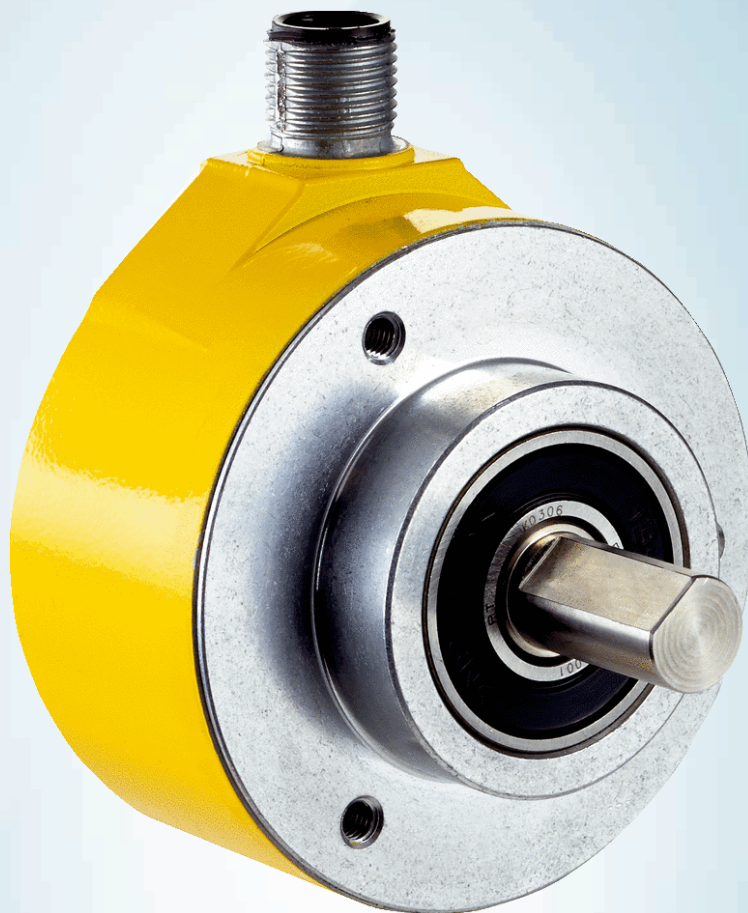




# DFS60S-S40C01024

DFS60S Pro

**SAFETY ENCODERS**

**SICK**  
Sensor Intelligence.

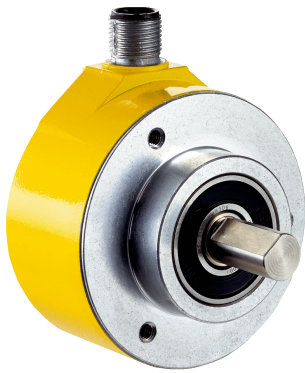


Illustration may differ



## Ordering information

| Type             | Part no. |
|------------------|----------|
| DFS60S-S40C01024 | 1069519  |

Other models and accessories → [www.sick.com/DFS60S\\_Pro](http://www.sick.com/DFS60S_Pro)

## Detailed technical data

## Safety-related parameters

|                                                                   |                                                    |
|-------------------------------------------------------------------|----------------------------------------------------|
| <b>Safety integrity level</b>                                     | SIL2 (IEC 61508), SILCL2 (IEC 62061) <sup>1)</sup> |
| <b>Performance level</b>                                          | PL d (EN ISO 13849) <sup>1)</sup>                  |
| <b>Category</b>                                                   | 3 (EN ISO 13849)                                   |
| <b>PFH<sub>D</sub>: Probability of dangerous failure per hour</b> | $1.7 \times 10^{-8}$ <sup>2)</sup>                 |
| <b>T<sub>M</sub> (mission time)</b>                               | 20 years (EN ISO 13849)                            |
| <b>Safety-related measuring step</b>                              | 0.09°, Quadrature analysis                         |
| <b>Safety-related accuracy</b>                                    | ± 0.09°                                            |

<sup>1)</sup> For more detailed information on the exact configuration of your machine/unit, please consult your relevant SICK branch office.<sup>2)</sup> The values displayed apply to a diagnostic degree of coverage of 99%, which must be achieved by the external drive system and 95 °C operating temperature.

