



# DFS21A-KFA1C002000

DFS2x

INCREMENTAL ENCODERS

**SICK**  
Sensor Intelligence.



Illustration may differ



### Ordering information

| Type               | Part no. |
|--------------------|----------|
| DFS21A-KFA1C002000 | 1082926  |

Other models and accessories → [www.sick.com/DFS2x](http://www.sick.com/DFS2x)

### Detailed technical data

#### Performance

|                                 |                                       |
|---------------------------------|---------------------------------------|
| <b>Pulses per revolution</b>    | 2,000                                 |
| <b>Measuring step</b>           | ± 90°, electric/pulses per revolution |
| <b>Measuring step deviation</b> | ± 0.008° pulses 100 ... 10,000        |
| <b>Error limits</b>             | ± 0.03°                               |

#### Interfaces

|                                       |                      |
|---------------------------------------|----------------------|
| <b>Communication interface</b>        | Incremental          |
| <b>Communication Interface detail</b> | TTL / RS-422         |
| <b>Number of signal channels</b>      | 6-channel            |
| <b>Initialization time</b>            | 40 ms <sup>1)</sup>  |
| <b>Output frequency</b>               | 820 kHz              |
| <b>Load current</b>                   | 30 mA                |
| <b>Operating current</b>              | 50 mA (without load) |

<sup>1)</sup> Valid positional data can be read once this time has elapsed.

#### Electrical data

|  |  |
|--|--|
| <b>Connection type</b>                         | Male connector, M12, 8-pin, radial <sup>1)</sup> |
| <b>Supply voltage</b>                          | 4.5 ... 5.5 V                                    |
| <b>Reference signal, number</b>                | 1  |
| <b>Reverse polarity protection</b>             | ✓  |
| <b>Short-circuit protection of the outputs</b> | ✓ <sup>2)</sup>                                  |
| <b>MTTFd: mean time to dangerous failure</b>   | 330 years (EN ISO 13849-1) <sup>3)</sup>         |

<sup>1)</sup> The Zero-Set function is not available with 6-pin MS connector or M12 connector options.

<sup>2)</sup> Short-circuit opposite to another channel or GND permissible for maximum 30 s.

<sup>3)</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.

## Mechanical data

|                                       |  |
|---------------------------------------|--|
| <b>Mechanical design</b>              | Through hollow shaft                   |
| <b>Shaft diameter</b>                 | 1/2"                                   |
| <b>Flange type / stator coupling</b>  | 2-point stator coupling                |
| <b>Weight</b>                         | + 0.3 kg <sup>1)</sup>                 |
| <b>Shaft material</b>                 | Stainless steel 1,4305                 |
| <b>Flange material</b>                | Aluminum                               |
| <b>Housing material</b>               | Aluminum                               |
| <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>   | ± 0.05 mm (radial)<br>± 0.1 mm (axial) |
| <b>Operating speed</b>                | ≤ 6,000 min <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>9</sup> revolutions      |
| <b>Angular acceleration</b>           | ≤ 500,000 rad/s <sup>2</sup>           |

<sup>1)</sup> Relates to encoders with male connector M12.

## Ambient data

|                                      |  |
|--------------------------------------|--|
| <b>EMC</b>                           | According to EN 61000-6-2 and EN 61000-6-3                     |
| <b>Enclosure rating</b>              | IP65, shaft side (IEC 60529)<br>IP67, housing side (IEC 60529) |
| <b>Permissible relative humidity</b> | 90 % (Condensation not permitted)                              |
| <b>Operating temperature range</b>   | -30 °C ... +85 °C  |
| <b>Storage temperature range</b>     | -40 °C ... +100 °C, without package                            |
| <b>Resistance to shocks</b>          | 100 g, 11 ms (EN 60068-2-27)                                   |
| <b>Resistance to vibration</b>       | 30 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)                        |

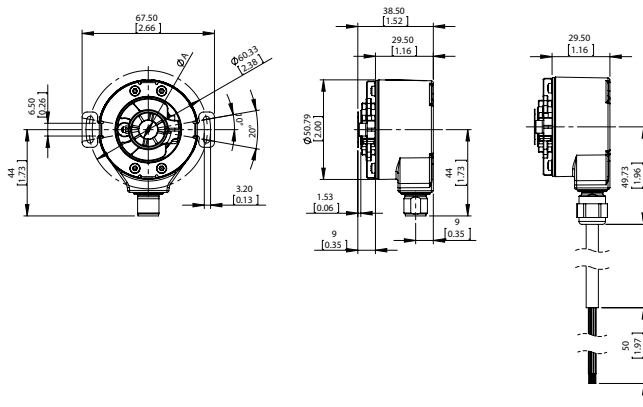
## Classifications

|                     |          |
|---------------------|----------|
| <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 |

