
|    | Aluminum measuring wheel with cross-knurled surface for 6 mm solid shaft, circumference 200 mm            | BEF-MR06200AK  | 4084745  |
|    | Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 200 mm     | BEF-MR10200APG | 4084740  |
|   | Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 500 mm     | BEF-MR10500APG | 4084736  |
|  | Aluminum measuring wheel with ridged polyurethane surface for 6 mm solid shaft, circumference 200 mm      | BEF-MR06200APG | 4084748  |
|  | Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm     | BEF-MR10200AP  | 4084738  |
|  | Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm     | BEF-MR10500AP  | 4084734  |
|  | Aluminum measuring wheel with smooth polyurethane surface for 6 mm solid shaft, circumference 200 mm      | BEF-MR06200AP  | 4084746  |
|  | Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm    | BEF-MR10200APN | 4084739  |
|  | Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 500 mm    | BEF-MR10500APN | 4084735  |
|  | Aluminum measuring wheel with studded polyurethane surface for 6 mm solid shaft, circumference 200 mm     | BEF-MR06200APN | 4084747  |
|  | Measuring wheel with ridged plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm          | BEF-MR-010020G | 5318678  |
|  | Plastic measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 500 mm  | BEF-MR-010050  | 5312989  |
|  | Plastic measuring wheel with smooth plastic surface (Hytrel), for 10 mm solid shaft, circumference 200 mm | BEF-MR-010020  | 5312988  |

| Figure | Brief description                                  | Type           | Part no. |
|--------|----------------------------------------------------|----------------|----------|
|        | O-ring for measuring wheels (circumference 200 mm) | BEF-OR-053-040 | 2064061  |
|        | O-ring for measuring wheels (circumference 300 mm) | BEF-OR-083-050 | 2064076  |
|        | O-ring for measuring wheels (circumference 500 mm) | BEF-OR-145-050 | 2064074  |

Dimensional drawings → [page 40](#)

#### Modular measuring wheel system

| Figure                                                                            | Brief description                                                                                                                    | Type         | Part no. |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|
|  | SICK modular measuring wheel system for face mount flange encoder with S4 mechanical design (10 x 19 mm solid shaft), e.g., DFS60-S4 | BEF-MRS-10-U | 2085714  |

Dimensional drawings → [page 40](#)

#### Mounting bells

| Figure                                                                            | Brief description                                                                | Type      | Part no. |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------|----------|
|  | Mounting bell for encoder with servo flange, 50 mm spigot, mounting kit included | BEF-MG-50 | 5312987  |

Dimensional drawings → [page 40](#)

#### Others

| Figure                                                                              | Brief description                                                                                                                                                                                                                                                                                                                                                                                        | Type               | Part no. |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|
|   | Bearing block for servo and face mount flange encoder. The heavy-duty bearing block is used to absorb very large radial and axial shaft loads. Particularly when using belt pulleys, chain sprockets, friction wheels.                                                                                                                                                                                   | BEF-FA-LB1210      | 2044591  |
|  | Bearing bracket for hollow shaft encoders, fastening screws included. The Bearing Block is intended for very large radial and axial shaft loads. Particularly for application on: Belt pulleys, Chain pinions, Friction wheels. It is designed this way to enable fitting of encoder with blind hollow shaft with Ø 12 mm., fastening screws included.                                                   | BEF-FA-B12-010     | 2042728  |
|  | Clamping ring for metal hollow shaft, metal                                                                                                                                                                                                                                                                                                                                                              | BEF-KR-M           | 2064709  |
|                                                                                     | Flange adapter (adapts size 60 face mount flange encoder to bearing block with part. no. 2044591)                                                                                                                                                                                                                                                                                                        | BEF-FA-036-050-019 | 2063378  |
|                                                                                     | Mounting kit for servo flange encoder on the bearing block, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911 | BEF-MK-LB          | 5320872  |

Dimensional drawings → [page 40](#)

#### Servo clamps

| Figure                                                                              | Brief description                                                                                                                 | Type         | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------|----------|
|  | Half-shell servo clamps (2 pcs.) for servo flanges with a 50 mm centering hub                                                     | BEF-WG-SF050 | 2029165  |
|  | Servo clamps, large, for servo flanges (clamps, eccentric fastener), 3 pcs., without mounting material, without mounting hardware | BEF-WK-SF    | 2029166  |

Dimensional drawings → [page 40](#)

## Shaft adaptation

### Collets and clamping rings

| Figure                                                                              | Brief description                                                                                                   | Type                      | Part no. |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------|----------|
|    | Collet metal for hollow shaft, shaft diameter 1/2" (12.7 mm), outer diameter 5/8" (15.875 mm), metal                | SPZ-58Z-12Z-M             | 2076225  |
|                                                                                     | Collet metal for hollow shaft, shaft diameter 10 mm, outer diameter 5/8" (15.875 mm), metal                         | SPZ-58Z-010-M             | 2076220  |
|                                                                                     | Collet metal for hollow shaft, shaft diameter 12 mm, outer diameter 5/8" (15.875 mm), metal                         | SPZ-58Z-012-M             | 2076221  |
|                                                                                     | Collet metal for hollow shaft, shaft diameter 14 mm, outer diameter 5/8" (15.875 mm), metal                         | SPZ-58Z-014-M             | 2076222  |
|                                                                                     | Collet metal for hollow shaft, shaft diameter 3/8" (9.525 mm), outer diameter 5/8" (15.875 mm), metal               | SPZ-58Z-38Z-M             | 2076224  |
|                                                                                     | Collet metal for hollow shaft, shaft diameter 8 mm, outer diameter 5/8" (15.875 mm), metal                          | SPZ-58Z-008-M             | 2076219  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 1/2" (12.7 mm), outer diameter 5/8" (15.875 mm), plastic  | SPZ-58Z-12Z-P             | 2076227  |
|    | Collet metal for hollow shaft, shaft diameter 15 mm, outer diameter 5/8" (15.875 mm), metal                         | SPZ-58Z-015-M             | 2076223  |
|    | Collet plastic insulated for hollow shaft, shaft diameter 10 mm, outer diameter 5/8" (15.875 mm), plastic           | SPZ-58Z-010-P             | 2076230  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 12 mm, outer diameter 5/8" (15.875 mm), plastic           | SPZ-58Z-012-P             | 2076231  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 3/8" (9.525 mm), outer diameter 5/8" (15.875 mm), plastic | SPZ-58Z-38Z-P             | 2076226  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 6 mm, outer diameter 5/8" (15.875 mm), plastic            | SPZ-58Z-006-P             | 2076228  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 8 mm, outer diameter 5/8" (15.875 mm), plastic            | SPZ-58Z-008-P             | 2076229  |
|  | Collet plastic insulated for hollow shaft, shaft diameter 14 mm, outer diameter 5/8" (15.875 mm), plastic           | SPZ-58Z-014-P             | 2076232  |
|                                                                                     | Collet plastic insulated for hollow shaft, shaft diameter 15 mm, outer diameter 5/8" (15.875 mm), plastic           | SPZ-58Z-015-P             | 2076233  |
|                                                                                     |                                                                                                                     |                           |          |
|  | PEEK conductor insulation (shaft diameter 1/2" (12.7 mm), outer diameter 15 mm)                                     | PEEK CONDUCTOR INSULATION | 2064572  |
|                                                                                     | PEEK conductor insulation (shaft diameter 10 mm, outer diameter 12 mm)                                              | PEEK CONDUCTOR INSULATION | 2064571  |
|                                                                                     | PEEK conductor insulation (shaft diameter 11 mm, outer diameter 12.7 mm)                                            | PEEK CONDUCTOR INSULATION | 2077319  |
|                                                                                     | PEEK conductor insulation (shaft diameter 12 mm, outer diameter 14 mm)                                              | PEEK CONDUCTOR INSULATION | 2064573  |
|                                                                                     | PEEK conductor insulation (shaft diameter 8 mm, outer diameter 10 mm)                                               | PEEK CONDUCTOR INSULATION | 2065642  |

Dimensional drawings → [page 44](#)

