



**DFS60B-S4EB00400**

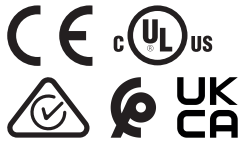
DFS60

**INCREMENTAL ENCODERS**

**SICK**  
Sensor Intelligence.



Illustration may differ



## Ordering information

| Type             | part no. |
|------------------|----------|
| DFS60B-S4EB00400 | 1087320  |

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

## Detailed technical data

### Safety-related parameters

|                                                          |                                          |
|----------------------------------------------------------|------------------------------------------|
| <b>MTTF<sub>D</sub> (mean time to dangerous failure)</b> | 300 years (EN ISO 13849-1) <sup>1)</sup> |
|----------------------------------------------------------|------------------------------------------|

<sup>1)</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.

### Performance

|                                                               |                                     |
|---------------------------------------------------------------|-------------------------------------|
| <b>Pulses per revolution</b>                                  | 400 <sup>1)</sup>                   |
| <b>Measuring step</b>                                         | 90°, electric/pulses per revolution |
| <b>Measuring step deviation at non binary number of lines</b> | ± 0.01°                             |
| <b>Error limits</b>                                           | ± 0.05°                             |

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

### Interfaces

|                                       |                        |
|---------------------------------------|------------------------|
| <b>Communication interface</b>        | Incremental            |
| <b>Communication Interface detail</b> | HTL / Push pull        |
| <b>Number of signal channels</b>      | 6-channel              |
| <b>Initialization time</b>            | 40 ms                  |
| <b>Output frequency</b>               | ≤ 600 kHz              |
| <b>Load current</b>                   | ≤ 30 mA                |
| <b>Power consumption</b>              | ≤ 0.5 W (without load) |

### Electronics

|                                   |                                             |
|-----------------------------------|---------------------------------------------|
| <b>Connection type</b>            | Male connector, M23, 12-pin, axial          |
| <b>Supply voltage</b>             | 10 ... 32 V                                 |
| <b>Reference signal, number</b>   | 1                                           |
| <b>Reference signal, position</b> | 90°, electric, logically gated with A and B |

<sup>1)</sup> Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

|                                         |                 |
|-----------------------------------------|-----------------|
| Reverse polarity protection             | ✓               |
| Short-circuit protection of the outputs | ✓ <sup>1)</sup> |

<sup>1)</sup> Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

## Mechanics

|                                |                                         |
|--------------------------------|-----------------------------------------|
| Mechanical design              | Solid shaft, face mount flange          |
| Shaft diameter                 | 10 mmWith flat                          |
| Shaft length                   | 19 mm                                   |
| Weight                         | + 0.3 kg                                |
| Shaft material                 | Stainless steel                         |
| Flange material                | Aluminum                                |
| Housing material               | Aluminum die cast                       |
| Start up torque                | 0.5 Ncm (+20 °C)                        |
| Operating torque               | 0.3 Ncm (+20 °C)                        |
| Permissible shaft loading      | 80 N (radial)<br>40 N (axial)           |
| Operating speed                | ≤ 9,000 min <sup>-1</sup> <sup>1)</sup> |
| Moment of inertia of the rotor | 6.2 gcm <sup>2</sup>                    |
| Bearing lifetime               | 3.6 x 10 <sup>10</sup> revolutions      |
| Angular acceleration           | ≤ 500,000 rad/s <sup>2</sup>            |

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

## Ambient data

|                               |                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------|
| EMC                           | According to EN 61000-6-2 and EN 61000-6-4                                                   |
| Enclosure rating              | IP67, Housing side, male connector (IEC 60529) <sup>1)</sup><br>IP65, shaft side (IEC 60529) |
| Permissible relative humidity | 90 % (Condensation not permitted)                                                            |
| Operating temperature range   | -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          | 70 g, 6 ms (EN 60068-2-27)                                                                   |
| Resistance to vibration       | 30 g, 10 Hz ... 2,000 Hz (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.

