

INCREMENTAL ENCODERS



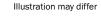
INCREMENTAL ENCODERS



Ordering information

| Туре | Part no. |
|------------------|----------|
| DFS60E-THAC00360 | 1061700 |

Other models and accessories -> www.sick.com/DFS60





Detailed technical data

Safety-related parameters

| $\mathbf{MTTF}_{\mathbf{D}}$ (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 | 360 ¹⁾ |
|--|-------------------------------------|
| Measuring step | 90°, electric/pulses per revolution |
| Measuring step deviation at non binary number of lines | ±0.2° |
| Error limits | ± 0.3° |

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 | ≤ 300 kHz |
| Load current | ≤ 30 mA |
| Operating current | 40 mA (without load) |

Electronics

| Connection type | Male connector, M12, 8-pin, radial |
|---|---|
| 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 | ✓ ¹) |

 $^{(1)}$ Short-circuit opposite to another channel, US or GND permissable for maximum 30 s.

INCREMENTAL ENCODERS

Mechanics

| Mechanical design | Through hollow shaft |
|--------------------------------|---------------------------------------|
| Shaft diameter | 15 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 movement static | ± 0.3 mm (radial) ± 0.5 mm (axial) |
| Permissible movement dynamic | ± 0.1 mm (radial) ± 0.2 mm (axial) |
| 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/s² |

 $^{\rm (1)}$ 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, male connector (IEC 60529) ¹⁾ IP65, shaft side (IEC 60529) |
| Permissible relative humidity | 90 % (Condensation not permitted) |
| Operating temperature range | 0 °C +85 °C |
| Storage temperature range | -40 °C +100 °C, without package |
| Resistance to shocks | 50 g, 6 ms (EN 60068-2-27) |
| Resistance to vibration | 20 g, 10 Hz 2,000 Hz (EN 60068-2-6) |

¹⁾ With mating connector fitted.

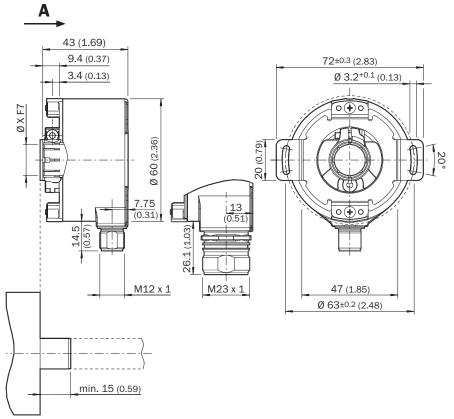
Classifications

| ECLASS 5.0 | 27270501 |
|--------------|----------|
| ECLASS 5.1.4 | 27270501 |
| ECLASS 6.0 | 27270590 |
| ECLASS 6.2 | 27270590 |
| ECLASS 7.0 | 27270501 |
| ECLASS 8.0 | 27270501 |
| ECLASS 8.1 | 27270501 |
| ECLASS 9.0 | 27270501 |
| ECLASS 10.0 | 27270501 |
| ECLASS 11.0 | 27270501 |
| ECLASS 12.0 | 27270501 |
| ETIM 5.0 | EC001486 |

INCREMENTAL ENCODERS

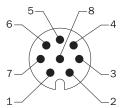
| ETIM 6.0 | EC001486 |
|----------------|----------|
| ETIM 7.0 | EC001486 |
| ETIM 8.0 | EC001486 |
| UNSPSC 16.0901 | 41112113 |

Dimensional drawing (Dimensions in mm (inch))



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

PIN assignment



View of M12 male device connector on encoder

| PIN Male connector M12, 8-pin | PIN Male connec- tor M23, 12-pin | Wire colors (ca- ble connection) | TTL/HTL signal | Sin/Cos 1.0 V _{PP} | Explanation |
|----------------------------------|--|-------------------------------------|----------------|-----------------------------|-------------|
| 1 | 6 | Brown | -A | COS- | Signal wire |
| 2 | 5 | White | A | COS+ | Signal wire |