## Shaft couplings

| Figure                                                                              | Brief description                                                                                                                                                                                                                                                                                                            | Type       | Part no. |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
|    | Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.2$ mm, angular $\pm 3^\circ$ ; speed 10,000 rpm, $-10^\circ$ to $+80^\circ$ Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub                                                        | KUP-1010-S | 2056408  |
|                                                                                     | Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.3$ mm, angular $\pm 3^\circ$ ; max. speed 10,000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub                                                           | KUP-0610-S | 2056407  |
|                                                                                     | Bar coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.2$ mm, angle $\pm 3^\circ$ ; max. speed 10,000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub                                                            | KUP-0606-S | 2056406  |
|                                                                                     | Bar coupling, shaft diameter 6 mm / 8 mm, maximum shaft offset radial $\pm 0.3$ mm, axial $\pm 0.2$ mm, angle $\pm 3^\circ$ , max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub                                                                           | KUP-0608-S | 5314179  |
|                                                                                     | Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.3$ mm, angular $\pm 3^\circ$ ; max. speed 10,000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub                                                           | KUP-0810-S | 5314178  |
|    | Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. revolutions 10,000 rpm, $-30^\circ$ to $+120^\circ$ °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs                                             | KUP-1010-B | 5312983  |
|                                                                                     | Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. speed 10,000 rpm, $-30^\circ$ °C to $+120^\circ$ °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub                                                         | KUP-0610-B | 5312982  |
|                                                                                     | Bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. speed 10,000 rpm, $-30^\circ$ °C to $+120^\circ$ °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub                                                          | KUP-0606-B | 5312981  |
|                                                                                     | Bellows coupling, shaft diameter 10 mm / 12 mm; maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. revolutions 10,000 rpm, $-30^\circ$ to $+120^\circ$ °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs                                           | KUP-1012-B | 5312984  |
|  | Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial $\pm 2.5$ mm, axial $\pm 3$ mm, angular $\pm 10^\circ$ ; max. speed 3,000 rpm, $-30^\circ$ to $+80^\circ$ °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange                                                           | KUP-1010-D | 5326703  |
|                                                                                     | Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial $\pm 2.5$ mm, axial $\pm 3$ mm, angular $\pm 10^\circ$ ; max. speed 3,000 rpm, $-30^\circ$ to $+80^\circ$ °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange                                                           | KUP-1012-D | 5326702  |
|                                                                                     | Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially $\pm 2.5$ mm, axially $\pm 3$ mm, angle $\pm 10$ degrees; max. speed 3,000 rpm, $-30$ to $+80$ degrees Celsius, torsional spring stiffness of 25 Nm/rad                                                                                       | KUP-0610-D | 5326697  |
|                                                                                     | Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially $\pm 0.25$ mm, axially $\pm 0.4$ mm, angle $\pm 4$ degrees; max. speed 10,000 rpm, $-30$ to $+120$ degrees Celsius, torsional spring stiffness of 150 Nm/rad                                                                                  | KUP-0810-D | 5326704  |
|  | Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial $\pm 0.3$ mm, axial $\pm 0.4$ mm, angle $\pm 2.5^\circ$ , torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin                                        | KUP-1010-F | 5312986  |
|                                                                                     | Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.4$ mm, angular $\pm 2.5^\circ$ ; max. speed 12,000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin | KUP-0610-F | 5312985  |
|  | Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial $\pm 1.5$ mm, axial $\pm 1.0$ mm, angle $\pm 5^\circ$ , max. speed 3,000 rpm, $-30^\circ$ to $+120^\circ$ °C, max. torque 150 Ncm; material: spring steel, clamping: zinc die cast                                                        | KUP-1010-W | 5319914  |

Dimensional drawings → [page 44](#)

## Connection systems

## Plug connectors and cables

## Cables (ready to assemble)

| Figure                                                                            | Brief description                                                                                                                                                                                                   | Type           | Part no. |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
|  | Head A: cable<br>Head B: cable<br>Cable: SSI, drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm <sup>2</sup> , Ø 5.6 mm                                                                                  | LTG-2308-MWENC | 6027529  |
|  | Head A: cable<br>Head B: cable<br>Cable: SSI, PUR, shielded, 4 x 2 x 0.15 mm <sup>2</sup> + 2 x 0.5mm <sup>2</sup> + 1 x 0.14mm <sup>2</sup> , Ø 7.5 mm                                                             | LTG-2411-MW    | 6027530  |
|  | Head A: cable<br>Head B: cable<br>Cable: SSI, drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 2 x 0.14 mm <sup>2</sup> , Ø 7.8 mm                             | LTG-2512-MW    | 6027531  |
|  | Head A: cable<br>Head B: cable<br>Cable: SSI, drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 2 x 0.14 mm <sup>2</sup> , Ø 7.8 mm, UV and saltwater-resistant | LTG-2612-MW    | 6028516  |

## Connecting cables with female connector

| Figure                                                                              | Brief description                                                                                                                                                                                   | Cable length | Type             | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|----------|
|    | Head A: female connector, JST, 8-pin, straight<br>Head B: cable<br>Cable: SSI, Incremental, drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm <sup>2</sup> , Ø 5.6 mm                    | 0.5 m        | DOL-0J08-G0M5AA3 | 2046873  |
|                                                                                     |                                                                                                                                                                                                     | 1.5 m        | DOL-0J08-G1M5AA6 | 2048590  |
|                                                                                     |                                                                                                                                                                                                     | 3 m          | DOL-0J08-G3M0AA6 | 2048591  |
|                                                                                     |                                                                                                                                                                                                     | 5 m          | DOL-0J08-G05MAA3 | 2046876  |
|                                                                                     |                                                                                                                                                                                                     | 10 m         | DOL-0J08-G10MAA3 | 2046877  |
|  | Head A: female connector, M12, 8-pin, straight<br>Head B: cable<br>Cable: drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm <sup>2</sup> , Ø 7 mm                                        | 2 m          | DOL-1208-G02MAC1 | 6032866  |
|                                                                                     |                                                                                                                                                                                                     | 5 m          | DOL-1208-G05MAC1 | 6032867  |
|                                                                                     |                                                                                                                                                                                                     | 10 m         | DOL-1208-G10MAC1 | 6032868  |
|                                                                                     |                                                                                                                                                                                                     | 20 m         | DOL-1208-G20MAC1 | 6032869  |
|  | Head A: female connector, M23, 12-pin, straight<br>Head B: cable<br>Cable: Incremental, PUR, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 1 x 0.14 mm <sup>2</sup> , Ø 7.5 mm | 2 m          | DOL-2312-G02MLA3 | 2030682  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G02MLD1 | 2062202  |
|                                                                                     |                                                                                                                                                                                                     | 7 m          | DOL-2312-G07MLA3 | 2030685  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G07MLD1 | 2062203  |
|                                                                                     |                                                                                                                                                                                                     | 10 m         | DOL-2312-G10MLA3 | 2030688  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G10MLD1 | 2062204  |
|                                                                                     |                                                                                                                                                                                                     | 15 m         | DOL-2312-G15MLA3 | 2030692  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G15MLD1 | 2062205  |
|                                                                                     |                                                                                                                                                                                                     | 20 m         | DOL-2312-G20MLA3 | 2030695  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G20MLD1 | 2062206  |
|                                                                                     |                                                                                                                                                                                                     | 25 m         | DOL-2312-G25MLA3 | 2030699  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G25MLD1 | 2062207  |
|                                                                                     |                                                                                                                                                                                                     | 30 m         | DOL-2312-G30MLA3 | 2030702  |
|                                                                                     |                                                                                                                                                                                                     |              | DOL-2312-G30MLD1 | 2062208  |

| Figure                                                                            | Brief description                                                                                                                                                                                                   | Cable length | Type              | Part no. |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------|----------|
|  | Head A: female connector, M23, 12-pin, straight<br>Head B: cable<br>Cable: Incremental, drag chain use, PUR, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 2 x 0.14 mm <sup>2</sup> , Ø 7.8 mm | 1.5 m        | DOL-2312-G1M5MA3  | 2029212  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G1M-5MD1 | 2062240  |
|                                                                                   |                                                                                                                                                                                                                     | 3 m          | DOL-2312-G03M-MA3 | 2029213  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G03M-MD1 | 2062243  |
|                                                                                   |                                                                                                                                                                                                                     | 5 m          | DOL-2312-G05M-MA3 | 2029214  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G05M-MD1 | 2062244  |
|                                                                                   |                                                                                                                                                                                                                     | 10 m         | DOL-2312-G10MMA3  | 2029215  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G10M-MD1 | 2062245  |
|                                                                                   |                                                                                                                                                                                                                     | 20 m         | DOL-2312-G20M-MA3 | 2029216  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G20M-MD1 | 2062246  |
|                                                                                   |                                                                                                                                                                                                                     | 30 m         | DOL-2312-G30M-MA3 | 2029217  |
|                                                                                   |                                                                                                                                                                                                                     |              | DOL-2312-G30M-MD1 | 2062247  |

Dimensional drawings → [page 46](#)