## Certificates

|                                                                       |   |
|-----------------------------------------------------------------------|---|
| EU declaration of conformity                                          | ✓ |
| UK declaration of conformity                                          | ✓ |
| ACMA declaration of conformity                                        | ✓ |
| Moroccan declaration of conformity                                    | ✓ |
| China-RoHS                                                            | ✓ |
| cULus certificate                                                     | ✓ |
| Information according to Art. 3 of Data Act (Regulation EU 2023/2854) | ✓ |

|                       |          |
|-----------------------|----------|
| <b>ECLASS 5.0</b>     | 27270501 |
| <b>ECLASS 5.1.4</b>   | 27270501 |
| <b>ECLASS 6.0</b>     | 27270590 |
| <b>ECLASS 6.2</b>     | 27270590 |
| <b>ECLASS 7.0</b>     | 27270501 |
| <b>ECLASS 8.0</b>     | 27270501 |
| <b>ECLASS 8.1</b>     | 27270501 |
| <b>ECLASS 9.0</b>     | 27270501 |
| <b>ECLASS 10.0</b>    | 27270501 |
| <b>ECLASS 11.0</b>    | 27270501 |
| <b>ECLASS 12.0</b>    | 27270501 |
| <b>ETIM 5.0</b>       | EC001486 |
| <b>ETIM 6.0</b>       | EC001486 |
| <b>ETIM 7.0</b>       | EC001486 |
| <b>ETIM 8.0</b>       | EC001486 |
| <b>UNSPSC 16.0901</b> | 41112113 |

Technical drawing of the M12 x 1 connector showing side, top, and detail views with dimensions and connector orientation options.

**Side View Dimensions:**

- Overall length: 57 (2.24)
- Flange thickness: 12 (0.47)
- Thread: M12 x 1
- Flange bore diameter:  $\varnothing 60$  (2.36)
- Flange outer diameter:  $\varnothing 48 \pm 0.1$  (1.89)
- Flange bore diameter:  $\varnothing 36$  f8 (1.42)
- Flange outer diameter:  $\varnothing 10$  f7 (0.39)
- Flange thickness: 9 (0.35)
- Flange bore diameter:  $\varnothing 18$  (0.71)
- Flange outer diameter:  $\varnothing 19 \pm 0.3$  (0.75)

**Top View Dimensions:**

- Flange bore diameter:  $\varnothing 60$  (2.36)
- Flange outer diameter:  $\varnothing 48 \pm 0.1$  (1.89)
- Flange bore diameter:  $\varnothing 36$  f8 (1.42)
- Flange outer diameter:  $\varnothing 10$  f7 (0.39)
- Flange thickness: 9 (0.35)
- Flange bore diameter:  $\varnothing 18$  (0.71)
- Flange outer diameter:  $\varnothing 19 \pm 0.3$  (0.75)

**Detail View X1:**

- Flange thickness: 12 (0.47)
- Thread: M12 x 1

**Detail View X2:**

- Flange thickness: 21.1 (0.83)
- Thread: M23 x 1

**Connector Orientation:**

- X1: Connector orientation with flange bore diameter  $\varnothing 36$  f8 (1.42)
- X2: Connector orientation with flange bore diameter  $\varnothing 10$  f7 (0.39)

