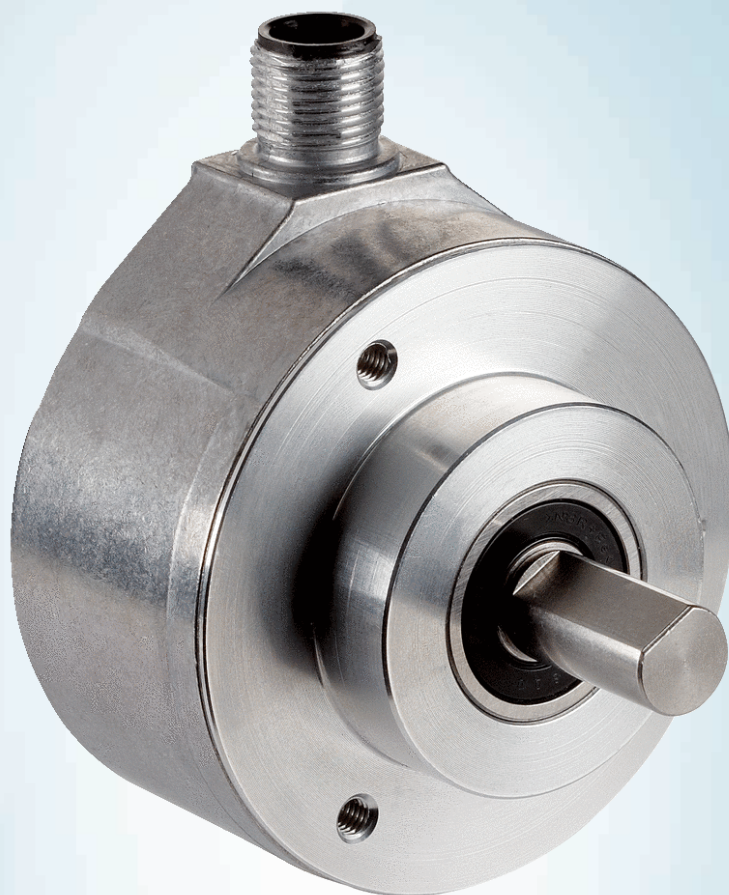




**AFM60A-S4AC262144**

AFS/AFM60 SSI

**MOTOR FEEDBACK SYSTEMS ROTARY INCREMENTAL**

**SICK**  
Sensor Intelligence.

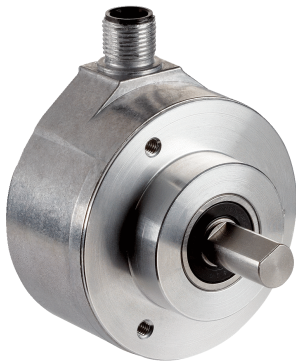


Illustration may differ



### Ordering information

| Type              | Part no. |
|-------------------|----------|
| AFM60A-S4AC262144 | 1037670  |

Other models and accessories → [www.sick.com/AFS\\_AFM60\\_SSI](http://www.sick.com/AFS_AFM60_SSI)

### Detailed technical data

#### Performance

|                                                                                 |                                   |
|---------------------------------------------------------------------------------|-----------------------------------|
| <b>Number of steps per revolution (max. resolution)</b>                         | 262,144 (18 bit)                  |
| <b>Number of revolutions</b>                                                    | 4,096 (12 bit)                    |
| <b>Max. resolution (number of steps per revolution x number of revolutions)</b> | 18 bit x 12 bit (262,144 x 4,096) |
| <b>Error limits G</b>                                                           | 0.03° <sup>1)</sup>               |
| <b>Repeatability standard deviation <math>\sigma_r</math></b>                   | 0.002° <sup>2)</sup>              |

<sup>1)</sup> In accordance with DIN ISO 1319-1, position of the upper and lower error limit depends on the installation situation, specified value refers to a symmetrical position, i.e. deviation in upper and lower direction is the same.

<sup>2)</sup> In accordance with DIN ISO 55350-13; 68.3% of the measured values are inside the specified area.