## Connection cables with female connector and male connector

| Figure                                                                              | Brief description                                                                                                                                                                                           | Cable length | Type             | Part no. |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|----------|
|  | Head A: female connector, plug-in system, 8-pin, straight<br>Head B: male connector, D-Sub, 9-pin, straight<br>Cable: Incremental, PVC, shielded                                                            | 0.5 m        | DSL-0D04-G0M0AC3 | 2078403  |
|                                                                                     |                                                                                                                                                                                                             |              | DSL-0D08-G0M5AC3 | 2061739  |
|  | Head A: female connector, M12, 8-pin, straight<br>Head B: male connector, D-Sub, 9-pin, straight<br>Cable: Incremental, shielded, 4 x 2 x 0.08 mm <sup>2</sup>                                              | 0.5 m        | DSL-2D08-G0M5AC3 | 2046579  |
|  | Head A: female connector, M23, 12-pin, straight<br>Head B: male connector, D-Sub, 9-pin, straight<br>Cable: Incremental, shielded, 4 x 2 x 0.08 mm <sup>2</sup>                                             | 0.5 m        | DSL-3D08-G0M5AC3 | 2046580  |
|  | Head A: female connector, JST, 8-pin, straight<br>Head B: male connector, M23, 12-pin, straight<br>Cable: Incremental, drag chain use, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm <sup>2</sup> , Ø 5.6 mm | 1 m          | STL-2312-G01MAA3 | 2061622  |
|                                                                                     |                                                                                                                                                                                                             | 2 m          | STL-2312-G02MAA3 | 2061504  |
|                                                                                     |                                                                                                                                                                                                             | 0.35 m       | STL-2312-GM35AA3 | 2061621  |

Dimensional drawings → [page 46](#)

## Female connectors (ready to assemble)

| Figure                                                                              | Brief description                                                                                                       | Type          | Part no. |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------|----------|
|  | Head A: female connector, M12, 8-pin, straight, A-coding<br>Head B: -<br>Cable: Incremental, SSI, shielded, CAT5, CAT5e | DOS-1208-GA01 | 6045001  |

| Figure                                                                            | Brief description                                                                                                           | Type         | Part no. |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------|----------|
|  | Head A: female connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, shielded               | DOS-2312-G   | 6027538  |
|  | Head A: female connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, PBT UL 94-V0, shielded | DOS-2312-G02 | 2077057  |
|  | Head A: female connector, M23, 12-pin, angled<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, shielded                 | DOS-2312-W01 | 2072580  |

Dimensional drawings → [page 46](#)

## Male connectors (ready to assemble)

| Figure                                                                            | Brief description                                                                                                         | Type          | Part no. |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------|----------|
|  | Head A: male connector, M12, 8-pin, straight, A-coding<br>Head B: -<br>Cable: Incremental, shielded, CAT5, CAT5e          | STE-1208-GA01 | 6044892  |
|  | Head A: male connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, RS-422, shielded       | STE-2312-G    | 6027537  |
|  | Head A: male connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, PBT UL 94-V0, shielded | STE-2312-G01  | 2077273  |
|  | Head A: male connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, shielded               | STE-2312-GX   | 6028548  |

Dimensional drawings → [page 46](#)

## Further accessories

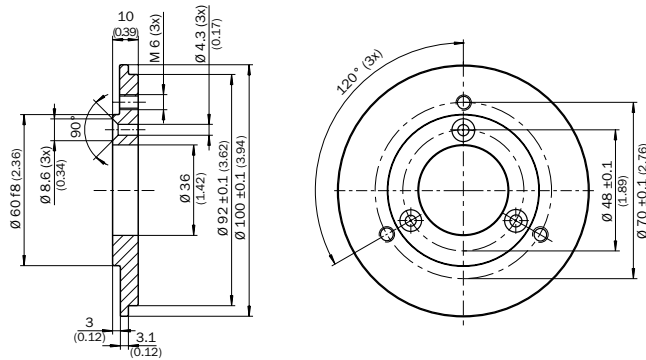
### Programming and configuration tools

| Figure                                                                              | Brief description                                                                                                                                                                                               | Type           | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
|  | USB programming unit, for programmable SICK encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoders                                                                        | PGT-08-S       | 1036616  |
|  | Programming unit display for programmable SICK DFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoder with DFS60, AFS/AFM60 and AHS/AHM36. Compact dimensions, low weight, and intuitive operation. | PGT-10-PRO-S01 | 1087462  |
|                                                                                     |                                                                                                                                                                                                                 | PGT-10-Pro     | 1072254  |

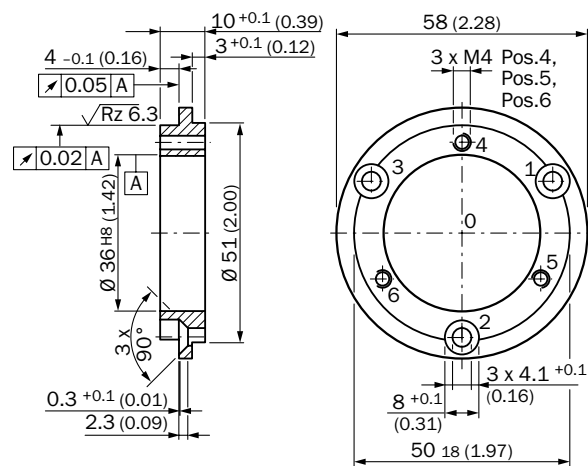
Dimensional drawings for accessories (Dimensions in mm (inch))

Flanges

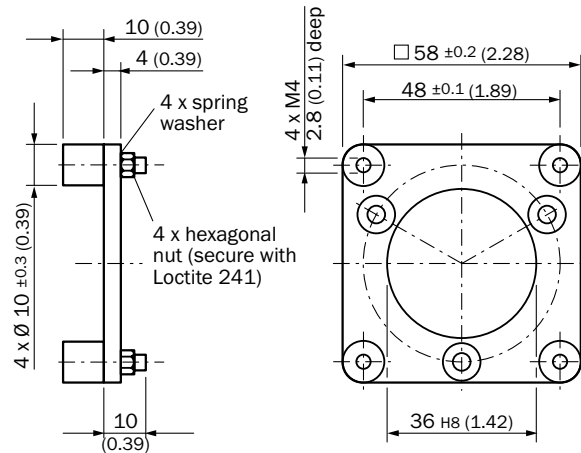
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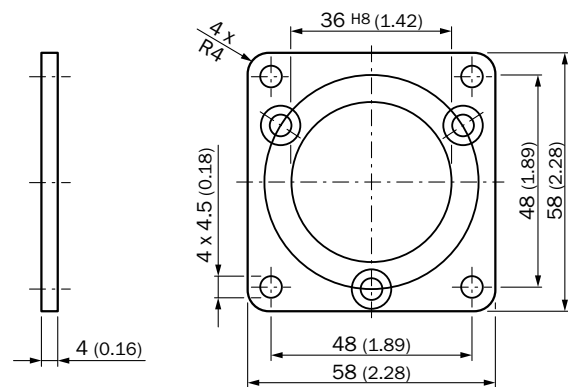
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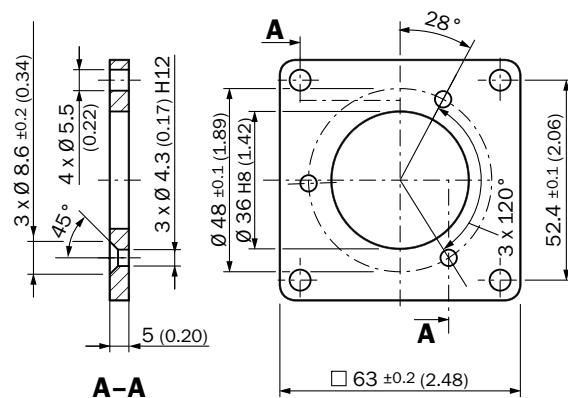
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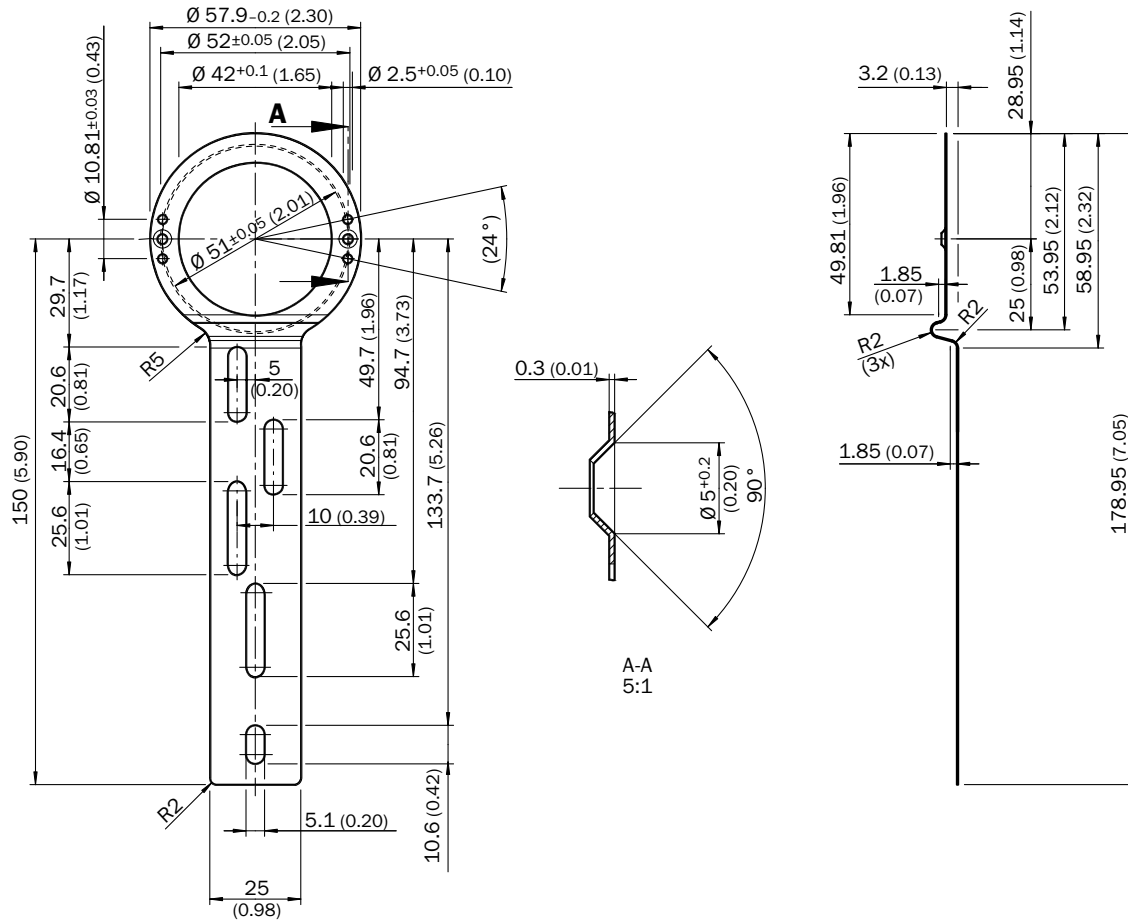
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BEF-FA-036-063REC