General tolerances according to DIN ISO 2768-mk

PIN assignment



view of M23 male device connector on encoder

| PINMale connec-<br>tor M12, 8-pin | PINMale connec-<br>tor M23, 12-pin | Wire colors (ca-<br>ble connection) | TTL/HTL signal      | Sin/Cos 1.0 V <sub>PP</sub> | Explanation                                                                                       |
|-----------------------------------|------------------------------------|-------------------------------------|---------------------|-----------------------------|---------------------------------------------------------------------------------------------------|
| 1                                 | 6                                  | Brown                               | $\overline{A}$      | COS-                        | Signal wire                                                                                       |
| 2                                 | 5                                  | White                               | A                   | COS+                        | Signal wire                                                                                       |
| 3                                 | 1                                  | Black                               | $\overline{B}$      | SIN-                        | Signal wire                                                                                       |
| 4                                 | 8                                  | Pink                                | B                   | SIN+                        | Signal wire                                                                                       |
| 5                                 | 4                                  | Yellow                              | $\overline{Z}$      | $\overline{Z}$              | Signal wire                                                                                       |
| 6                                 | 3                                  | Purple                              | Z                   | Z                           | Signal wire                                                                                       |
| 7                                 | 10                                 | Blue                                | GND                 | GND                         | Ground connection                                                                                 |
| 8                                 | 12                                 | Red                                 | +U <sub>S</sub>     | +U <sub>S</sub>             | Supply voltage                                                                                    |
| -                                 | 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>                    | Orange                              | O-SET <sup>1)</sup> | N.c.                        | Set zero pulse <sup>1)</sup>                                                                      |
| Screen                            | Screen                             | Screen                              | Screen              | Screen                      | Screen connect-<br>ed to housing on<br>encoder side. Con-<br>nected to ground<br>on control side. |

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

maximum revolution range



signal outputs



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

| Supply voltage  | Output |
|-----------------|--------|
| 4,5 V ... 5,5 V | TTL    |
| 10 V ... 32 V   | TTL    |
| 10 V ... 32 V   | HTL    |

## Recommended accessories

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Type       | part no. |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
| shaft adaptation                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial <math>\pm 0.25</math> mm, axial <math>\pm 0.4</math> mm, angular <math>\pm 4^\circ</math>; max. speed 10,000 rpm, <math>-30^\circ\text{C}</math> to <math>+120^\circ\text{C}</math>, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub</li> </ul>                                                                                                                              | KUP-0610-B | 5312982  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially <math>\pm 2.5</math> mm, axially <math>\pm 3</math> mm, angle <math>\pm 10</math> degrees; max. speed 3,000 rpm, <math>-30</math> to <math>+80</math> degrees Celsius, torsional spring stiffness of 25 Nm/rad</li> </ul>                                                                                                                                                                      | KUP-0610-D | 5326697  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial <math>\pm 0.3</math> mm, axial <math>\pm 0.4</math> mm, angular <math>\pm 2.5^\circ</math>; max. speed 12,000 rpm, <math>-10^\circ</math> to <math>+80^\circ\text{C}</math>, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin</li> </ul>                                                                            | KUP-0610-F | 5312985  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial <math>\pm 0.3</math> mm, axial <math>\pm 0.3</math> mm, angular <math>\pm 3^\circ</math>; max. speed 10,000 rpm, <math>-10^\circ</math> to <math>+80^\circ\text{C}</math>, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub</li> </ul>                                                                                                                                      | KUP-0610-S | 2056407  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial <math>\pm 0.22</math> mm, axial <math>\pm 1</math> mm angular <math>\pm 1.3^\circ</math>, max. speed 19,000 rpm, angle of twist max. <math>10^\circ</math>, <math>-30^\circ\text{C}</math> to <math>+80^\circ\text{C}</math>, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane</li> </ul> | KUP-0610-J | 2127056  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially <math>\pm 0.25</math> mm, axially <math>\pm 0.4</math> mm, angle <math>\pm 4</math> degrees; max. speed 10,000 rpm, <math>-30</math> to <math>+120</math> degrees Celsius, torsional spring stiffness of 150 Nm/rad</li> </ul>                                                                                                                                                                 | KUP-0810-D | 5326704  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial <math>\pm 0.3</math> mm, axial <math>\pm 0.3</math> mm, angular <math>\pm 3^\circ</math>; max. speed 10,000 rpm, <math>-10^\circ</math> to <math>+80^\circ\text{C}</math>, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub</li> </ul>                                                                                                                                      | KUP-0810-S | 5314178  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bellows coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial <math>\pm 0.25</math> mm, axial <math>\pm 0.4</math> mm, angular <math>\pm 4^\circ</math>; max. revolutions 10,000 rpm, <math>-30^\circ</math> to <math>+120^\circ\text{C}</math>, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs</li> </ul>                                                                                                                     | KUP-1010-B | 5312983  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial <math>\pm 2.5</math> mm, axial <math>\pm 3</math> mm, angular <math>\pm 10^\circ</math>; max. speed 3,000 rpm, <math>-30^\circ</math> to <math>+80^\circ\text{C}</math>, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange</li> </ul>                                                                                                                                      | KUP-1010-D | 5326703  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial <math>\pm 0.3</math> mm, axial <math>\pm 0.4</math> mm, angle <math>\pm 2.5^\circ</math>, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin</li> </ul>                                                                                                                                              | KUP-1010-F | 5312986  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial <math>\pm 0.3</math> mm, axial <math>\pm 0.2</math> mm, angular <math>\pm 3^\circ</math>; speed 10,000 rpm, <math>-10^\circ</math> to <math>+80^\circ\text{C}</math>, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub</li> </ul>                                                                                                                                        | KUP-1010-S | 2056408  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | KUP-1012-B | 5312984  |

