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DATA SHEET

# DFS60B-S4AK03000

DFS60
Incremental encoders

SICK Sensor Intelligence



Illustration may differ

## INCREMENTAL ENCODERS

# DFS60B-S4AK03000

### ORDERING INFORMATION

| Type | part no. |
|---|---|
| DFS60B-S4AK03000 | 1037220 |

Further device versions and accessories at www.sick.com/DFS60

## DETAILED TECHNICAL DATA

### SAFETY-RELATED PARAMETERS

| | |
|---|---|
| $MTTF_D$ (mean time to dangerous failure) | 300 years (EN ISO 13849-1) [1] |

[1] 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

| | |
|---|---|
| Pulses per revolution | 3,000 [1] |
| Measuring step | 90°, electric/pulses per revolution |
| 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 / RS-422 |
| Number of signal channels | 6-channel |
| Initialization time | 40 ms |
| Output frequency | ≤ 600 kHz |
| Load current | ≤ 30 mA |
| Operating current | 40 mA (without load) |

## ELECTRONICS

| | |
|---|---|
| Connection type | Cable, 8-wire, universal, 1.5 m [1] |
| Supply voltage | 4.5 ... 5.5 V |
| Reference signal, number | 1 |
| Reference signal, position | 90°, electric, logically gated with A and B |
| Short-circuit protection of the outputs | ✓ [2] |

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

[2] Short-circuit opposite to another channel, US or GND permissable for maximum 30 s.

## MECHANICS

| | |
|---|---|
| Mechanical design | Solid shaft, face mount flange |
| Shaft diameter | 10 mm<br>With 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 $min^{-1}$ [1] |
| Moment of inertia of the rotor | 6.2 $gcm^2$ |
| 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 | IP67, housing side, cable connection (IEC 60529)<br>IP65, shaft side (IEC 60529) |
| Permissible relative humidity | 90 % (Condensation 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 (EN 60068-2-27) |
| Resistance to vibration | 30 g, 10 Hz ... 2,000 Hz (EN 60068-2-6) |

[1] Stationary position of the cable.

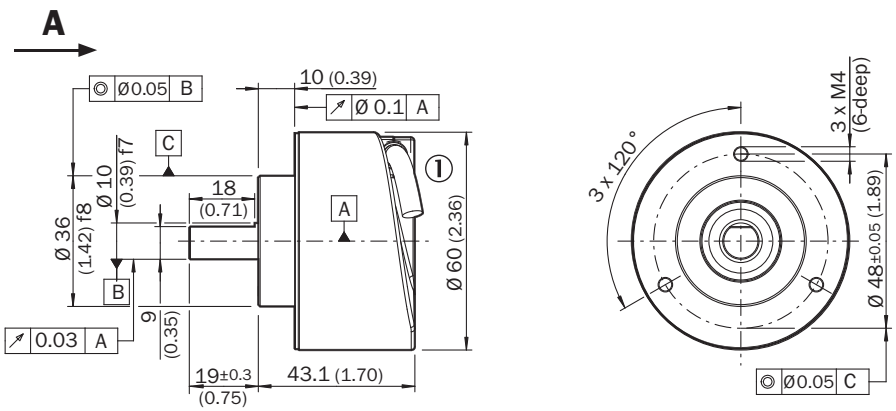
[2] Flexible position of the cable.

## CERTIFICATES

| | |
|---|---|
| EU declaration of conformity | ✓ |
| UK declaration of conformity | ✓ |
| ACMA declaration of conformity | ✓ |
| Moroccan declaration of conformity | ✓ |
| China RoHS | ✓ |

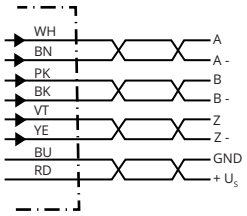
| | |
|---|---|
| cULus certificate | ✓ |
| Information according to Art. 3 of Data Act (Regulation EU 2023/2854) | ✓ |