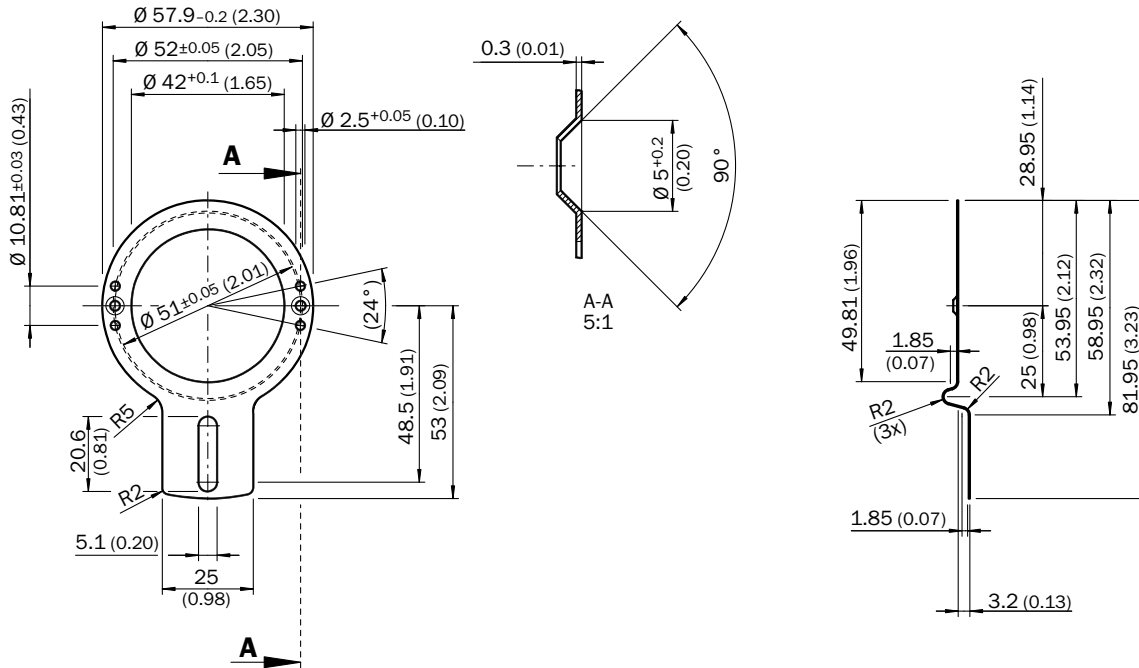


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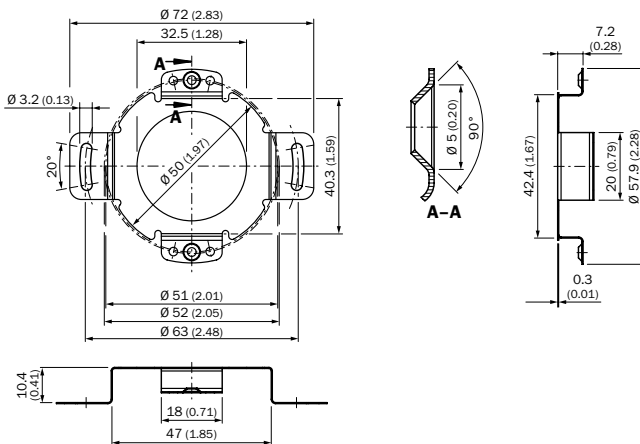




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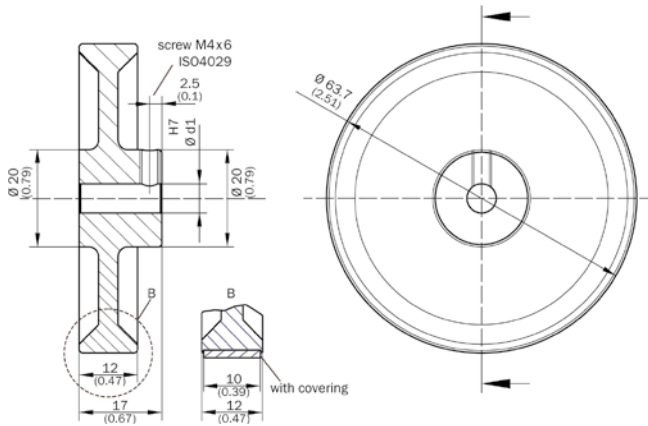
BEF-DS00XFX



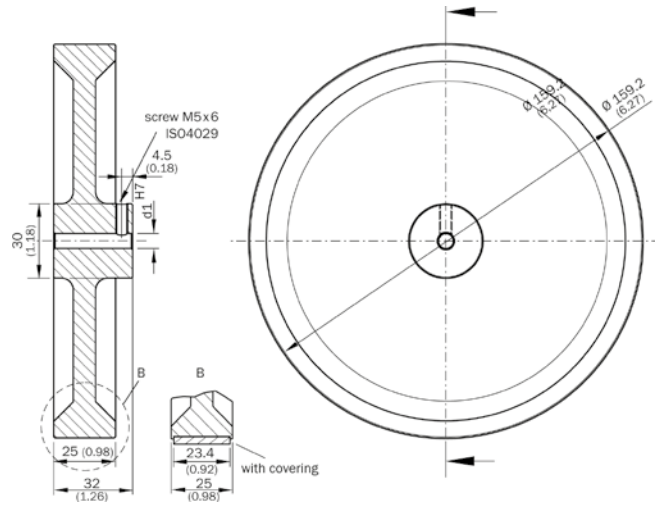




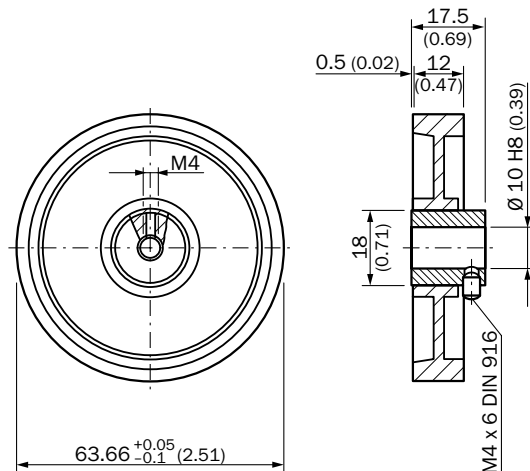
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MR10200APN, BEF-MR06200APN