#### Interfaces

|                                                |                                                      |
|------------------------------------------------|------------------------------------------------------|
| <b>Communication interface</b>                 | SSI                                                  |
| <b>Initialization time</b>                     | 50 ms <sup>1)</sup>                                  |
| <b>Position forming time</b>                   | < 1 $\mu$ s                                          |
| <b>Code type</b>                               | Gray                                                 |
| <b>Code sequence parameter adjustable</b>      | CW/CCW (V/R) parameter adjustable                    |
| <b>Clock frequency</b>                         | $\leq 2$ MHz <sup>2)</sup>                           |
| <b>Set (electronic adjustment)</b>             | H-active (L = 0 - 3 V, H = 4,0 - U <sub>s</sub> V)   |
| <b>CW/CCW (counting sequence when turning)</b> | L-active (L = 0 - 1,5 V, H = 2,0 - U <sub>s</sub> V) |

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

<sup>2)</sup> Minimum, LOW level (Clock +): 250 ns.

#### Electrical data

|                        |                                    |
|------------------------|------------------------------------|
| <b>Connection type</b> | Male connector, M12, 8-pin, radial |
|------------------------|------------------------------------|

<sup>1)</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.

|                                              |                                          |
|----------------------------------------------|------------------------------------------|
| <b>Supply voltage</b>                        | 4.5 ... 32 V                             |
| <b>Power consumption</b>                     | ≤ 0.7 W (without load)                   |
| <b>Reverse polarity protection</b>           | ✓                                        |
| <b>MTTFd: mean time to dangerous failure</b> | 250 years (EN ISO 13849-1) <sup>1)</sup> |

<sup>1)</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>              | Solid shaft, face mount flange          |
| <b>Shaft diameter</b>                 | 10 mm                                   |
| <b>Shaft length</b>                   | 19 mm                                   |
| <b>Weight</b>                         | 0.3 kg <sup>1)</sup>                    |
| <b>Shaft material</b>                 | Stainless steel                         |
| <b>Flange material</b>                | Aluminum                                |
| <b>Housing material</b>               | Aluminum die cast                       |
| <b>Start up torque</b>                | < 0.5 Ncm (+20 °C)                      |
| <b>Operating torque</b>               | < 0.3 Ncm (+20 °C)                      |
| <b>Permissible shaft loading</b>      | 80 N (radial)<br>40 N (axial)           |
| <b>Operating speed</b>                | ≤ 9,000 min <sup>-1</sup> <sup>2)</sup> |
| <b>Moment of inertia of the rotor</b> | 6.2 gcm <sup>2</sup>                    |
| <b>Bearing lifetime</b>               | 3.0 x 10 <sup>9</sup> revolutions       |
| <b>Angular acceleration</b>           | ≤ 500,000 rad/s <sup>2</sup>            |

<sup>1)</sup> Based on devices with male connector.

<sup>2)</sup> Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

## Ambient data

|                                      |                                                                              |
|--------------------------------------|------------------------------------------------------------------------------|
| <b>EMC</b>                           | According to EN 61000-6-2 and EN 61000-6-3 <sup>1)</sup>                     |
| <b>Enclosure rating</b>              | IP65, shaft side (IEC 60529)<br>IP67, housing side (IEC 60529) <sup>2)</sup> |
| <b>Permissible relative humidity</b> | 90 % (Condensation not permitted)                                            |
| <b>Operating temperature range</b>   | -40 °C ... +100 °C <sup>3)</sup>                                             |
| <b>Storage temperature range</b>     | -40 °C ... +100 °C, without package                                          |
| <b>Resistance to shocks</b>          | 60 g, 6 ms (EN 60068-2-27)                                                   |
| <b>Resistance to vibration</b>       | 20 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)                                      |

<sup>1)</sup> EMC according to the standards quoted is achieved if shielded cables are used.

<sup>2)</sup> For devices with male connector: with mounted mating connector.