## DIMENSIONAL DRAWING




Dimensions in mm (inch)
① cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

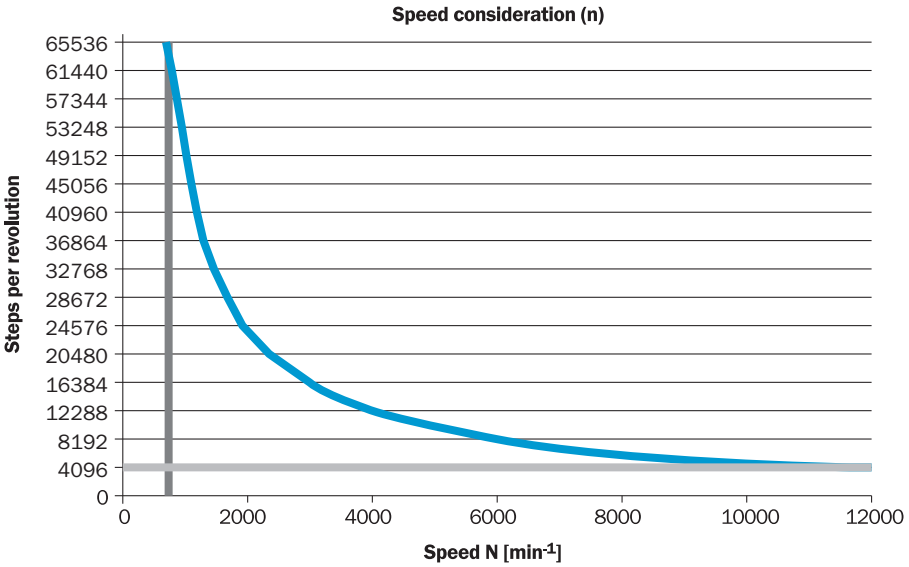
## PIN ASSIGNMENT



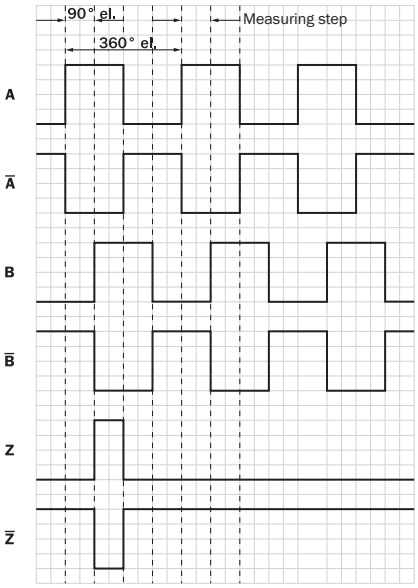

| PINMale connector M12, 8-pin | PINMale connector M23, 12-pin | Wire colors (cable connection) | TTL/HTL signal | Sin/Cos 1.0 $V_{PP}$ | Explanation |
|---|---|---|---|---|---|
| 1 | 6 | Brown | $\bar{A}$ | COS- | Signal wire |
| 2 | 5 | White | A | COS+ | Signal wire |
| 3 | 1 | Black | $\bar{B}$ | SIN- | Signal wire |
| 4 | 8 | Pink | B | SIN+ | Signal wire |
| 5 | 4 | Yellow | $\bar{Z}$ | $\bar{Z}$ | Signal wire |
| 6 | 3 | Purple | Z | Z | Signal wire |
| 7 | 10 | Blue | GND | GND | Ground connection |
| 8 | 12 | Red | $+U_s$ | $+U_s$ | Supply voltage |
| - | 9 | - | N.c. | N.c. | Not assigned |
| - | 2 | - | N.c. | N.c. | Not assigned |
| - | 11 | - | N.c. | N.c. | Not assigned |
| - | 7 [1] | Orange | 0-SET [1] | N.c. | Set zero pulse [1] |
| Screen | Screen | Screen | Screen | Screen | Screen connected to housing on encoder side. Connected to ground on control side. |

[1] 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 |

Further information as well as suitable accessories, example applications and downloads such as CAD dimensional models, operating instructions and software can be found at www.sick.com/1037220

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# SICK AT A GLANCE

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SICK combines sensor intelligence with industry expertise and certified consulting services. We provide the ideal foundation for scalable as well as tailor-made automation solutions and create added value along the entire value chain. Our close partnerships with our customers are more than just a promise: Together, we optimize productivity, improve quality, protect health and safety, and help build a sustainable future. All with empathy and trust.

Since 1946, we have been developing innovative technologies with passion and a pioneering spirit. With a global network in around 40 countries, SICK has a global presence and is always close by. The company's headquarters are located in Waldkirch near Freiburg, Germany. Our customers benefit from our understanding of both local and global requirements, which enables us to deliver tailor-made solutions

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