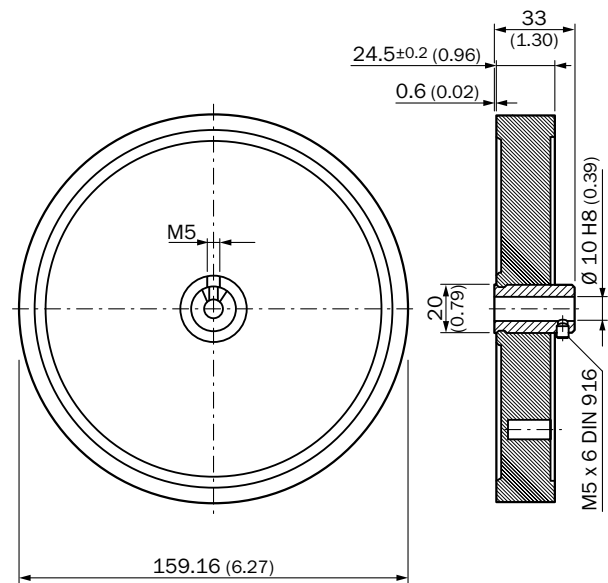
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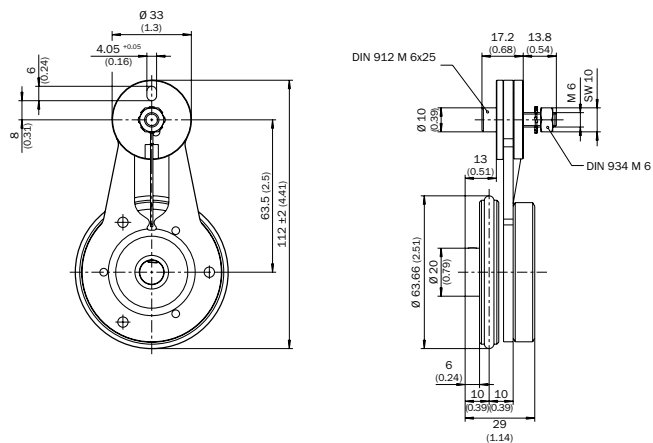
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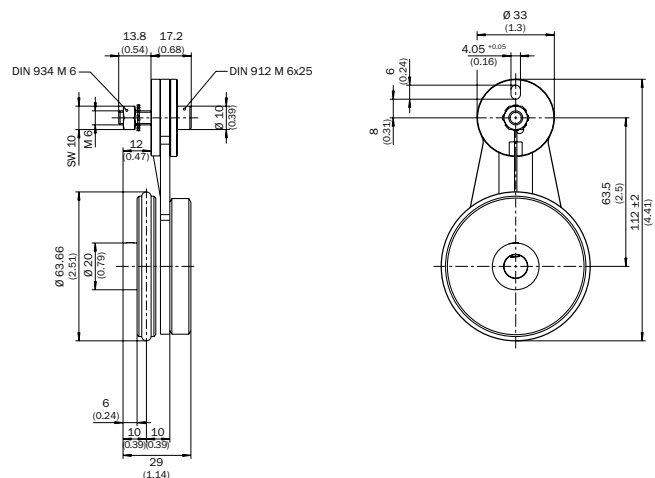
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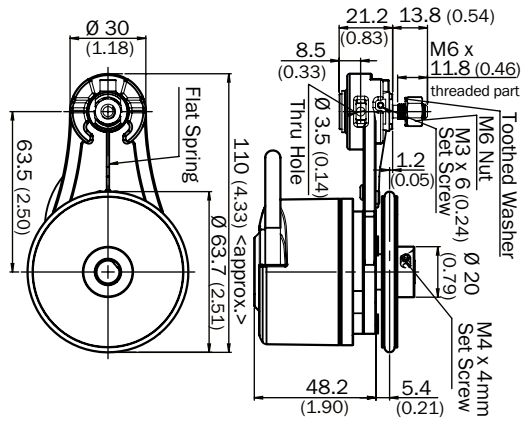
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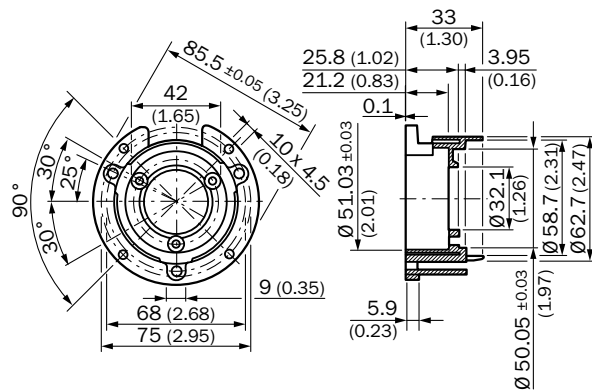
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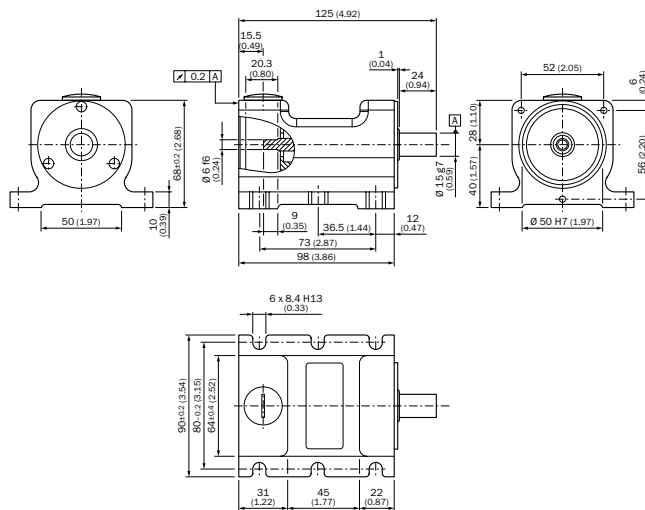
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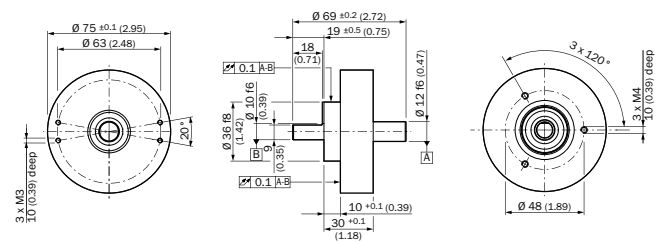
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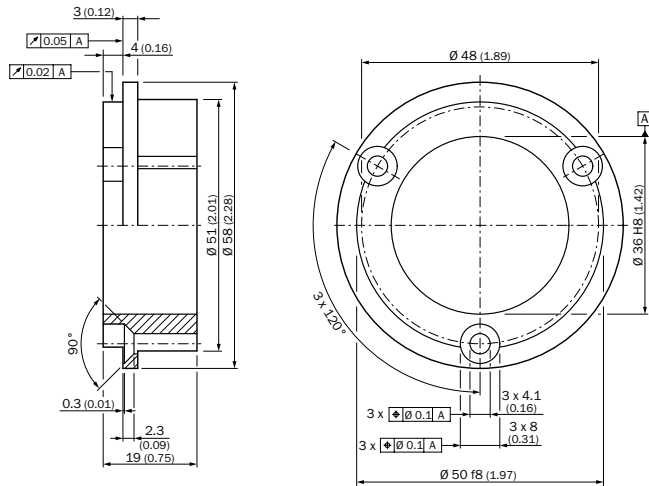
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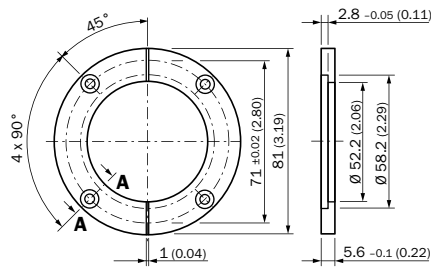
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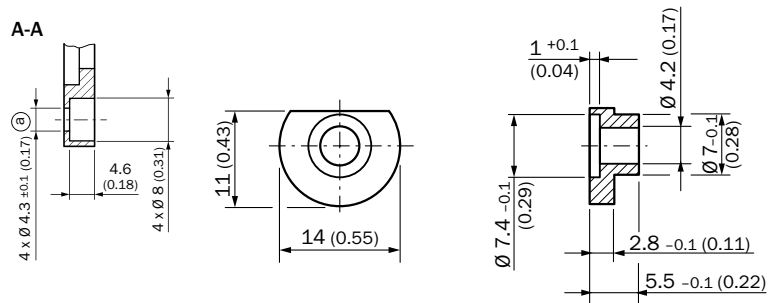
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BEF-WG-SF050