|                                                                                   | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Type       | part no. |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
|  | <ul style="list-style-type: none"> <li><b>Description:</b> 10 mm / 12 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs</li> </ul>                                                                                                                                                                                                                    |            |          |
|                                                                                   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial +/- 2.5 mm, axial +/- 3 mm, angular +/- 10°; max. speed 3,000 rpm, -30° to +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange</li> </ul>                                                                                                         | KUP-1012-D | 5326702  |
|                                                                                   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 8 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane</li> </ul>  | KUP-0810-J | 2128267  |
|                                                                                   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 10 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane</li> </ul> | KUP-1010-J | 2127054  |
|                                                                                   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 10 mm / 12 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane</li> </ul> | KUP-1012-J | 2128265  |

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Type           | part no. |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
| measuring wheels and measuring wheel mechanics                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |          |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with studded polyurethane surface for 6 mm solid shaft, circumference 200 mm</li> </ul>                                                                                                                                                                                                                                    | BEF-MR06200APN | 4084747  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheel mechanics</li> <li><b>Description:</b> SICK modular measuring wheel system for face mount flange encoder with S4 mechanical design (10 mm x 19 mm solid shaft), e.g., DFS60-S4: with O-ring measuring wheel, circumference 200 mm</li> <li><b>Suitable for:</b> Face mount flange encoder DFS60, DBS60, AFM60, AFS60, mechanical design S4 (solid shaft 10 mm x 19 mm)</li> </ul> | BEF-MRS-10-U   | 2085714  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm</li> </ul>                                                                                                                                                                                                                                                | BEF-MR010020R  | 2055224  |
|    | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm</li> </ul>                                                                                                                                                                                                                                                | BEF-MR010030R  | 2049278  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm</li> </ul>                                                                                                                                                                                                                                                          | BEF-MR010050R  | 2055227  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm</li> </ul>                                                                                                                                                                                                                                          | BEF-MR10200AK  | 4084737  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm</li> </ul>                                                                                                                                                                                                                                    | BEF-MR10200AP  | 4084738  |
|                                                                                     | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> </ul>                                                                                                                                                                                                                                                                                                                                                                       | BEF-MR10200APN | 4084739  |

|                                                                                    | Brief description                                                                                                                                                                                                                                                                                             | Type           | part no. |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
|                                                                                    | <ul style="list-style-type: none"> <li><b>Description:</b> Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm</li> </ul>                                                                                                                                  |                |          |
|   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm</li> </ul>        | BEF-MR10500AK  | 4084733  |
|   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm</li> </ul>  | BEF-MR10500AP  | 4084734  |
|   | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 500 mm</li> </ul>  | BEF-MR10500APG | 4084736  |
|  | <ul style="list-style-type: none"> <li><b>Product segment:</b> Measuring wheels and measuring wheel mechanics</li> <li><b>Product family:</b> Measuring wheels</li> <li><b>Description:</b> Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 500 mm</li> </ul> | BEF-MR10500APN | 4084735  |

