Product data sheet



# DFS60B-TBPM10000

## DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ

## Ordering information

| Type | Part no. |
|---|---|
| DFS60B-TBPM10000 | 1036937 |

Other models and accessories → www.sick.com/DFS60

## Detailed technical data

### Performance

| | |
|---|---|
| **Pulses per revolution** | 10,000 [1] |
| **Measuring step** | 90° electronically/ppr |
| **Measuring step deviation at non binary number of lines** | ± 0.01° |
| **Error limits** | ± 0.05° |

[1] See maximum revolution range.

### Interfaces

| | |
|---|---|
| **Communication interface** | Incremental |
| **Communication Interface detail** | TTL / HTL |
| **Factory setting** | Factory setting: output level TTL |
| **Number of signal channels** | 6-channel |
| **Programmable/configurable** | ✓ |
| **Initialization time** | 32 ms [1]<br>30 ms |
| **Output frequency** | ≤ 600 kHz |
| **Load current** | ≤ 30 mA |
| **Power consumption** | ≤ 0.7 W (without load) |

[1] With mechanical zero pulse width.

### Electrical data

| | |
|---|---|
| **Connection type** | Cable, 8-wire, universal, 5 m [1] |
| **Supply voltage** | 4.5 ... 32 V |
| **Reference signal, number** | 1 |

[1] The universal cable connection is positioned so that it is possible to lay it without bends in a radial or axial direction.

[2] Programming TTL with ≥ 5.5 V: short-circuit opposite to another channel or GND permissable for maximum 30 s.

[3] 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.

| | |
|---|---|
| **Reference signal, position** | 90°, electric, logically gated with A and B |
| **Reverse polarity protection** | ✓ |
| **Short-circuit protection of the outputs** | ✓ [2] |
| **MTTFd: mean time to dangerous failure** | 300 years (EN ISO 13849-1) [3] |

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## Mechanical data

| | |
|---|---|
| **Mechanical design** | Through hollow shaft |
| **Shaft diameter** | 8 mm |
| **Weight** | + 0.2 kg |
| **Shaft material** | Stainless steel |
| **Flange material** | Aluminum |
| **Housing material** | Aluminum die cast |
| **Start up torque** | 0.8 Ncm (+20 °C) |
| **Operating torque** | 0.6 Ncm (+20 °C) |
| **Permissible shaft movement, axial static/dynamic** | ± 0.5 mm / ± 0.2 mm |
| **Permissible shaft movement, radial static/dynamic** | ± 0.3 mm / ± 0.1 mm |
| **Operating speed** | ≤ 6,000 $min^{-1}$ [1] |
| **Moment of inertia of the rotor** | 40 $gcm^2$ |
| **Bearing lifetime** | 3.6 x 10^10 revolutions |
| **Angular acceleration** | ≤ 500,000 $rad/s^2$ |

[1] 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 61000-6-3 |
| **Enclosure rating** | IP65, housing side, cable connection (according to IEC 60529)<br>IP65, shaft side (according to IEC 60529) |
| **Permissible relative humidity** | 90 % (condensation of the optical scanning not permitted) |
| **Operating temperature range** | –40 °C ... +100 °C [1]<br>–30 °C ... +100 °C [2] |
| **Storage temperature range** | –40 °C ... +100 °C, without package |
| **Resistance to shocks** | 70 g, 6 ms (according to EN 60068-2-27) |
| **Resistance to vibration** | 30 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6) |

[1] Stationary position of the cable.

[2] Flexible position of the cable.