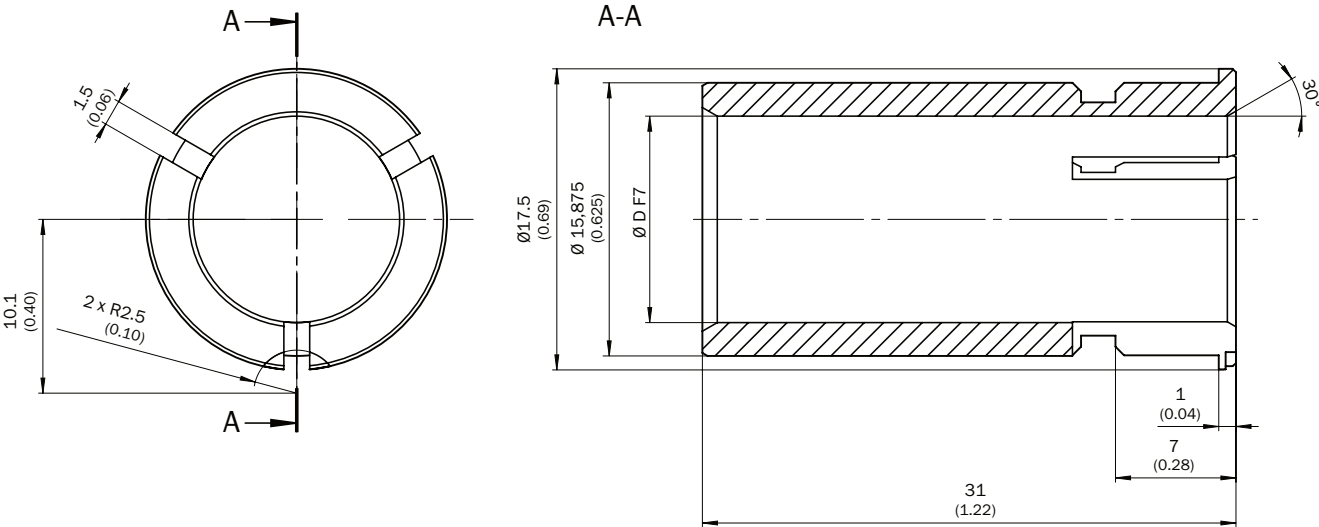


BEF-WK-SF



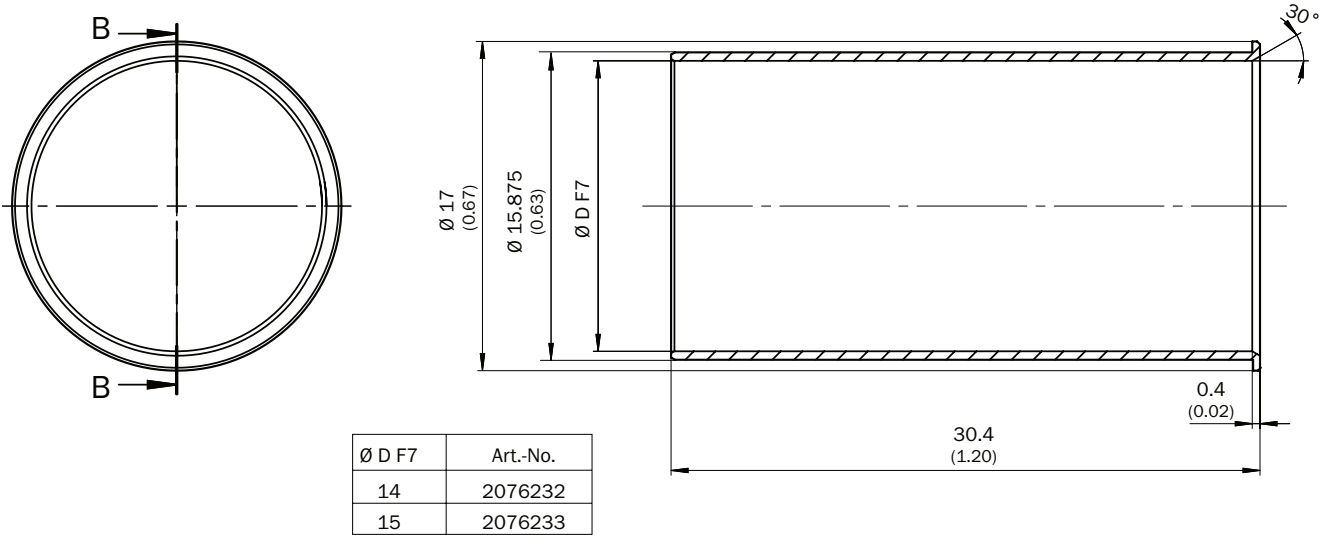
Shaft adaptation

SPZ-58Z-xxx-M



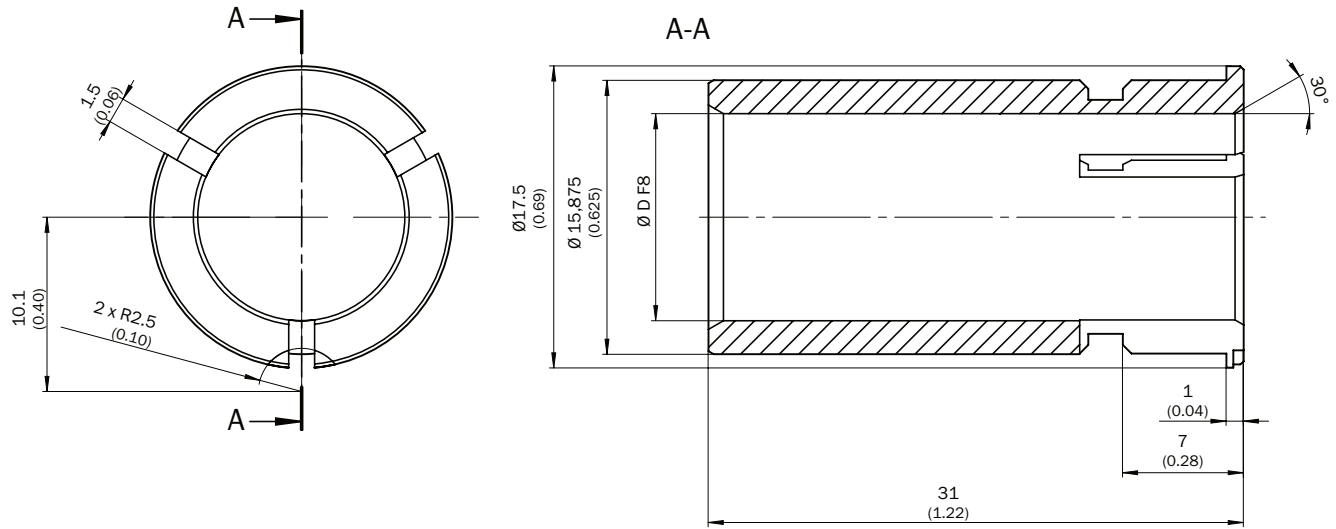
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|--------------|----------|
| 8            | 2076219  |
| 3/8" (9.525) | 2076224  |
| 10           | 2076220  |
| 12           | 2076221  |
| 1/2" (12.7)  | 2076225  |
| 14           | 2076222  |

SPZ-58Z-015-M



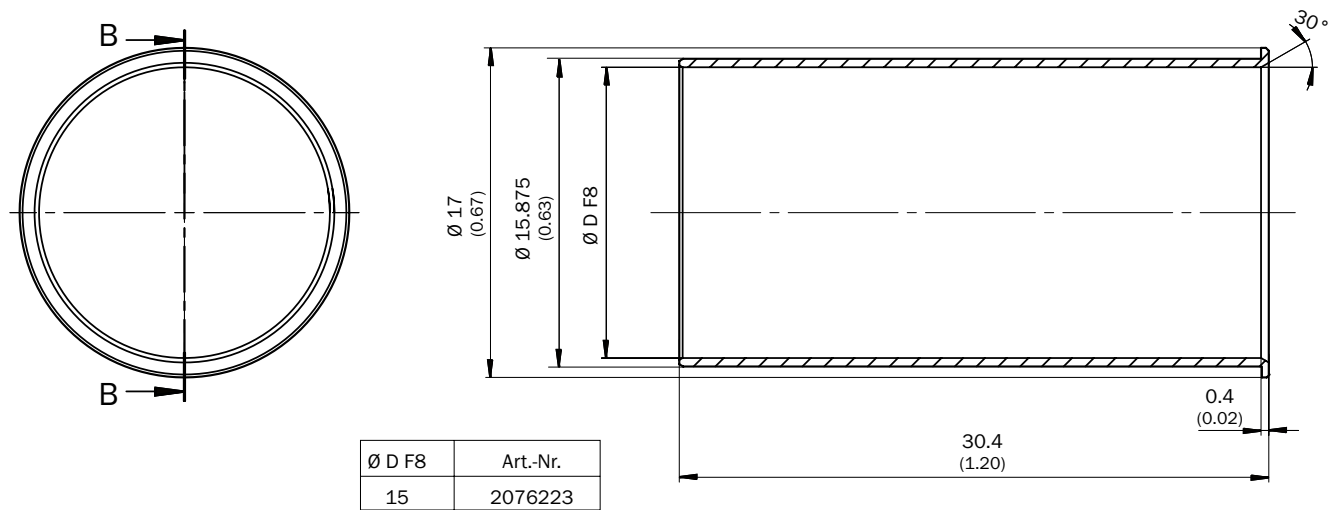
| Ø D F7 | Art.-No. |
|--------|----------|
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| 15     | 2076233  |