## Performance

|                                           |                                                                                       |
|-------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Sine/cosine periods per revolution</b> | 1,024                                                                                 |
| <b>Measuring step</b>                     | 0.3°, For interpolation of the sine/cosine signals with, e. g., 12 bits <sup>1)</sup> |
| <b>Initialization time</b>                | 50 ms <sup>2)</sup>                                                                   |
| <b>Integral non-linearity</b>             | Typ. ± 45 Winkelsekunden (without mechanical tension of the stator coupling)          |
| <b>Differential non-linearity</b>         | ± 7 Winkelsekunden                                                                    |
| <b>Reference signal, number</b>           | 1                                                                                     |
| <b>Reference signal, position</b>         | 90°, electronically, gated with Sinus and Cosinus                                     |

<sup>1)</sup> Not safety-related.<sup>2)</sup> Valid signals can be read once this time has elapsed.

## Electrical data

|                                            |                                    |
|--------------------------------------------|------------------------------------|
| <b>Communication interface</b>             | Incremental                        |
| <b>Communication Interface detail</b>      | Sin/Cos <sup>1)</sup>              |
| <b>Connection type</b>                     | Male connector, M12, 8-pin, radial |
| <b>Supply voltage</b>                      | 4.5 V ... 32 V                     |
| <b>Maximum output frequency</b>            | ≤ 153.6 kHz                        |
| <b>Load resistance</b>                     | ≥ 120 Ω                            |
| <b>Power consumption max. without load</b> | ≤ 0.7 W                            |
| <b>Power consumption</b>                   | Without load                       |
| <b>Reverse polarity protection</b>         | ✓                                  |
| <b>Protection class</b>                    | III (according to DIN EN 61140)    |
| <b>Short-circuit protection</b>            | ✓ <sup>2)</sup>                    |

<sup>1)</sup> 1.0 V<sub>SS</sub> (differential).

<sup>2)</sup> Short-circuit to another channel or GND permitted for max. 30 s. In the case of U<sub>S</sub> ≤ 12 V additional short-circuit to U<sub>S</sub> permitted for max. 30 s.

## Mechanical data

|                                           |                                                 |
|-------------------------------------------|-------------------------------------------------|
| <b>Mechanical design</b>                  | Solid shaft, face mount flange                  |
| <b>Shaft diameter</b>                     | 10 mm                                           |
| <b>Shaft length</b>                       | 19 mm                                           |
| <b>Shaft material</b>                     | Stainless steel                                 |
| <b>Flange material</b>                    | Aluminum                                        |
| <b>Housing material</b>                   | Aluminum die cast                               |
| <b>Weight</b>                             | Approx. 0.3 kg <sup>1)</sup>                    |
| <b>Start up torque</b>                    | ≤ 0.5 Ncm (at 20 °C)                            |
| <b>Operating torque</b>                   | ≤ 0.3 Ncm (at 20 °C)                            |
| <b>Permissible Load capacity of shaft</b> | 80 N (radial)<br>40 N (axial)                   |
| <b>Max. angular acceleration</b>          | ≤ 500,000 rad/s <sup>2</sup>                    |
| <b>Operating speed</b>                    | 9,000 min <sup>-1</sup> <sup>2)</sup>           |
| <b>Moment of inertia of the rotor</b>     | 8 gcm <sup>2</sup>                              |
| <b>Bearing lifetime</b>                   | 3.6 x 10 <sup>9</sup> revolutions <sup>3)</sup> |

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

<sup>2)</sup> Allow for self-heating of approx. 3.0 K per 1,000 rpm regarding the permissible operating temperature.