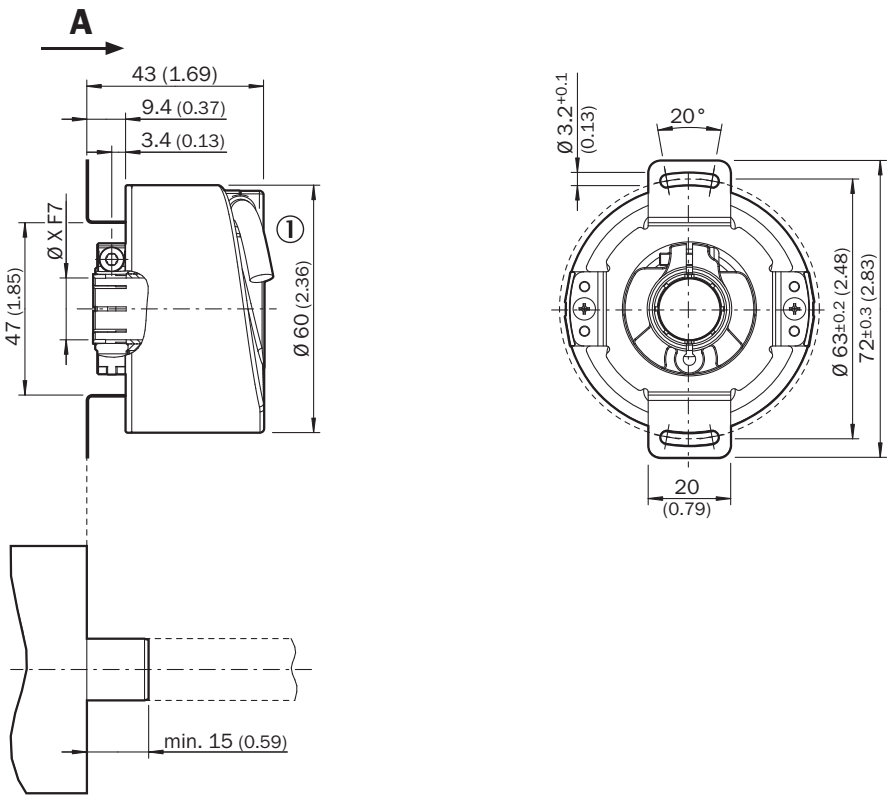
## Classifications

| | |
|---|---|
| **ECl@ss 5.0** | 27270501 |
| **ECl@ss 5.1.4** | 27270501 |
| **ECl@ss 6.0** | 27270590 |

| | |
|---|---|
| **ECl@ss 6.2** | 27270590 |
| **ECl@ss 7.0** | 27270501 |
| **ECl@ss 8.0** | 27270501 |
| **ECl@ss 8.1** | 27270501 |
| **ECl@ss 9.0** | 27270501 |
| **ECl@ss 10.0** | 27270501 |
| **ECl@ss 11.0** | 27270501 |
| **ETIM 5.0** | EC001486 |
| **ETIM 6.0** | EC001486 |
| **ETIM 7.0** | EC001486 |
| **UNSPSC 16.0901** | 41112113 |

## Dimensional drawing (Dimensions in mm (inch))

Through hollow shaft, cable connection




General tolerances according to DIN ISO 2768-mk

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

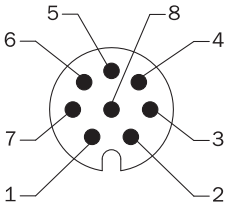
| Type<br>Through hollow shaft | Shaft diameter XF7 | Shaft diameter xj7 |
|---|---|---|
| DFS60x-TAxxxxxxxx | 6 mm | Provided by customer |
| DFS60x-TBxxxxxxxx | 8 mm | |
| DFS60x-TCxxxxxxxx | 3/8" | |
| DFS60x-TDxxxxxxxx | 10 mm | |

| Type<br>Through hollow shaft | Shaft diameter XF7 | Shaft diameter xj7 |
|---|---|---|
| DFS60x-TExxxxxxxx | 12 mm | |
| DFS60x-TFxxxxxxxx | 1/2″ | |
| DFS60x-TGxxxxxxxx | 14 mm | |
| DFS60x-THxxxxxxxx | 15 mm | |
| DFS60x-TJxxxxxxxx | 5/8″ | |