SPZ-58Z-xxx-P



| Ø D F8       | Art.-No. |
|--------------|----------|
| 6            | 2076228  |
| 8            | 2076229  |
| 3/8" (9.525) | 2076226  |
| 10           | 2076230  |
| 12           | 2076231  |
| 1/2" (12.7)  | 2076227  |

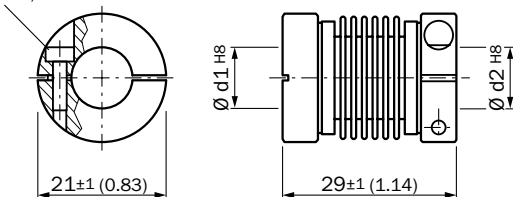
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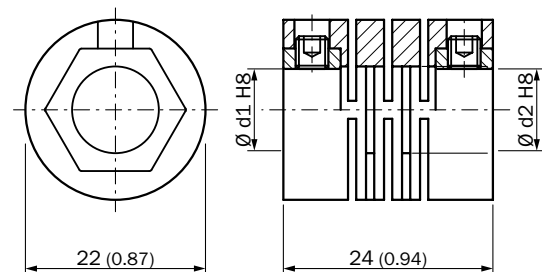
| Ø D F8 | Art.-Nr. |
|--------|----------|
| 15     | 2076223  |

KUP-xxxx-B

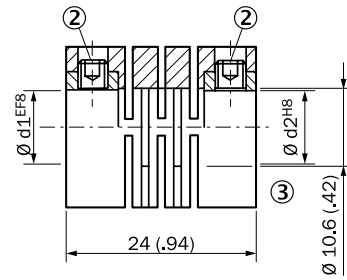
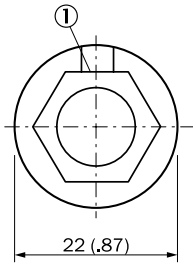
Cheese-head screw  
M2.5 x 8, DIN 912 A2



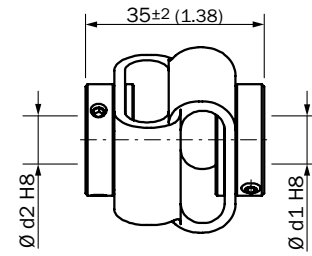
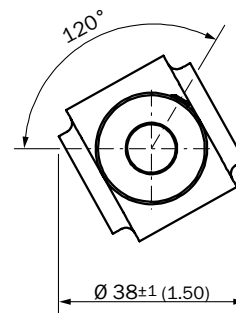
KUP-xxxx-S



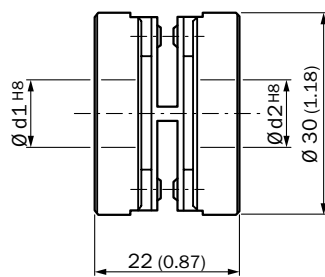
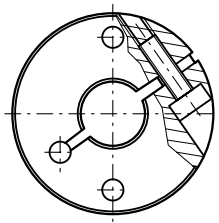
KUP-0xxx-S



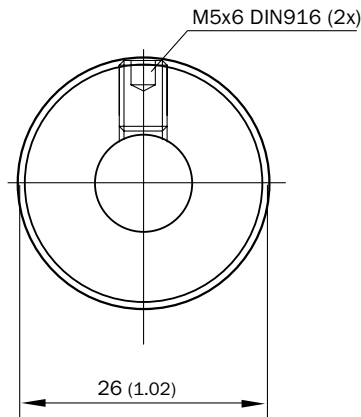
KUP-xx1x-D



KUP-xx10-F

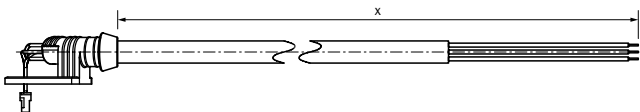


KUP-1010-W

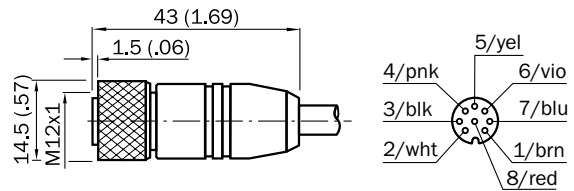


## Plug connectors and cables

DOL-0J08-GxxxAAx

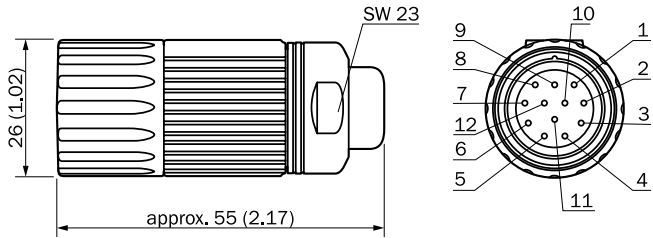


DOL-1208-GxxMAC1



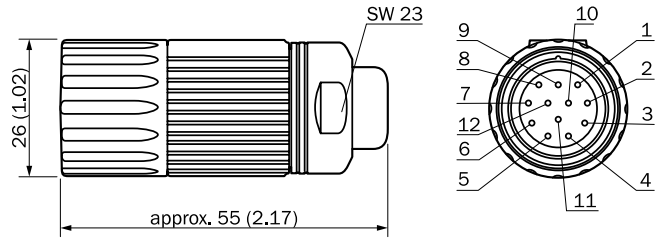
All dimensions in mm (inch)

DOL-2312-Gxxxxx3



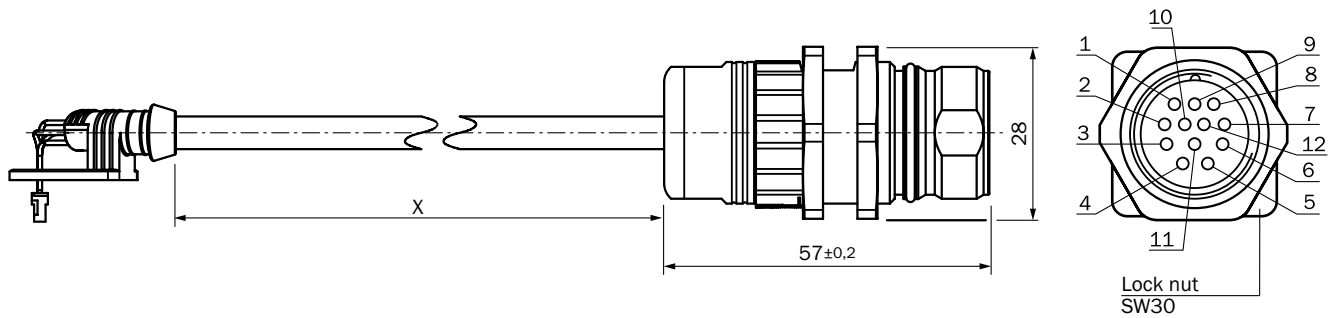
- ① Black
- ② Gray
- ③ Purple
- ④ Yellow
- ⑤ White
- ⑥ Brown
- ⑧ Pink
- ⑨ Screen
- ⑩ Blue
- ⑪ Green
- ⑫ Red

DOL-2312-Gxxxxx1

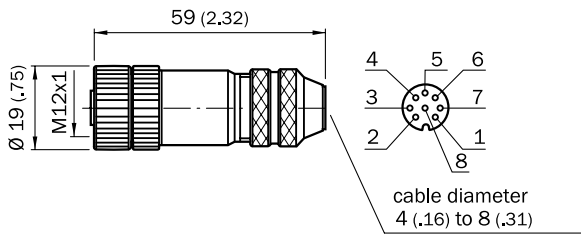


- ① Black
- ② Gray
- ③ Purple
- ④ Yellow
- ⑤ White
- ⑥ Brown
- ⑦ Orange
- ⑧ Pink
- ⑨ Screen
- ⑩ Blue
- ⑪ Green
- ⑫ Red