<sup>3)</sup> On maximum operating speed and temperature.

## Ambient data

|                                      |                                                           |
|--------------------------------------|-----------------------------------------------------------|
| <b>EMC</b>                           | According to EN 61000-6-2, EN 61000-6-3 and IEC 61326-3-1 |
| <b>Enclosure rating</b>              | IP65 (according to IEC 60529) <sup>1)</sup>               |
| <b>Permissible relative humidity</b> | 90 %, Condensation not permitted                          |
| <b>Operating temperature range</b>   | -30 °C ... +95 °C <sup>2)</sup>                           |

<sup>1)</sup> With male connector and mating connector fitted minimum IP65.

<sup>2)</sup> At operating temperature measuring point.

<sup>3)</sup> Checked during operation using vector length monitoring.

<sup>4)</sup> Checked to operation with vector length monitoring. Including mating connector.

|                                                    |                                                        |
|----------------------------------------------------|--------------------------------------------------------|
| <b>Storage temperature range</b>                   | -30 °C ... +90 °C, without package                     |
| <b>Resistance to shocks</b>                        | 100 g, 6 ms (according to EN 60068-2-27) <sup>3)</sup> |
| <b>Frequency range of resistance to vibrations</b> | 30 g, 10 Hz ... 1,000 Hz (EN 60068-2-6) <sup>4)</sup>  |

<sup>1)</sup> With male connector and mating connector fitted minimum IP65.

<sup>2)</sup> At operating temperature measuring point.

<sup>3)</sup> Checked during operation using vector length monitoring.

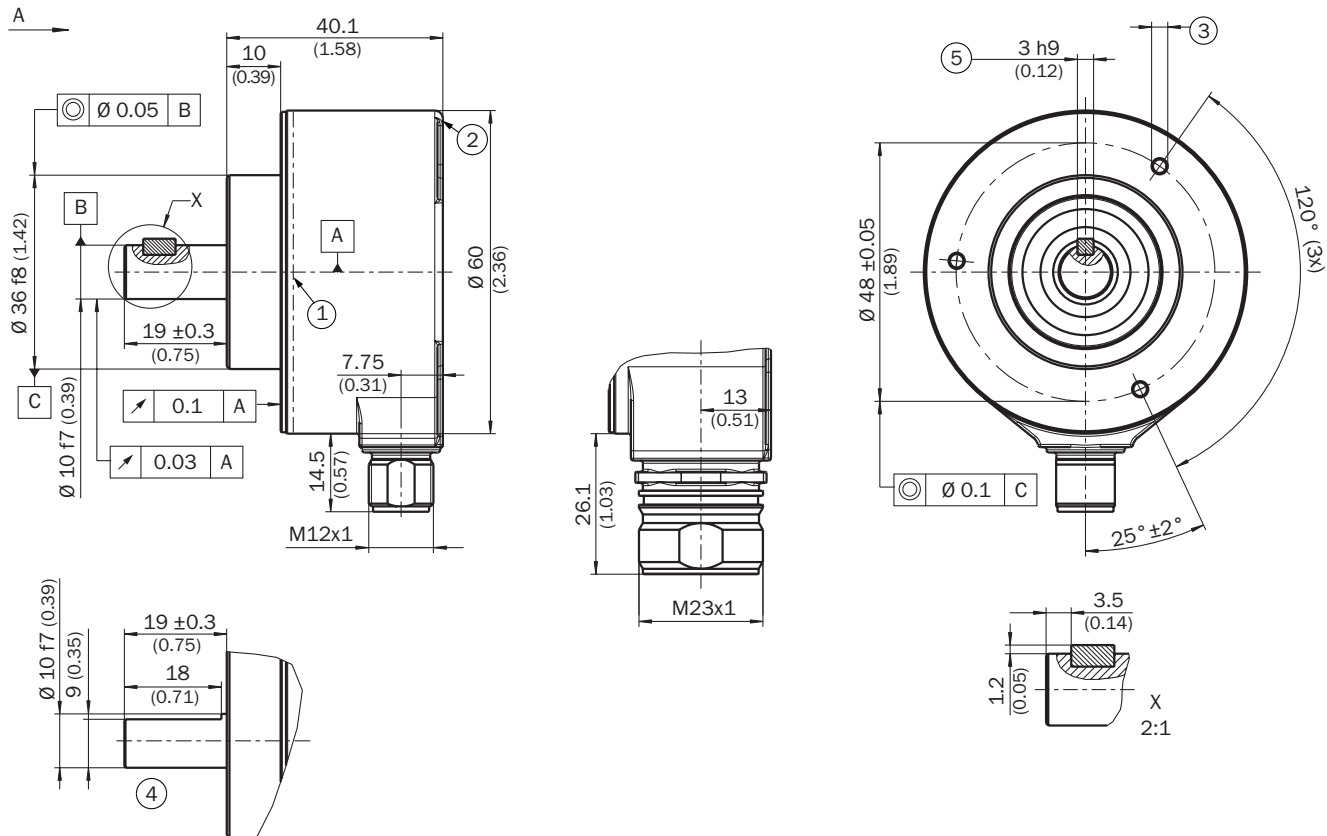
<sup>4)</sup> Checked to operation with vector length monitoring. Including mating connector.