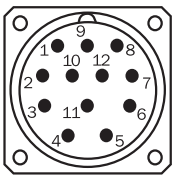
## PIN assignment

**Cable, 8-wire**

View of M12 male device connector on encoder




View of M23 male device connector on encoder

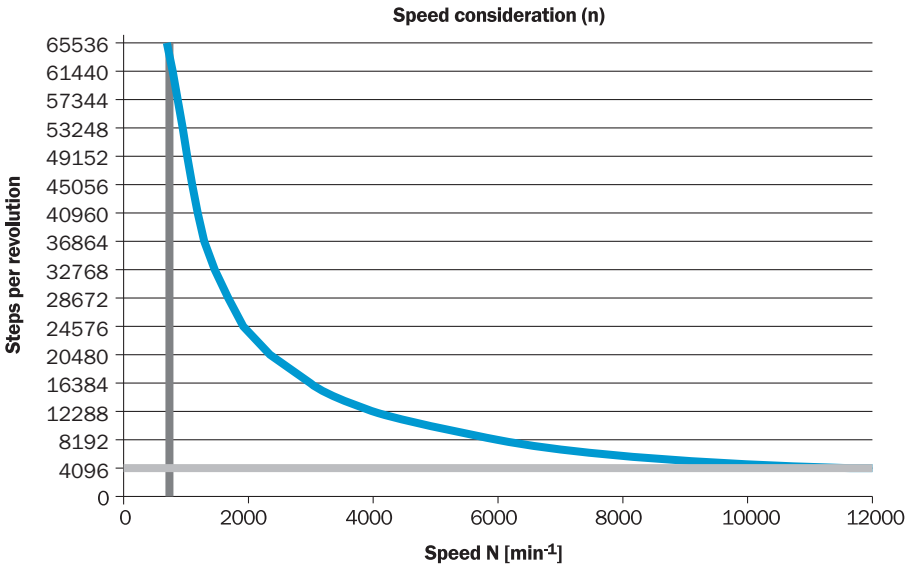



| PIN, 8-pin, M12 male connector | PIN, 12-pin, M23 male connector | Color of the wires for encoders with cable outlet | TTL/HTL signal | Sin/cos 1.0 $V_{ss}$ | Explanation |
|---|---|---|---|---|---|
| 1 | 6 | Brown | $\overline{A}$ | COS– | Signal wire |
| 2 | 5 | White | A | COS+ | Signal wire |
| 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 | Violet | Z | Z | Signal wire |
| 7 | 10 | Blue | GND | GND | Ground connection of the encoder |
| 8 | 12 | Red | $+U_S$ | $+U_S$ | 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 [1] | – | 0-SET [1] | n.c. | Set zero pulse [1] |
| Screen | Screen | Screen | Screen | Screen | Screen connected to housing on encoder side.<br>Connected to ground on control side. |

[1] 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 $U_S$ for longer than 250 ms after it had previously been unassigned for at least 1,000 ms or had been connected to the GND, the current position of the shaft is assigned to the zero pulse signal “Z”.