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

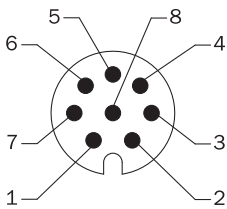
DFS21 through hollow shaft



| Type                                 | Shaft diameter<br>A |
|--------------------------------------|---------------------|
| DFS2x-x1xxxxxxxx                     | 1/4"                |
| DFS2x-x2xxxxxxxx<br>DFS2x-xCxxxxxxxx | 3/8"                |
| DFS2x-xFxxxxxxxx                     | 1/2"                |
| DFS2x-x3xxxxxxxx                     | 6 mm                |
| DFS2x-x4xxxxxxxx                     | 10 mm               |

### PIN assignment

View of M12 male device connector on encoder

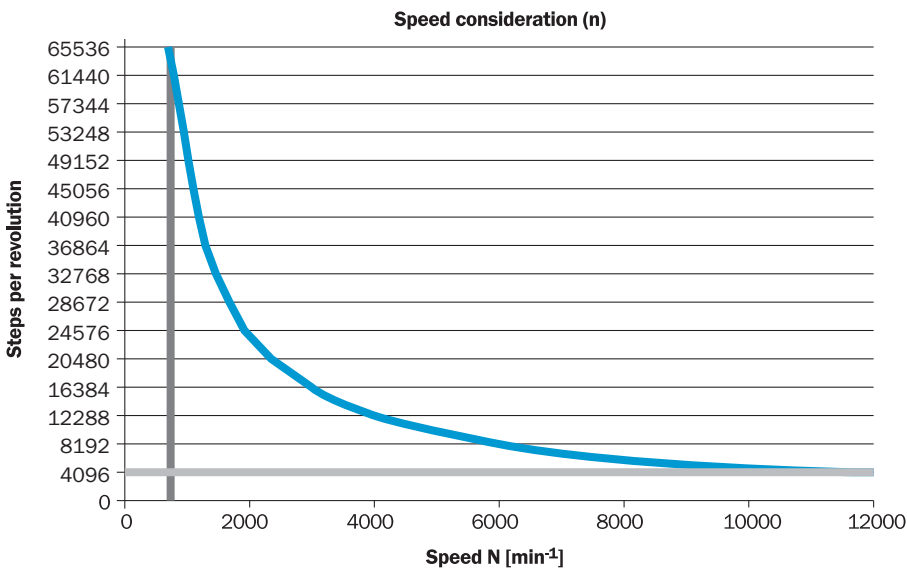


| M12, 8-pin | MS, 10-pin | MS, 7-pin | MS, 6-pin | Cable, 9-wire | Signal    | Description |
|------------|------------|-----------|-----------|---------------|-----------|-------------|
| 1          | H          | -         | -         | Brown         | $\bar{A}$ | Signal wire |
| 2          | A          | A         | E         | White         | A         | Signal wire |
| 3          | I          | -         | -         | Black         | $\bar{B}$ | Signal wire |
| 4          | B          | B         | D         | Pink          | B         | Signal wire |
| 5          | J          | -         | -         | Yellow        | $\bar{Z}$ | Signal wire |
| 6          | C          | C         | C         | Purple        | Z         | Signal wire |
| 7          | F          | F         | A         | Blue          | GND       | GND         |

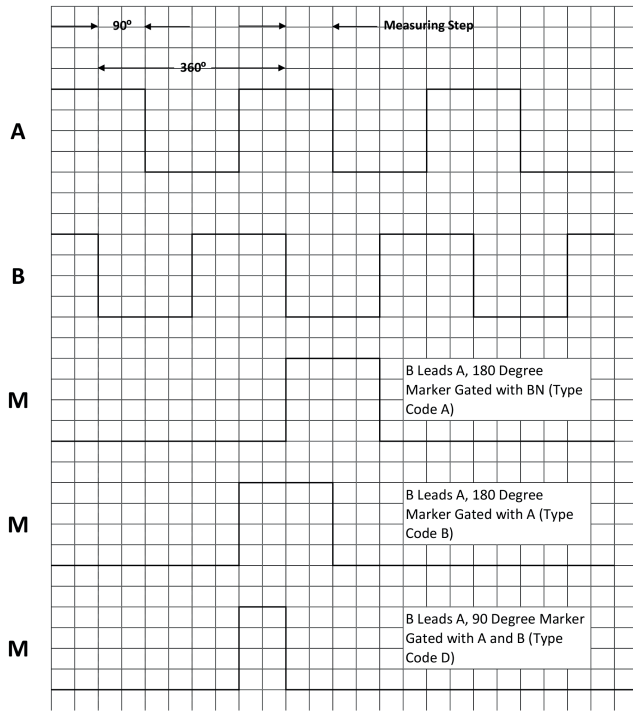
| M12, 8-pin | MS, 10-pin | MS, 7-pin | MS, 6-pin | Cable, 9-wire | Signal     | Description                                     |
|------------|------------|-----------|-----------|---------------|------------|---|
| 8          | D          | D         | B         | Red           | Us         | Supply voltage                                  |
| -          | E          | E         | -         | Orange        | 0-SET      | Input signal                                    |
| -          | G          | G         | F         | -             | Housing    | Electrically connected to the housing potential |
| -          | -          | -         | -         | Blank         | Drain wire | Bare wire parallel to the braided screen        |
| -          | -          | -         | -         | Screen        | Screen     | Screen connected to housing on encoder side     |