## Classifications

|                       |          |
|-----------------------|----------|
| <b>ECl@ss 5.0</b>     | 27272501 |
| <b>ECl@ss 5.1.4</b>   | 27272501 |
| <b>ECl@ss 6.0</b>     | 27272590 |
| <b>ECl@ss 6.2</b>     | 27272590 |
| <b>ECl@ss 7.0</b>     | 27272590 |
| <b>ECl@ss 8.0</b>     | 27272590 |
| <b>ECl@ss 8.1</b>     | 27272590 |
| <b>ECl@ss 9.0</b>     | 27272590 |
| <b>ECl@ss 10.0</b>    | 27272501 |
| <b>ECl@ss 11.0</b>    | 27272501 |
| <b>ETIM 5.0</b>       | EC001486 |
| <b>ETIM 6.0</b>       | EC001486 |
| <b>ETIM 7.0</b>       | EC001486 |
| <b>UNSPSC 16.0901</b> | 41112113 |

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

Solid shaft, face mount flange, radial male connector M12 and M23

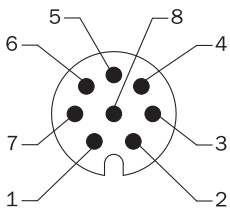


General tolerances according to DIN ISO 2768-mk

- ① Operating temperature measuring point (freely selectable, around the housing surface area in each case, approx. 3 mm away from flange)
- ② Measuring point vibration (respectively at the housing face. approx. 3 mm away from the cover edge)
- ③ M3 / M4 (3x) (6 mm deep)
- ④ Shaft with flat
- ⑤ Square key, DIN 6885-A 3x3x6

## PIN assignment

View of the M12 male connector plug-in face



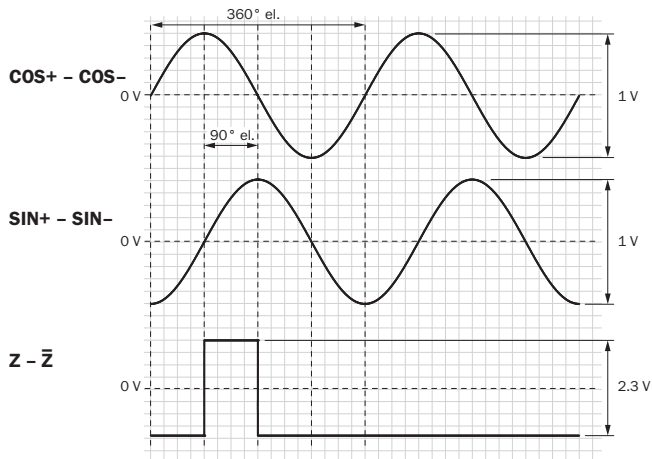
| Connection type | + U <sub>S</sub> | Zulässige Leitungslänge bei maximaler Ausgangsfrequenz in Abhängigkeit der Versorgungsspannung <sup>1)</sup> |
|-----------------|------------------|--------------------------------------------------------------------------------------------------------------|
| Male connector  | 4,5 V ... 5,0 V  | 50 m                                                                                                         |
|                 | 5,0 V ... 7,0 V  | 100 m                                                                                                        |
|                 | 7,0 V ... 30 V   | 150 m                                                                                                        |