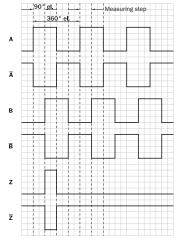
INCREMENTAL ENCODERS

| 812Red+UsHusSupply voltage-9-N.c.N.c.Not assigned-2-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-71OrangeO-SETN.c.ScreenScreenScreenScreenScreen on encode side. Connected to ground on controlScreenScreen on encode side. Connected to ground on control | PIN Male connector M12, 8-pin | PIN Male connec- tor M23, 12-pin | Wire colors (ca- ble connection) | TTL/HTL signal | Sin/Cos 1.0 V _{PP} | Explanation |
|--|----------------------------------|--|-------------------------------------|---------------------|-----------------------------|---|
| 54YellowZZZSignal wire63PurpleZZSignal wire710BlueGNDGNDGround connection812Red+Us+UsSupply voltage-9-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-7 ¹)OrangeO-SETN.c.ScreenScreenScreenScreenScreen connected for ground on controlScreen connected for ground on control | 3 | 1 | Black | Б | SIN- | Signal wire |
| 63PurpleZZSignal wire710BlueGNDGNDGround connection812Red+Us+UsSupply voltage-9-N.c.N.c.Not assigned-2-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-11-ScreenScreen pulse1)ScreenScreenScreenScreen on ocorrected bousing on encode side. Connected to ground on control | 4 | 8 | Pink | В | SIN+ | Signal wire |
| 710BlueGNDGNDGround connection812Red+Us+UsSupply voltage-9-N.c.N.c.Not assigned-2-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-71OrangeO-SETN.c.Set zero pulseScreenScreenScreenScreen on encodeScreen on encode | 5 | 4 | Yellow | ⁻ z | ⁻ z | Signal wire |
| 812Red+Us+UsSupply voltage-9-N.c.N.c.N.c.Not assigned-2-N.c.N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-7 ¹)OrangeO-SET ¹)N.c.Set zero pulse 1)ScreenScreenScreenScreen connected housing on encode side. Connected to ground on control | 6 | 3 | Purple | Z | Z | Signal wire |
| -9-N.c.N.c.Not assigned-2-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-7 ¹)OrangeO-SET ¹)N.c.Set zero pulse 1)ScreenScreenScreenScreen connected housing on encode side. Connected to ground on control | 7 | 10 | Blue | GND | GND | Ground connection |
| -2-N.c.N.c.Not assigned-11-N.c.N.c.Not assigned-7 10range0-SET 1N.c.Set zero pulse 1)ScreenScreenScreenScreen connected housing on encode side. Connected to ground on control | 8 | 12 | Red | +U _S | +U _S | Supply voltage |
| - 11 - N.c. N.c. Not assigned - 7 ¹) Orange 0-SET ¹) N.c. Set zero pulse 1) Screen Screen Screen Screen connected housing on encode side. Connected to ground on control | - | 9 | - | N.c. | N.c. | Not assigned |
| - 7 ¹) Orange 0-SET ¹) N.c. Set zero pulse 1) Screen Screen Screen Screen connected housing on encode side. Connected to ground on control | - | 2 | - | N.c. | N.c. | Not assigned |
| Screen Scren Screen Screen Screen <td>-</td> <td>11</td> <td>-</td> <td>N.c.</td> <td>N.c.</td> <td>Not assigned</td> | - | 11 | - | N.c. | N.c. | Not assigned |
| housing on encode side. Connected to ground on control | - | 7 ¹⁾ | Orange | 0-SET ¹⁾ | N.c. | |
| side. | Screen | Screen | Screen | Screen | Screen | Screen connected to housing on encoder side. Connected to ground on control side. |

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".