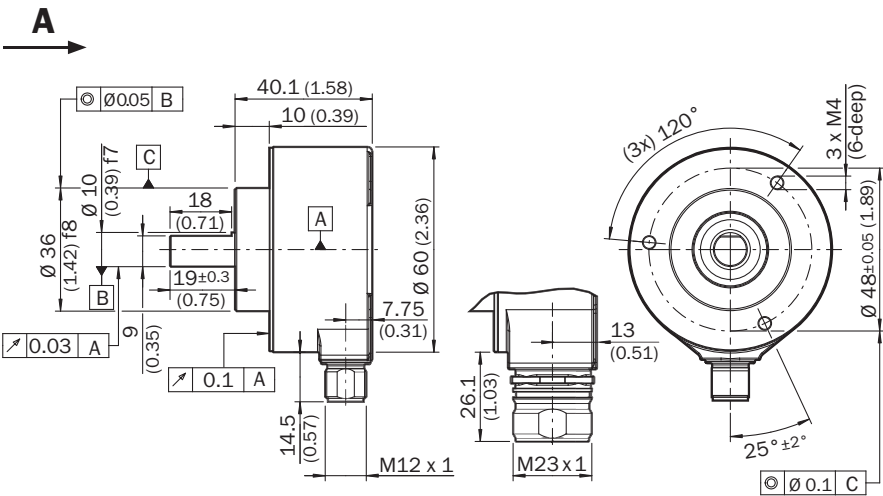
<sup>3)</sup> Stationary position of the cable.

## Classifications

|                     |          |
|---------------------|----------|
| <b>ECLASS 5.0</b>   | 27270502 |
| <b>ECLASS 5.1.4</b> | 27270502 |
| <b>ECLASS 6.0</b>   | 27270590 |
| <b>ECLASS 6.2</b>   | 27270590 |

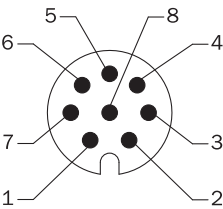
|                |          |
|----------------|----------|
| ECLASS 7.0     | 27270502 |
| ECLASS 8.0     | 27270502 |
| ECLASS 8.1     | 27270502 |
| ECLASS 9.0     | 27270502 |
| ECLASS 10.0    | 27270502 |
| ECLASS 11.0    | 27270502 |
| ECLASS 12.0    | 27270502 |
| ETIM 5.0       | EC001486 |
| ETIM 6.0       | EC001486 |
| ETIM 7.0       | EC001486 |
| ETIM 8.0       | EC001486 |
| UNSPSC 16.0901 | 41112113 |

Dimensional drawing (Dimensions in mm (inch))



PIN assignment

M12 male connector, 8-pin and cable, 8-wire, SSI/Gray

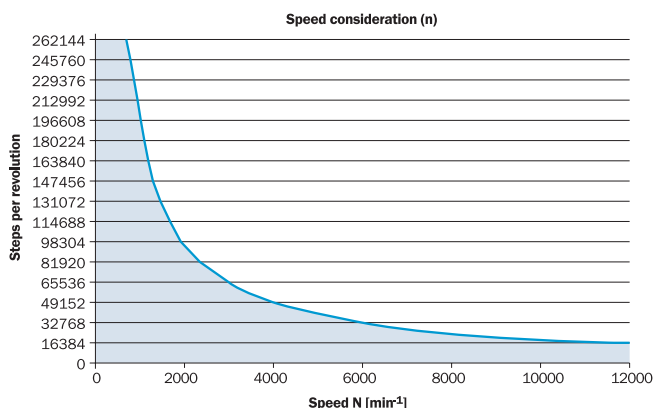


View of M12 male device connector on encoder

| PIN | Wire colors (cable connection) | Signal | Explanation       |
|-----|--------------------------------|--------|-------------------|
| 1   | Brown                          | Data - | Interface signals |
| 2   | White                          | Data + | Interface signals |

| PIN | Wire colors (cable connection) | Signal         | Explanation                                                                               |
|-----|--------------------------------|----------------|-------------------------------------------------------------------------------------------|
| 3   | Black                          | V/R            | Sequence in direction of rotation                                                         |
| 4   | Pink                           | SET            | Electronic adjustment<br>Interface signals                                                |
| 5   | Yellow                         | Clock +        | Interface signals                                                                         |
| 6   | Purple                         | Clock -        | Interface signals                                                                         |
| 7   | Blue                           | GND            | Ground connection                                                                         |
| 8   | Red                            | U <sub>S</sub> | Operating voltage                                                                         |
|     |                                | Screen         | Screen connected to housing on en-<br>coder side. Connected to ground on<br>control side. |

## Diagrams



The maximum speed is also dependent on the shaft type.