| Connection type | + U <sub>S</sub> | Zulässige Leitungslänge bei maximaler Ausgangsfrequenz in Abhängigkeit der Versorgungsspannung <sup>1)</sup> |
|-----------------|------------------|--------------------------------------------------------------------------------------------------------------|
| Cable           | 4,5 V ... 5,0 V  | 50 m - (4 x Leitungslänge Encoder)                                                                           |
|                 | 5,0 V ... 7,0 V  | 100 m - (4 x Leitungslänge Encoder)                                                                          |
|                 | 7,0 V ... 30 V   | 150 m - (4 x Leitungslänge Encoder)                                                                          |

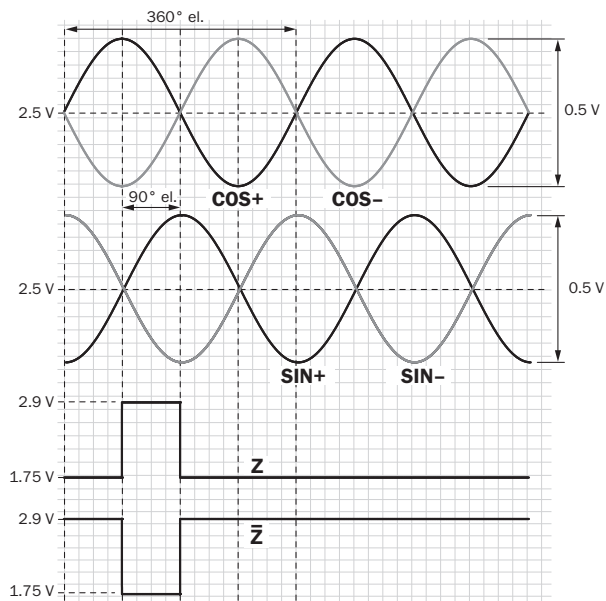
<sup>1)</sup> Datenleitung 4 x 2 x 0,25 mm<sup>2</sup> + 2 x 0,5 mm<sup>2</sup> + 1 x 0,14 mm<sup>2</sup> mit Abschirmung (für US, GND 2 x 0,5 mm<sup>2</sup>), Art.Nr. 6027530

## Diagrams

Signal SIN/COS after differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)  
Signal SIN/COS before differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)

## Recommended accessories

Other models and accessories → [www.sick.com/DFS60S\\_Pro](http://www.sick.com/DFS60S_Pro)