## Diagrams

Maximum revolution range

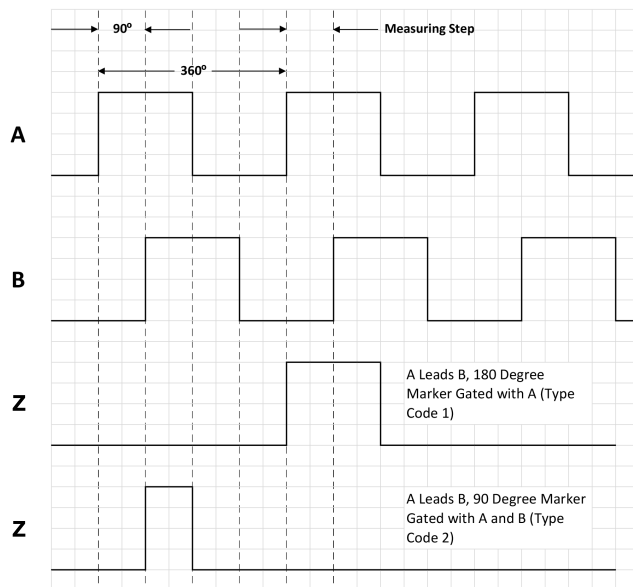


Signal Outputs with Counter Clock-wise Counting Direction Option Selected (B leads A for clock-wise rotation). Complement signals AN, BN and ZN are not shown.



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

Signal Outputs with Clock-wise Counting Direction Option Selected (A leads B for clock-wise rotation). Complement signals AN, BN and ZN are not shown.



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

## Recommended accessories

Other models and accessories → [www.sick.com/DFS2x](http://www.sick.com/DFS2x)

|   | Brief description   | Type             | Part no. |
|---|---|------------------|----------|
| Others  |   |                  |          |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental, SSI</li> <li>• <b>Cable:</b> 2 m, 8-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm<sup>2</sup>, Ø 7.0 mm</li> <li>• <b>Connection systems:</b> Flying leads</li> </ul>                                      | DOL-1208-G02MAC1 | 6032866  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental, SSI</li> <li>• <b>Cable:</b> 5 m, 8-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm<sup>2</sup>, Ø 7.0 mm</li> <li>• <b>Connection systems:</b> Flying leads</li> </ul>                                      | DOL-1208-G05MAC1 | 6032867  |
|    | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental, SSI</li> <li>• <b>Cable:</b> 10 m, 8-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm<sup>2</sup>, Ø 7.0 mm</li> <li>• <b>Connection systems:</b> Flying leads</li> </ul>                                     | DOL-1208-G10MAC1 | 6032868  |
|   | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> Incremental, SSI</li> <li>• <b>Cable:</b> 20 m, 8-wire, PUR, halogen-free</li> <li>• <b>Description:</b> Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm<sup>2</sup>, Ø 7.0 mm</li> <li>• <b>Connection systems:</b> Flying leads</li> </ul>                                     | DOL-1208-G20MAC1 | 6032869  |
|  | <ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight, A-coded</li> <li>• <b>Signal type:</b> Incremental, SSI</li> <li>• <b>Cable:</b> CAT5, CAT5e</li> <li>• <b>Description:</b> Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: -40 °C ... +85 °C</li> <li>• <b>Connection systems:</b> IDC quick connection</li> <li>• <b>Permitted cross-section:</b> 0.14 mm<sup>2</sup> ... 0.34 mm<sup>2</sup></li> </ul> | DOS-1208-GA01    | 6045001  |

## SICK AT A GLANCE

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