



DFS60I-S4CC01024

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

| Type | Part no. |
|------------------|----------|
| DFS60I-S4CC01024 | 1095706 |

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

Detailed technical data

Performance

| | |
|---|-------------------------------------|
| Pulses per revolution | 1,024 ¹⁾ |
| Measuring step | 90°, electric/pulses per revolution |
| Measuring step deviation at binary number of lines | ± 0.008° |
| Error limits | ± 0.03° |

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 | ≤ 820 kHz |
| Load current | ≤ 30 mA |
| Operating current | 40 mA (without load) |
| Power consumption | ≤ 0.5 W (without load) |
| Load resistance | ≥ 120 Ω |

Electrical data

| | |
|------------------------------------|---|
| Connection type | Male connector, M12, 8-pin, radial |
| Supply voltage | 10 ... 32 V |
| Reference signal, number | 1 |
| Reference signal, position | 90°, electric, logically gated with A and B |
| Reverse polarity protection | ✓ |

¹⁾ Short-circuit opposite to another channel or GND permissible for maximum 30 s.

²⁾ 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.

| | |
|--|--|
| Short-circuit protection of the outputs | ✓ ¹⁾ |
| MTTFd: mean time to dangerous failure | 300 years (EN ISO 13849-1) ²⁾ |

¹⁾ Short-circuit opposite to another channel or GND permissible for maximum 30 s.

²⁾ 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

| | |
|---------------------------------------|---|
| Mechanical design | Solid shaft, face mount flange |
| Shaft diameter | 10 mm |
| Shaft length | 19 mm |
| Weight | + 0.5 kg |
| Shaft material | Stainless steel V2A |
| Flange material | Stainless steel V2A |
| Housing material | Stainless steel V2A |
| Start up torque | 1 Ncm (+20 °C) |
| Operating torque | 0.5 Ncm (+20 °C) |
| Permissible shaft loading | 80 N (radial) 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 61000-6-4 |
| Enclosure rating | IP67, housing side (IEC 60529) ¹⁾ IP67, shaft side (IEC 60529) |
| Permissible relative humidity | 90 % (Condensation not permitted) |
| Operating temperature range | -40 °C ... +100 °C ²⁾ -30 °C ... +100 °C ³⁾ |
| Storage temperature range | -40 °C ... +100 °C, without package |
| Resistance to shocks | 100 g, 6 ms (EN 60068-2-27) |
| Resistance to vibration | 10 g, 10 Hz ... 2,000 Hz (EN 60068-2-6) |

¹⁾ With mating connector fitted.

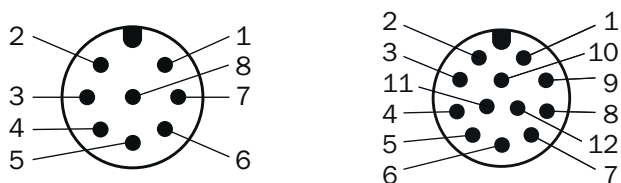
²⁾ Stationary position of the cable.

³⁾ Flexible position of the cable.

Classifications

| | |
|---------------------|----------|
| eCI@ss 5.0 | 27270501 |
| eCI@ss 5.1.4 | 27270501 |
| eCI@ss 6.0 | 27270590 |
| eCI@ss 6.2 | 27270590 |
| eCI@ss 7.0 | 27270501 |

PIN assignment

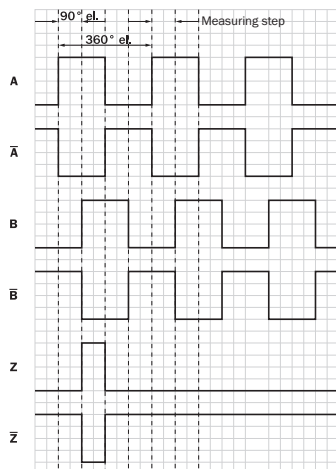


View of M12 male device connector on encoder

| Male connector M12, 8-pin | Connector M12, 12-pin | Wire colors (cable connection) | TTL/HTL signal | Sin/Cos 1.0 V _{PP} | Explanation |
|---------------------------|-----------------------|--------------------------------|---------------------|-----------------------------|---|
| 1 | 7 | Brown | \bar{A} | COS- | Signal wire |
| 2 | 6 | White | A | COS+ | Signal wire |
| 3 | 9 | Black | \bar{B} | SIN- | Signal wire |
| 4 | 8 | Pink | B | SIN+ | Signal wire |
| 5 | 4 | Yellow | \bar{Z} | \bar{Z} | Signal wire |
| 6 | 11 | Purple | Z | Z | Signal wire |
| 7 | 12 | Blue | GND | GND | Ground connection |
| 8 | 5 | Red | +U _S | +U _S | Supply voltage |
| - | 2 | - | N.c. | N.c. | Not assigned |
| - | 3 | - | N.c. | N.c. | Not assigned |
| - | 1 | - | N.c. | N.c. | Not assigned |
| - | 10 ¹⁾ | - | O-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. |

