



# DFS60B-BDWA00500

DFS60

INCREMENTAL ENCODERS

**SICK**  
Sensor Intelligence.



## Ordering information

| Type             | part no. |
|------------------|----------|
| DFS60B-BDWA00500 | 1106705  |

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

Illustration may differ



## 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>                                  | 500 <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>0-set function via hardware pin</b> | ✓                                                               |
| <b>0-SET function</b>                  | H-active, L = 0 - 3 V, H = 4,0 - U <sub>S</sub> V <sup>1)</sup> |
| <b>Initialization time</b>             | 30 ms                                                           |
| <b>Output frequency</b>                | ≤ 600 kHz                                                       |
| <b>Load current</b>                    | ≤ 30 mA                                                         |
| <b>Power consumption</b>               | ≤ 0.7 W (without load)                                          |

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

## Electronics

|                        |                                     |
|------------------------|-------------------------------------|
| <b>Connection type</b> | Male connector, M23, 12-pin, radial |
|------------------------|-------------------------------------|

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

|                                                |                                             |
|------------------------------------------------|---------------------------------------------|
| <b>Supply voltage</b>                          | 4.5 ... 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>              | Blind hollow shaft                      |
| <b>Shaft diameter</b>                 | 10 mm<br>Front clamp                    |
| <b>Weight</b>                         | + 0.2 kg                                |
| <b>Shaft material</b>                 | Stainless steel                         |
| <b>Flange material</b>                | Aluminum                                |
| <b>Housing material</b>               | Aluminum die cast                       |
| <b>Start up torque</b>                | 0.8 Ncm (+20 °C)                        |
| <b>Operating torque</b>               | 0.6 Ncm (+20 °C)                        |
| <b>Permissible movement static</b>    | ± 0.3 mm (radial)<br>± 0.5 mm (axial)   |
| <b>Permissible movement dynamic</b>   | ± 0.1 mm (radial)<br>± 0.2 mm (axial)   |
| <b>Operating speed</b>                | ≤ 6,000 min <sup>-1</sup> <sup>1)</sup> |
| <b>Moment of inertia of the rotor</b> | 40 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 61000-6-3                                                   |
| <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> | ✓ |

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

### Classifications

|                       |          |
|-----------------------|----------|
| <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 1000 Series 1/2" (25.4 mm) component, showing three views: side, front, and top.

**Side View (Left):**

- Overall length: 45.5 (1.79)
- Distance from front face to first mounting hole: 9.4 (0.37)
- Distance between mounting holes: 3.4 (0.13)
- Distance from last mounting hole to back face: 2.5 (0.10)
- Mounting hole diameter:  $\varnothing 32.6$  (1.28)
- Mounting hole pitch diameter:  $\varnothing 60$  (2.36)
- Threaded section length: 7.75 (0.31)
- Threaded section diameter: M12 x 1
- Distance from front face to threaded section: 14.5 (0.57)
- Minimum distance from front face to mounting hole: min. 15 (0.59)
- Maximum distance from front face to mounting hole: max. 42 (1.65)

**Front View (Middle):**

- Threaded section length: 26.1 (1.03)
- Threaded section diameter: M23 x 1
- Distance from front face to threaded section: 13 (0.51)

**Top View (Right):**

- Overall width: 72 $\pm$ 0.3 (2.83)
- Distance between mounting holes: 47 (1.85)
- Mounting hole diameter:  $\varnothing 3.2$  $\pm$ 0.1 (0.13)
- Distance from front face to mounting hole: 20 (0.79)
- Overall diameter:  $\varnothing 63$  $\pm$ 0.2 (2.48)
- Angle: 20°

General tolerances according to DIN ISO 2768-mk

A diagram of a 12-pin circular connector. The pins are arranged in a circular pattern and are numbered 1 through 12. Pin 1 is at the top-left, pin 12 is at the top-right, pin 9 is at the top, pin 6 is at the bottom-right, pin 5 is at the bottom, pin 4 is at the bottom-left, pin 3 is at the left, pin 2 is at the top-left (adjacent to pin 1), pin 10 is at the top-left (adjacent to pin 1), pin 11 is at the center-left, and pin 8 is at the top-right (adjacent to pin 12).

5

| PIN Male connector M12, 8-pin | PIN Male connector M23, 12-pin | Wire colors (cable 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                         | 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. 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 plug. The 0-SET input is used to set the zero pulse to the current shaft position. If the 0-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. |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|
| Mounting systems                                                                    |                                                                                                                                                                           |             |          |
|  | <ul style="list-style-type: none"> <li><b>Product family:</b> Stator couplings</li> <li><b>Description:</b> Standard stator coupling</li> </ul>                           | BEF-DS00XFX | 2056812  |
|  | <ul style="list-style-type: none"> <li><b>Description:</b> Clamping ring for metal hollow shaft</li> <li><b>Material:</b> Steel</li> <li><b>Details:</b> Metal</li> </ul> | BEF-KR-M    | 2064709  |

|                                                                                     | 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> 15 m, 11-wire, PUR</li> <li>• <b>Description:</b> Incremental, shielded</li> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                | DOL-2312-G15MLD1 | 2062205  |
|    | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                 | DOL-2312-G02MLD1 | 2062202  |
|    | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                 | DOL-2312-G07MLD1 | 2062203  |
|    | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                | DOL-2312-G10MLD1 | 2062204  |
|    | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                | DOL-2312-G20MLD1 | 2062206  |
|   | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                | DOL-2312-G25MLD1 | 2062207  |
|  | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>                | DOL-2312-G30MLD1 | 2062208  |
|  | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul> | DOL-2312-G1M5MD1 | 2062240  |
|  | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>   | DOL-2312-G03MMD1 | 2062243  |
|  | <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> <li>• <b>Application:</b> Zones with oils and lubricants</li> </ul>   | DOL-2312-G05MMD1 | 2062244  |
|  | <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-G10MMD1 | 2062245  |

|                                                                                   | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                         | Type             | part no. |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|
|  | <ul style="list-style-type: none"> <li><b>Application:</b> Zones with oils and lubricants</li> <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> <li><b>Application:</b> Zones with oils and lubricants</li> </ul> | DOL-2312-G20MMD1 | 2062246  |
|  | <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> <li><b>Description:</b> Incremental, shielded</li> <li><b>Application:</b> Zones with oils and lubricants</li> </ul>                                                             | DOL-2312-G30MMD1 | 2062247  |
|  | <ul style="list-style-type: none"> <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>, shielded, SSI, Incremental</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>, shielded, SSI, Incremental</li> <li><b>Connection systems:</b> Solder connection</li> </ul>                                                                                                                 | DOS-2312-W01     | 2072580  |

## 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)