Diagrams

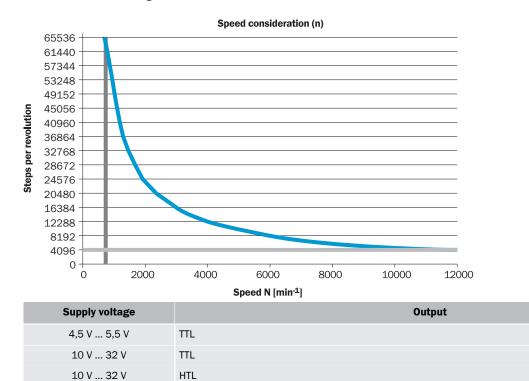
Signal outputs



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

INCREMENTAL ENCODERS

Maximum revolution range



Recommended accessories

Other models and accessories -> www.sick.com/DFS60

| | Brief description | Туре | Part no. |
|---------------|--|------------------|----------|
| Flanges | | | |
| Ŵ | Description: Standard stator coupling | BEF-DS00XFX | 2056812 |
| Other mountin | ng accessories | | |
| | Description: Clamping ring for metal hollow shaft^c Details: Metal | BEF-KR-M | 2064709 |
| Others | | | |
| | Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 2 m, 8-wire, PUR, halogen-free Description: 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 mm², Ø 7.0 mm Connection systems: Flying leads | DOL-1208-G02MAC1 | 6032866 |

DFS60E-THAC00360 | DFS60 INCREMENTAL ENCODERS

| Brief description | Туре | Part no. |
|---|------------------|----------|
| Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 5 m, 8-wire, PUR, halogen-free Description: 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 mm², Ø 7.0 mm Connection systems: Flying leads | DOL-1208-G05MAC1 | 6032867 |
| Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 10 m, 8-wire, PUR, halogen-free Description: 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 mm², Ø 7.0 mm Connection systems: Flying leads | DOL-1208-G10MAC1 | 6032868 |
| Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 20 m, 8-wire, PUR, halogen-free Description: 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 mm², Ø 7.0 mm Connection systems: Flying leads | DOL-1208-G20MAC1 | 6032869 |
| Connection type head A: Female connector, M12, 8-pin, straight, A-coded Signal type: Incremental, SSI Cable: CAT5, CAT5e Description: 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 Connection systems: IDC quick connection Permitted cross-section: 0.14 mm² 0.34 mm² | DOS-1208-GA01 | 6045001 |
| Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Signal type: HIPERFACE[®], Incremental Cable: 2 m, 8-wire, PUR, halogen-free Description: HIPERFACE[®], Incremental, shielded | DOL-1208-W02MAC1 | 6037724 |
| Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Signal type: HIPERFACE[®], Incremental Cable: 5 m, 8-wire, PUR, halogen-free Description: HIPERFACE[®], Incremental, shielded | DOL-1208-W05MAC1 | 6037725 |
| Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Signal type: HIPERFACE[®], Incremental Cable: 10 m, 8-wire, PUR, halogen-free Description: HIPERFACE[®], Incremental, shielded | DOL-1208-W10MAC1 | 6037726 |
| Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Signal type: HIPERFACE[®], Incremental Cable: 20 m, 8-wire, PUR Description: HIPERFACE[®], Incremental, shielded | DOL-1208-W20MAC1 | 6037727 |
| Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Cable: 2 m, 8-wire, PVC Description: Shielded Connection systems: Flying leads | DOL-1208-W02MA | 6020992 |

INCREMENTAL ENCODERS

| | Brief description | Туре | Part no. |
|---|---|-----------------------|----------|
| | Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Signal type: Sensor/actuator cable Cable: 2 m, 8-wire, PUR, halogen-free Description: Sensor/actuator cable, shielded Connection systems: Flying leads | DOL-1208- W02MAS01 | 6029224 |
| 2 | Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Cable: 2 m, 8-wire, PUR, halogen-free Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 2 m, PUR halogen free | DOL-1208-W02MC | 6035623 |
| | Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Cable: 5 m, 8-wire, PVC Description: Shielded Connection systems: Flying leads | DOL-1208-W05MA | 6021033 |
| 6 | Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Cable: 5 m, 8-wire, PUR Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 5 m, PUR halogen free | DOL-1208-W05MC | 6035624 |
| 2 | Connection type head A: Female connector, M12, 8-pin, angled Connection type head B: Flying leads Cable: 10 m, 8-wire, PUR, halogen-free Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 10 m, PUR halogen free | DOL-1208-W10MC | 6035625 |

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



Online data sheet