## Recommended accessories

Other models and accessories → [www.sick.com/AFS\\_AFM60\\_SSI](http://www.sick.com/AFS_AFM60_SSI)

|                                                                                     | Brief description                                                                                                                                                                                                                     | Type           | Part no. |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
| <b>Flanges</b>                                                                      |                                                                                                                                                                                                                                       |                |          |
|  | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum, Aluminum                                                                                          | BEF-FA-036-100 | 2029161  |
| <b>Other mounting accessories</b>                                                   |                                                                                                                                                                                                                                       |                |          |
|  | Servo clamps, large, for servo flange (clamps, eccentric fastener), 3 pcs, without mounting material, without mounting hardware                                                                                                       | BEF-WK-SF      | 2029166  |
| <b>Shaft adaptation</b>                                                             |                                                                                                                                                                                                                                       |                |          |
|  | Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular +/- 4°; max. speed 10,000 rpm, -30 °C to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub | KUP-0610-B     | 5312982  |

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                                                                                              | Type       | Part no. |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
|    | 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 +/- 2.5°; max. speed 12,000 rpm, -10° to +80 °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 $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °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 $\pm 0,3$ mm, axial $\pm 0,3$ mm, angular $\pm 3^\circ$ ; max. speed 10.000 rpm, -10° to +80 °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 $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °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 $\pm 0,3$ mm, axial $\pm 0,3$ mm, angular $\pm 3^\circ$ ; max. speed 10.000 rpm, -10° to +80 °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 +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °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 +/- 10°; max. speed 3,000 rpm, -30° to +80 °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 $\pm 0.3$ mm, axial $\pm 0.4$ 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 $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °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 $\pm 0.3$ mm, axial $\pm 0.2$ mm, angular $\pm 3^\circ$ ; speed 10,000 rpm, -10° to +80° Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub                                                                                                                                                        | KUP-1010-S | 2056408  |
|  | Spring coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial $\pm 1.5$ mm, axial $\pm 1.0$ mm, angular $\pm 5^\circ$ , max. speed 3,000 rpm, -30° to +120 °Celsius, nominal torque 150 Ncm, rotational angle at half nominal torque, direction of rotation right viewed on driving shaft 40°, left viewed on driving shaft 60°, material: spring steel 1.0600 nickel plated, zinc die cast hubs | KUP-1010-W | 5319914  |
|  | 10 mm / 12 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °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 +/- 10°; max. speed 3,000 rpm, -30° to +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange                                                                                                                                                                        | KUP-1012-D | 5326702  |

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type             | Part no. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|
|    | Claw coupling, shaft diameter 10 mm / 12 mm, damping element 80 shore blue, maximum shaft offset: radial $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. $10^\circ$ , $-30^\circ\text{C}$ to $+80^\circ\text{C}$ , max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane                                                                                                                                                                                                                              | KUP-1012-J       | 2128265  |
| Others                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |          |
|    | <ul style="list-style-type: none"> <li><b>Connection type head A:</b> Flying leads</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> SSI, Incremental, HIPERFACE®</li> <li><b>Cable:</b> 8-wire, PUR, halogen-free</li> <li><b>Description:</b> SSI, Incremental, HIPERFACE®, shielded</li> <li><b>Items supplied:</b> By the meter</li> </ul>                                                                                                                                                                                                                                                    | LTG-2308-MWENC   | 6027529  |
|    | <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>, <math>\varnothing</math> 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>, <math>\varnothing</math> 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>, <math>\varnothing</math> 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>, <math>\varnothing</math> 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</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 25 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>, <math>\varnothing</math> 7.0 mm</li> <li><b>Connection systems:</b> Flying leads</li> </ul>                                                              | DOL-1208-G25MAC1 | 6067859  |
|  | <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: <math>-40^\circ\text{C}</math> ... <math>+85^\circ\text{C}</math></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

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.

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**For us, that is “Sensor Intelligence.”**

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