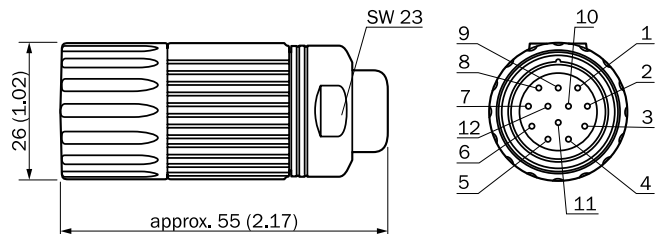
STL-2312-GxxxAA3



DOS-1208-GA01

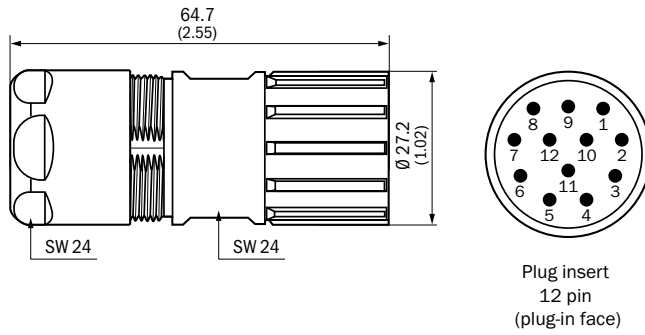


DOS-2312-G

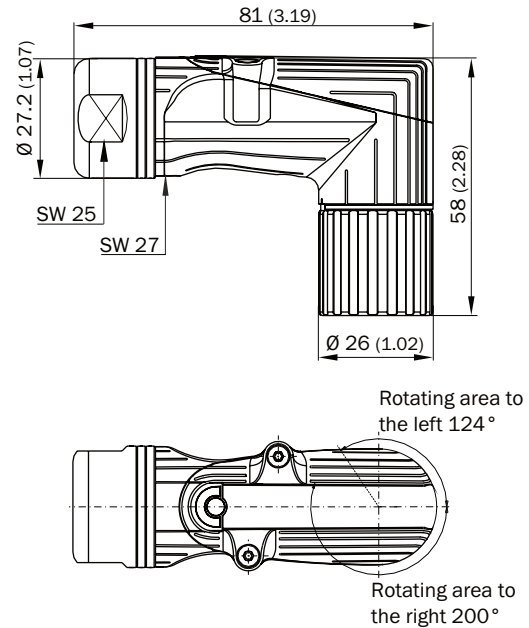


- ① Blue
- ② White
- ③ Yellow
- ④ Gray
- ⑤ Green
- ⑥ Pink
- ⑦ Black
- ⑧ Red
- ⑨ Orange
- ⑩ Brown
- ⑪ Purple
- ⑫ Orange/black

DOS-2312-G02

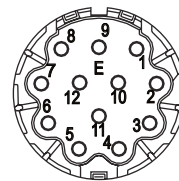


DOS-2312-W01



**Main dimensions**

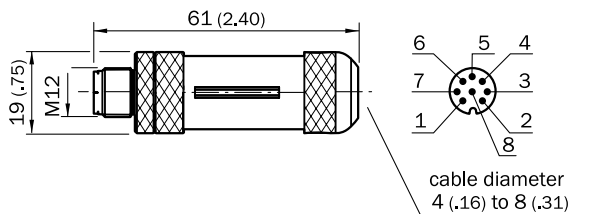
Plug



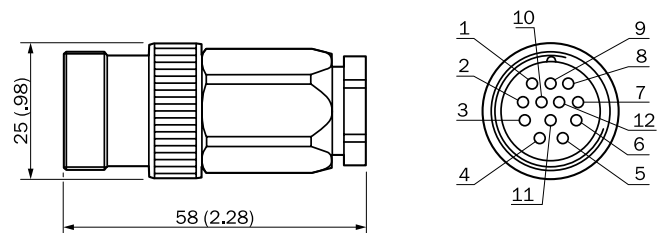
**Contact arrangement**

Mating view

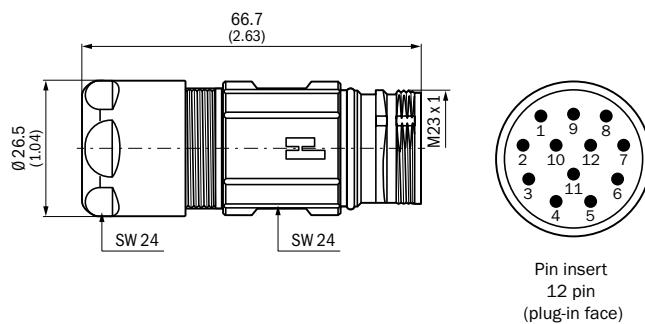
STE-1208-GA01



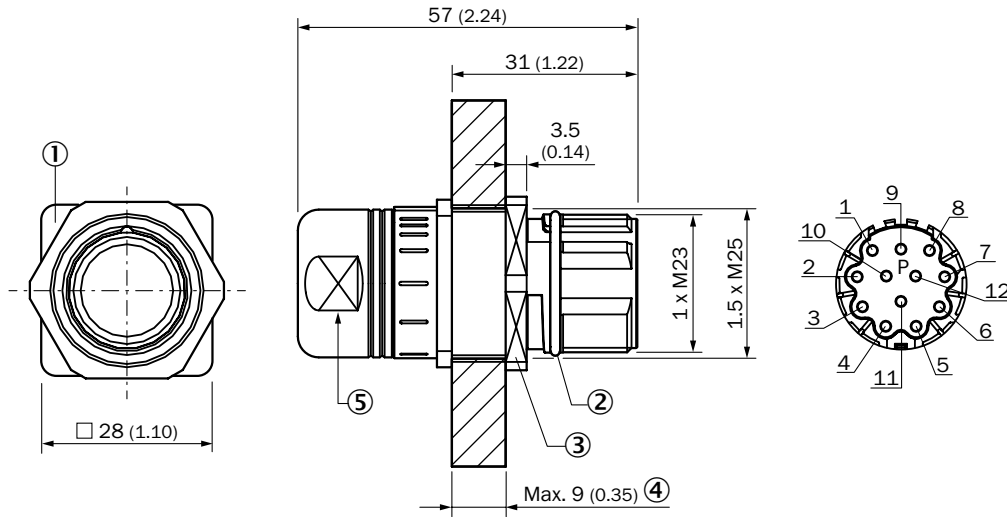
STE-2312-G



STE-2312-G01



STE-2312-GX

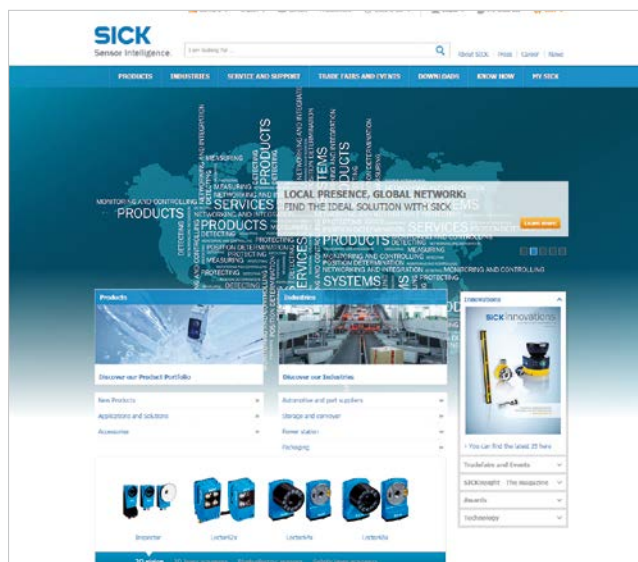


- ① Fixed stop position
- ② Vibration protection
- ③ Fixing nut SW30
- ④ Max. wall thickness
- ⑤ SW23



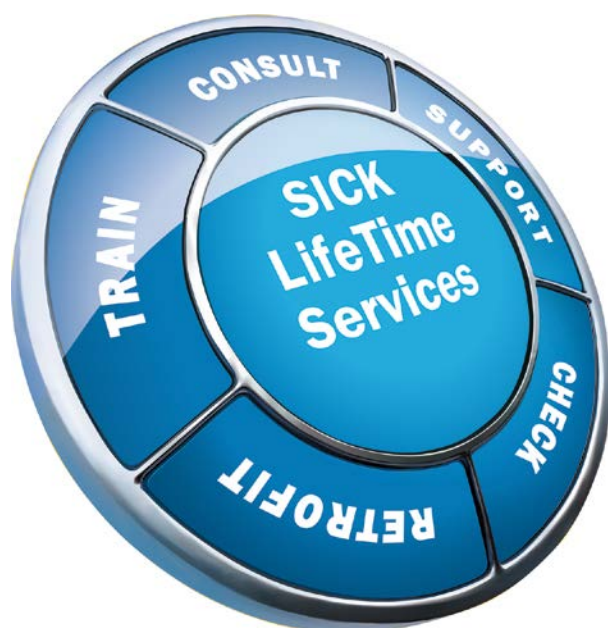
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