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                | Type               | part no. |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|
| Mounting systems                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |          |
|    | <ul style="list-style-type: none"> <li><b>Description:</b> 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. Operating speed max. 4,000 rpm<sup>-1</sup>, axial shaft load 150 N, radial shaft load 250 N, bearing service life 3.6 x 10<sup>9</sup> revolutions</li> </ul> | BEF-FA-LB1210      | 2044591  |
|    | <ul style="list-style-type: none"> <li><b>Description:</b> Mounting bracket for encoder with spigot 36 mm for face mount flange</li> <li><b>Items supplied:</b> Mounting kit included</li> </ul>                                                                                                                                                                                                                                                 | BEF-WF-36          | 2029164  |
|    | <ul style="list-style-type: none"> <li><b>Description:</b> 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</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> <li><b>Items supplied:</b> Including 3 countersunk screws M3 x 10</li> </ul>                                                                                 | BEF-FA-036-050     | 2029160  |
|    | <ul style="list-style-type: none"> <li><b>Description:</b> 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 8</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> <li><b>Items supplied:</b> Including 3 countersunk screws M4 x 8</li> </ul>                                                                          | BEF-FA-036-060REC  | 2029162  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> </ul>                                                                                                                                                                | BEF-FA-036-060RSA  | 2029163  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> 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</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> <li><b>Items supplied:</b> Including 3 countersunk screws M3 x 10</li> </ul>                                                                        | BEF-FA-036-063REC  | 2034225  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> </ul>                                                                                                                                                                    | BEF-FA-036-100     | 2029161  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> Flange adapter (adapts size 60 face mount flange encoder to bearing block with part. no. 2044591)</li> </ul>                                                                                                                                                                                                                                                                          | BEF-FA-036-050-019 | 2063378  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> Mounting angle spring-loaded, for flange with centerring collar 36 mm, working temperature range -40° ... +120°C</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> </ul>                                                                                                                                                                                      | BEF-WF36F          | 4084775  |

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                            | Type             | part no. |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|
| connectors and cables                                                               |                                                                                                                                                                                                                                                                                                                                              |                  |          |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 2 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                 | DOL-2312-G02MLA3 | 2030682  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 7 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                 | DOL-2312-G07MLA3 | 2030685  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 10 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                | DOL-2312-G10MLA3 | 2030688  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 15 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                | DOL-2312-G15MLA3 | 2030692  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 20 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                | DOL-2312-G20MLA3 | 2030695  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 25 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                | DOL-2312-G25MLA3 | 2030699  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 30 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>                | DOL-2312-G30MLA3 | 2030702  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 1.5 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul> | DOL-2312-G1M5MA3 | 2029212  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 3 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>   | DOL-2312-G03MMA3 | 2029213  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 5 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>   | DOL-2312-G05MMA3 | 2029214  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 10 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>  | DOL-2312-G10MMA3 | 2029215  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 20 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, shielded</li> </ul>  | DOL-2312-G20MMA3 | 2029216  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental</li> <li>• <b>Cable:</b> 30 m, 12-wire, PUR, halogen-free</li> </ul>                                                       | DOL-2312-G30MMA3 | 2029217  |

|                                                                                   | Brief description                                                                                                                                                                                                                                                                                                                                                                              | Type         | part no. |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|
|  | <ul style="list-style-type: none"><li>• <b>Description:</b> Incremental, shielded</li><li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, straight, A-coded</li><li>• <b>Signal type:</b> HIPERFACE<sup>®</sup>, SSI, Incremental</li><li>• <b>Description:</b> HIPERFACE<sup>®</sup>, shieldedSSIIncremental</li><li>• <b>Connection systems:</b> Solder connection</li></ul> | DOS-2312-G02 | 2077057  |
|                                                                                   | <ul style="list-style-type: none"><li>• <b>Connection type head A:</b> Female connector, M23, 12-pin, angled, A-coded</li><li>• <b>Signal type:</b> HIPERFACE<sup>®</sup>, SSI, Incremental</li><li>• <b>Description:</b> HIPERFACE<sup>®</sup>, shieldedSSIIncremental</li><li>• <b>Connection systems:</b> Solder connection</li></ul>                                                       | DOS-2312-W01 | 2072580  |

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