

# DFS60B-S1EZ00S02

DFS60

**INCREMENTAL ENCODERS**

**SICK**  
Sensor Intelligence.

Illustration may differ

### Ordering information

| Type             | part no. |
|------------------|----------|
| DFS60B-S1EZ00S02 | 1104944  |

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



### Detailed technical data

#### Features

|                                  |                                                                              |
|----------------------------------|------------------------------------------------------------------------------|
| <b>Special device</b>            | ✓                                                                            |
| <b>Specialty</b>                 | Number of lines 10,000<br>Male connector, M23 (6027537), 12-pin on cable end |
| <b>Standard reference device</b> | DFS60B-S1EK10000, 1056192                                                    |

#### 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>                                  | 10,000 <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> | Special version |
|------------------------|-----------------|

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

|                                                |                                                    |
|------------------------------------------------|----------------------------------------------------|
| <b>Connection type Detail</b>                  | Male connector, M23 (6027537), 12-pin on cable end |
| <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        |
| <b>Reverse polarity protection</b>             | ✓                                                  |
| <b>Short-circuit protection of the outputs</b> | ✓ <sup>1)</sup>                                    |

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

## Mechanics

|                                       |                                         |
|---------------------------------------|-----------------------------------------|
| <b>Mechanical design</b>              | Solid shaft, Servo flange               |
| <b>Shaft diameter</b>                 | 6 mm<br>With flat                       |
| <b>Shaft length</b>                   | 10 mm                                   |
| <b>Weight</b>                         | + 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>                | 0.5 Ncm (+20 °C)                        |
| <b>Operating torque</b>               | 0.3 Ncm (+20 °C)                        |
| <b>Permissible shaft loading</b>      | 80 N (radial)<br>40 N (axial)           |
| <b>Operating speed</b>                | ≤ 9,000 min <sup>-1</sup> <sup>1)</sup> |
| <b>Moment of inertia of the rotor</b> | 6.2 gcm <sup>2</sup>                    |
| <b>Bearing lifetime</b>               | 3.6 x 10 <sup>10</sup> revolutions      |
| <b>Angular acceleration</b>           | ≤ 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

|                                      |                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------------------------|
| <b>EMC</b>                           | According to EN 61000-6-2 and EN 61000-6-4                                                   |
| <b>Enclosure rating</b>              | IP67, Housing side, male connector (IEC 60529) <sup>1)</sup><br>IP65, shaft side (IEC 60529) |
| <b>Permissible relative humidity</b> | 90 % (Condensation not permitted)                                                            |
| <b>Operating temperature range</b>   | -40 °C ... +100 °C <sup>2)</sup><br>-30 °C ... +100 °C <sup>3)</sup>                         |
| <b>Storage temperature range</b>     | -40 °C ... +100 °C, without package                                                          |
| <b>Resistance to shocks</b>          | 70 g, 6 ms (EN 60068-2-27)                                                                   |
| <b>Resistance to vibration</b>       | 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

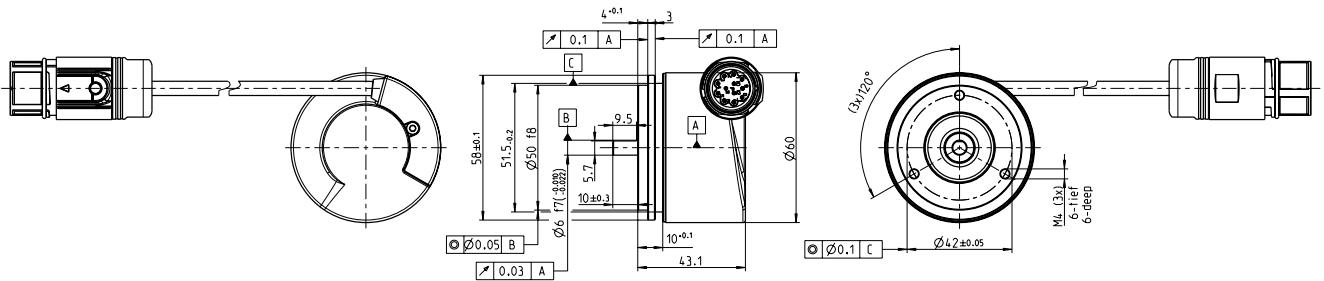
|                                       |   |
|---------------------------------------|---|
| <b>EU declaration of conformity</b>   | ✓ |
| <b>UK declaration of conformity</b>   | ✓ |
| <b>ACMA declaration of conformity</b> | ✓ |