Diagrams

Signal outputs



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





Maximum revolution range




| 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





| | Brief description | Type | Part no. |
|---|--|-------------------|----------|
| Flanges | | | |
|  | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum, Aluminum | BEF-FA-036-060RSA | 2029163 |
| Mounting brackets and plates | | | |
|  | Mounting bracket for encoder with spigot 36 mm for face mount flange, mounting kit included | BEF-WF-36 | 2029164 |
|  | Mounting angle spring-loaded, for flange with centering collar 36 mm, working temperature range -40° ... +120 °C, Aluminum | BEF-WF36F | 4084775 |
| Other mounting accessories | | | |
|  | Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm | BEF-MR010020R | 2055224 |
| | Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm | BEF-MR010030R | 2049278 |
| | Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm | BEF-MR010050R | 2055227 |

| | Brief description | Type | Part no. |
|---|---|----------------|----------|
|  | Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm | BEF-MR10200AK | 4084737 |
|  | Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm | BEF-MR10200AP | 4084738 |
|  | Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 200 mm | BEF-MR10200APG | 4084740 |
|  | Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm | BEF-MR10200APN | 4084739 |
|  | Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm | BEF-MR10500AK | 4084733 |
|  | Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm | BEF-MR10500AP | 4084734 |
|  | Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 500 mm | BEF-MR10500APG | 4084736 |
|  | Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 500 mm | BEF-MR10500APN | 4084735 |
|  | SICK modular measuring wheel system for face mount flange encoder with S4 mechanical design (10 mm x 19 mm solid shaft), e.g., DFS60-S4: with O-ring measuring wheel, circumference 200 mm | BEF-MRS-10-U | 2085714 |
|  | Bearing block for servo and face mount flange encoder. The heavy-duty bearing block is used to absorb very large radial and axial shaft loads. Particularly when using belt pulleys, chain sprockets, friction wheels. Operating speed max. 4,000 rpm ⁻¹ , axial shaft load 150 N, radial shaft load 250 N, bearing service life 3.6 x 10 ⁹ revolutions | BEF-FA-LB1210 | 2044591 |

Plug connectors and cables

| | | | |
|---|--|------------------|---------|
|  | Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 2 m | DOL-1208-G02MAC1 | 6032866 |
|  | Head A: female connector, M12, 8-pin, straight, A-coded Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 2 m | DOL-1208-G02MIE1 | 2120313 |
|  | Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 5 m | DOL-1208-G05MAC1 | 6032867 |
| | Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 10 m | DOL-1208-G10MAC1 | 6032868 |
| | Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 20 m | DOL-1208-G20MAC1 | 6032869 |
| | Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 25 m | DOL-1208-G25MAC1 | 6067859 |
|  | Head A: female connector, M12, 8-pin, straight, A-coded Cable: Incremental, SSI, shielded | DOS-1208-GA01 | 6045001 |

| | Brief description | Type | Part no. |
|---|--|--------------------|----------|
|  | Head A: female connector, M12, 8-pin, straight, A-coded Cable: shielded | YF12ES8-0050S5586A | 2097334 |
|  | Head A: male connector, M12, 8-pin, straight, A-coded Cable: shielded | YM12ES8-0050S5586A | 2097337 |
| Shaft adaptation | | | |
|  | Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. speed 10,000 rpm, -30°C to $+120^\circ\text{C}$, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub | KUP-0610-B | 5312982 |
|  | Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially ± 2.5 mm, axially ± 3 mm, angle ± 10 degrees; max. speed 3,000 rpm, -30 to $+80$ degrees Celsius, torsional spring stiffness of 25 Nm/rad | KUP-0610-D | 5326697 |
|  | Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular $\pm 2.5^\circ$; max. speed 12,000 rpm, -10° to $+80^\circ\text{C}$, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin | KUP-0610-F | 5312985 |
|  | Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10° , -30°C to $+80^\circ\text{C}$, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane | KUP-0610-J | 2127056 |
|  | Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial ± 0.3 mm, axial ± 0.3 mm, angular $\pm 3^\circ$; max. speed 10,000 rpm, -10° to $+80^\circ\text{C}$, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub | KUP-0610-S | 2056407 |
|  | Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially ± 0.25 mm, axially ± 0.4 mm, angle ± 4 degrees; max. speed 10,000 rpm, -30 to $+120$ degrees Celsius, torsional spring stiffness of 150 Nm/rad | KUP-0810-D | 5326704 |
|  | Claw coupling, shaft diameter 8 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10° , -30°C to $+80^\circ\text{C}$, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane | KUP-0810-J | 2128267 |
|  | Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial ± 0.3 mm, axial ± 0.3 mm, angular $\pm 3^\circ$; max. speed 10,000 rpm, -10° to $+80^\circ\text{C}$, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub | KUP-0810-S | 5314178 |
|  | Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, -30° to $+120^\circ\text{C}$, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs | KUP-1010-B | 5312983 |
|  | Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, -30° to $+80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange | KUP-1010-D | 5326703 |
|  | Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle $\pm 2.5^\circ$, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin | KUP-1010-F | 5312986 |
|  | Claw coupling, shaft diameter 10 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10° , -30°C to $+80^\circ\text{C}$, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane | KUP-1010-J | 2127054 |
|  | Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular $\pm 3^\circ$; speed 10,000 rpm, -10° to $+80^\circ\text{C}$, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub | KUP-1010-S | 2056408 |

| | Brief description | Type | Part no. |
|---|---|------------|----------|
|  | Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle $\pm 2.5^\circ$, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin | KUP-1010-W | 5319914 |
|  | 10 mm / 12 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, -30° to $+120^\circ$ °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs | KUP-1012-B | 5312984 |
|  | Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, -30° to $+80^\circ$ °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange | KUP-1012-D | 5326702 |
|  | Claw coupling, shaft diameter 10 mm / 12 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10° , -30° °C to $+80^\circ$ °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane | KUP-1012-J | 2128265 |

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