|                                                                                     | Brief description                                                                                                                                                                                                                                                                                                                               | Type              | Part no. |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|
| Flanges                                                                             |                                                                                                                                                                                                                                                                                                                                                 |                   |          |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10                                                                                                                                                | BEF-FA-036-050    | 2029160  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 8, Aluminum, including 3 countersunk screws M4 x 8                                                                                                                                         | BEF-FA-036-060REC | 2029162  |
|    | 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  |
|    | Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10                                                                                                                                       | BEF-FA-036-063REC | 2034225  |
|    | 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  |
| Shaft adaptation                                                                    |                                                                                                                                                                                                                                                                                                                                                 |                   |          |
|    | Bellows coupling, shaft diameter 6 mm / 10 mm, bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. speed 10,000 rpm, $-30^\circ\text{C} \dots +120^\circ\text{C}$ , max. torque 80 Ncm; material: stainless steel bellows, fixed with two setscrews each | KUP-0610-BS       | 2075377  |
|                                                                                     | Bellows coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. speed 10,000 rpm, $-30^\circ \dots +120^\circ\text{C}$ , max. torque 80 Ncm; material: stainless steel bellows, fixed with two setscrews each                                                      | KUP-1010-BS       | 2075376  |
| Plug connectors and cables                                                          |                                                                                                                                                                                                                                                                                                                                                 |                   |          |
|  | Head A: cable<br>Head B: Flying leads<br>Cable: SSI, Incremental, HIPERFACE®, PUR, halogen-free, shielded                                                                                                                                                                                                                                       | LTG-2308-MWENC    | 6027529  |
|  | Head A: cable<br>Head B: Flying leads<br>Cable: SSI, Incremental, PUR, shielded                                                                                                                                                                                                                                                                 | LTG-2411-MW       | 6027530  |
|  | Head A: cable<br>Head B: Flying leads<br>Cable: SSI, Incremental, PUR, halogen-free, shielded                                                                                                                                                                                                                                                   | LTG-2512-MW       | 6027531  |
|  | Head A: cable<br>Head B: Flying leads<br>Cable: SSI, TTL, HTL, Incremental, PUR, halogen-free, shielded                                                                                                                                                                                                                                         | LTG-2612-MW       | 6028516  |
|  | Head A: female connector, M12, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 2 m                                                                                                                                                                                                             | DOL-1208-G02MAC1  | 6032866  |
|                                                                                     | Head A: female connector, M12, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 5 m                                                                                                                                                                                                             | DOL-1208-G05MAC1  | 6032867  |
|                                                                                     | Head A: female connector, M12, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 10 m                                                                                                                                                                                                            | DOL-1208-G10MAC1  | 6032868  |
|                                                                                     | Head A: female connector, M12, 8-pin, straight<br>Head B: Flying leads<br>Cable: Incremental, SSI, PUR, halogen-free, shielded, 20 m                                                                                                                                                                                                            | DOL-1208-G20MAC1  | 6032869  |

|                                                                                   | Brief description                                                                                                                                                              | Type               | Part no. |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|
|  | Head A: female connector, M12, 8-pin, straight, A-coded<br>Head B: male connector, M12, 8-pin, straight, A-coded<br>Cable: PUR, halogen-free, shielded, 2 m<br>Drag chain use  | YF2AA8-020S01MKA18 | 2099207  |
|                                                                                   | Head A: female connector, M12, 8-pin, straight, A-coded<br>Head B: male connector, M12, 8-pin, straight, A-coded<br>Cable: PUR, halogen-free, shielded, 5 m<br>Drag chain use  | YF2AA8-050S01MKA18 | 2099209  |
|                                                                                   | Head A: female connector, M12, 8-pin, straight, A-coded<br>Head B: male connector, M12, 8-pin, straight, A-coded<br>Cable: PUR, halogen-free, shielded, 10 m<br>Drag chain use | YF2AA8-100S01MKA18 | 2099210  |
|                                                                                   | Head A: female connector, M12, 8-pin, straight, A-coded<br>Head B: male connector, M12, 8-pin, straight, A-coded<br>Cable: PUR, halogen-free, shielded, 20 m<br>Drag chain use | YF2AA8-200S01MKA18 | 2099208  |
|  | Head A: female connector, M12, 8-pin, straight, A-coded<br>Head B: -<br>Cable: Incremental, SSI, shielded                                                                      | DOS-1208-GA01      | 6045001  |
|  | Head A: male connector, M12, 8-pin, straight, A-coded<br>Head B: -<br>Cable: Incremental, shielded                                                                             | STE-1208-GA01      | 6044892  |

## 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](http://www.sick.com)