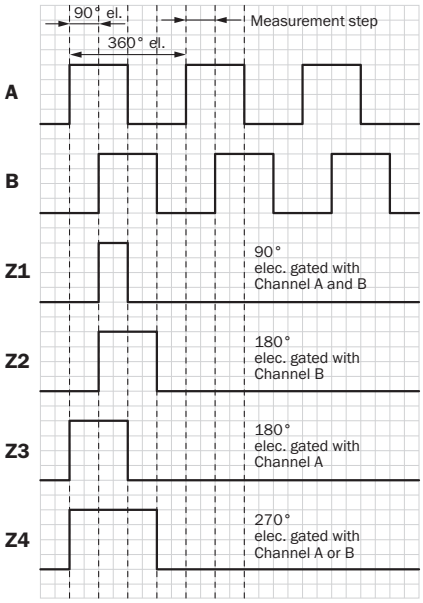
## Maximum revolution range

Maximum revolution range



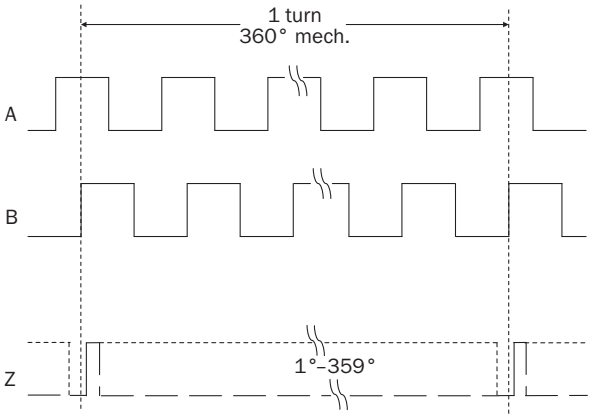

## Diagrams

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




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

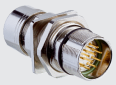
Mechanical zero pulse width 1° to 359° programmable. Width of the zero pulse in relation to a mechanical revolution of the shaft.




## Recommended accessories

Other models and accessories ➜ www.sick.com/DFS60

| | Brief description | Type | Part no. |
|---|---|---|---|
| Flanges | | | |
|  | Standard stator coupling | BEF-DS00XFX | 2056812 |
| Other mounting accessories | | | |
|  | Clamping ring for metal hollow shaft, metal | BEF-KR-M | 2064709 |
| Plug connectors and cables | | | |
|  | Head A: female connector, JST, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 5 m | DOL-0J08-G05MAA3 | 2046876 |
| | Head A: female connector, JST, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 0.5 m | DOL-0J08-G0M5AA3 | 2046873 |
| | Head A: female connector, JST, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 10 m | DOL-0J08-G10MAA3 | 2046877 |
| | Head A: female connector, JST, 8-pin, straight<br>Head B: Flying leads<br>Cable: SSI, Incremental, PUR, halogen-free, shielded, 1.5 m | DOL-0J08-G1M5AA6 | 2048590 |
| | Head A: female connector, JST, 8-pin, straight<br>Head B: Flying leads<br>Cable: SSI, Incremental, PUR, halogen-free, shielded, 3 m | DOL-0J08-G3M0AA6 | 2048591 |
|  | Head A: female connector, terminal box, 8-pin, straight<br>Head B: male connector, D-Sub, 9-pin, straight<br>Cable: SSI + incremental, PVC, shielded, 0.5 m<br>Programming adapter cable for programming tool PGT-10-Pro and PGT-08-S | DSL-0D08-G0M5AC3 | 2061739 |
|  | Head A: female connector, JST, 8-pin, straight<br>Head B: male connector, M23, 12-pin, straight<br>Cable: Incremental, PUR, halogen-free, shielded, 1 m | STL-2312-G01MAA3 | 2061622 |

| | Brief description | Type | Part no. |
|---|---|---|---|
| | Head A: female connector, JST, 8-pin, straight<br>Head B: male connector, M23, 12-pin, straight<br>Cable: Incremental, PUR, halogen-free, shielded, 2 m | STL-2312-G02MAA3 | 2061504 |
| | Head A: female connector, JST, 8-pin, straight<br>Head B: male connector, M23, 12-pin, straight<br>Cable: Incremental, PUR, halogen-free, shielded, 0.35 m | STL-2312-GM35AA3 | 2061621 |
|  | Head A: male connector, M12, 8-pin, straight, A-coded<br>Head B: -<br>Cable: Incremental, shielded | STE-1208-GA01 | 6044892 |
|  | Head A: male connector, M23, 12-pin, straight<br>Head B: -<br>Cable: HIPERFACE®, SSI, Incremental, shielded | STE-2312-G01 | 2077273 |
|  | | STE-2312-GX | 6028548 |
| Programming and configuration tools | | | |
|  | USB programming unit, for programmable SICK encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoders | PGT-08-S | 1036616 |
|  | Programming unit display for programmable SICK DFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoder with DFS60, AFS/AFM60 and AHS/AHM36. Compact dimensions, low weight, and intuitive operation. | PGT-10-Pro | 1072254 |

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