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

Classifications

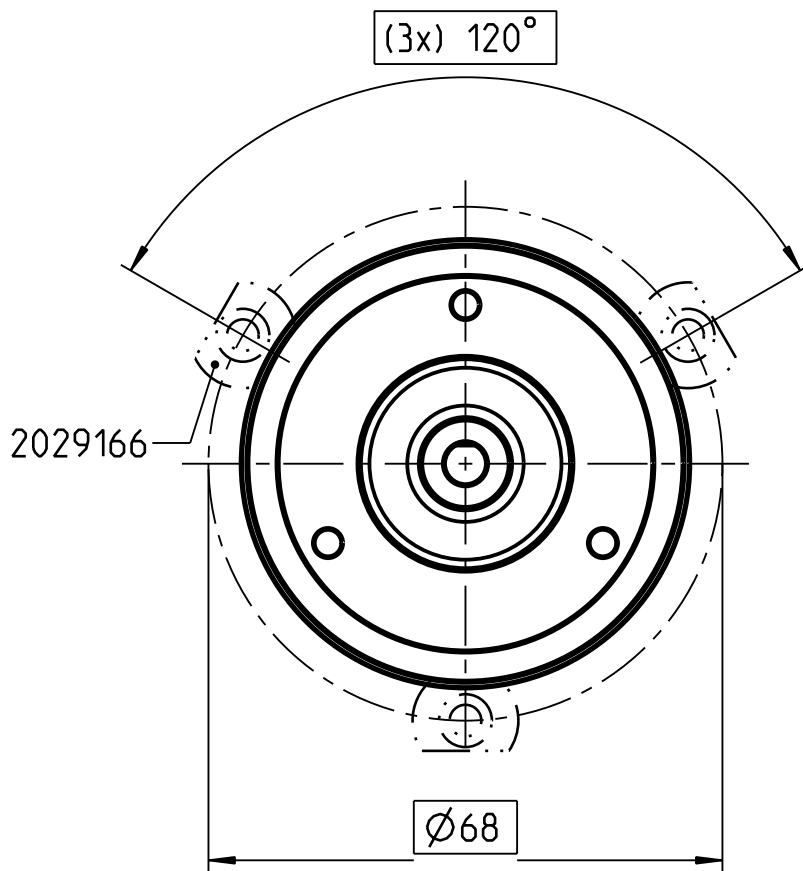
|                |          |
|----------------|----------|
| ECLASS 5.0     | 27270501 |
| ECLASS 5.1.4   | 27270501 |
| ECLASS 6.0     | 27270590 |
| ECLASS 6.2     | 27270590 |
| ECLASS 7.0     | 27270501 |
| ECLASS 8.0     | 27270501 |
| ECLASS 8.1     | 27270501 |
| ECLASS 9.0     | 27270501 |
|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

Dimensional drawing

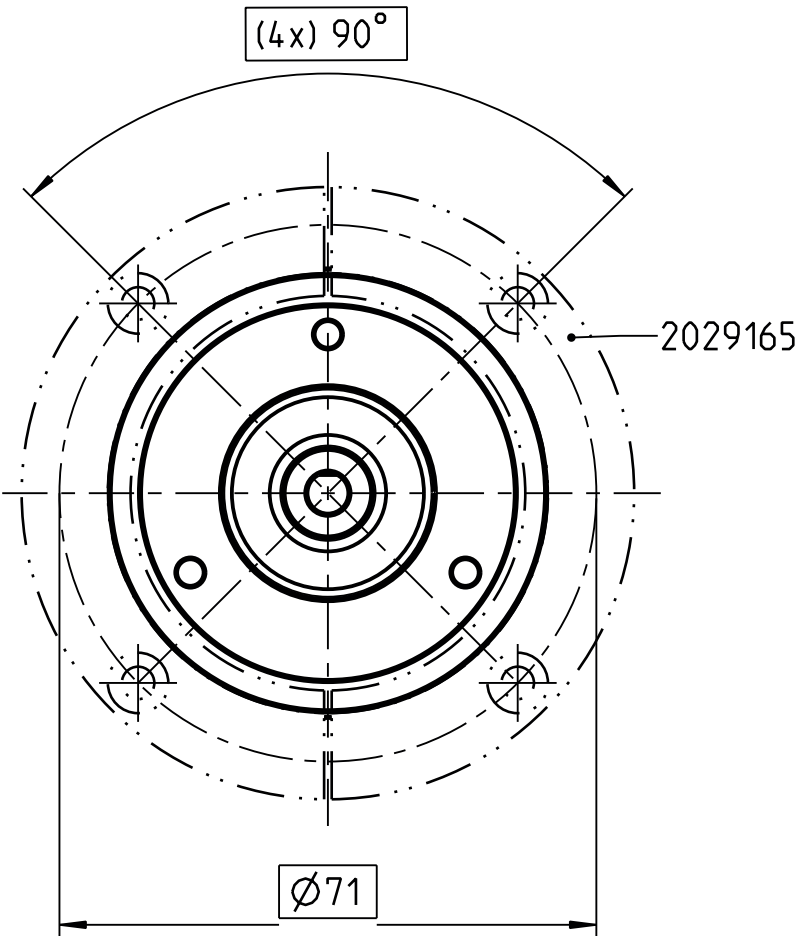


Dimensions in mm (inch)

Attachment specifications Mounting requirements for small servo clamp



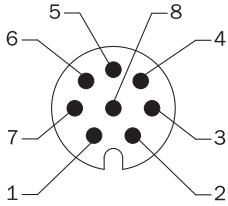
Attachment specifications Mounting requirements for half-shell servo clamp



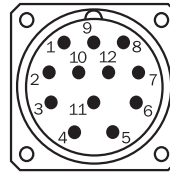
## PIN assignment

**Cable, 8-wire**

View of M12 male device connector on encoder



View of M23 male device connector



| 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>                 | -                                                 | 0-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 0-SET function on PIN 7 on M23 male connector. The 0-SET input is used to set the zero pulse on the current shaft position. If the 0-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



## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

## WORLDWIDE PRESENCE:

Contacts and other locations –[www.sick.com](http://www.sick.com)