



# MAX48N-12V10AC1000

MAX®

LINEAR ENCODERS

**SICK**  
Sensor Intelligence.



Illustration may differ

### Ordering information

| Type               | Part no. |
|--------------------|----------|
| MAX48N-12V10AC1000 | 1219933  |

Accessories not included with delivery, please order separately.

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



### Detailed technical data

#### Features

|                |                                                                  |
|----------------|------------------------------------------------------------------|
| Items supplied | Accessories not included with delivery, please order separately. |
|----------------|------------------------------------------------------------------|

#### Performance

|                                       |                                                                                                                         |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Type                                  | 48 mm installation housing – IN cylinder mounting                                                                       |
| Cable connection                      | Radial                                                                                                                  |
| Pressure pipe/End cap                 | Flat/M6 threaded stud                                                                                                   |
| Measured values                       | Positioning                                                                                                             |
| Measuring range                       |                                                                                                                         |
| Position (F.S.)                       | 0 mm ... 1,000 mm <sup>1)</sup>                                                                                         |
| Unusable range                        |                                                                                                                         |
| Null zone                             | 30 mm                                                                                                                   |
| Damping zone                          | 30 mm                                                                                                                   |
| Switch-on time                        | < 250 ms                                                                                                                |
| Measuring frequency (internal)        | 2 ms                                                                                                                    |
| Transmission rate (cycle time)        | Steady signal                                                                                                           |
| Setpoint tolerance                    |                                                                                                                         |
| Zero point and F.S.                   | ≤ ± 1 mm                                                                                                                |
| Resolution                            | Typ. 0.1 mm (noise-free)                                                                                                |
| Hysteresis                            | ± 0,1 mm                                                                                                                |
| Repeatability                         | Typ. ± 0.2 mm                                                                                                           |
| Linearity (in the operational status) | Typ. ± 0.25 mm (measuring range 50 to 500 mm) <sup>2)</sup><br>Typ. ± 0.04% F.S. (measuring range from 500 to 2,500 mm) |
| Temperature drift                     |                                                                                                                         |
| Warming up phase                      | Typ. ≤ ± 0.25 mm (2 min)                                                                                                |
| In the operational status             | Typ. ≤ ± 0.005% x F.S. x ΔT (ΔT 40 °C) <sup>3)</sup>                                                                    |

<sup>1)</sup> F.S. = Full Scale (Measuring range).

<sup>2)</sup> Hydraulic oil at operating temperature.

<sup>3)</sup> 40 °C increase in oil temperature during operation.

<sup>4)</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 of electronic 60 °C, frequency of use 8760 h/a.

<sup>5)</sup> Every second failure of an electronic component is regarded as a dangerous failure.

|              |                                            |
|--------------|--------------------------------------------|
| <b>MTTFd</b> | 69 years (EN ISO 13849-1) <sup>4) 5)</sup> |
|--------------|--------------------------------------------|

<sup>1)</sup> F.S. = Full Scale (Measuring range).

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## Interfaces

|                                       |                       |
|---------------------------------------|-----------------------|
| <b>Communication interface</b>        | Analog                |
| <b>Communication Interface detail</b> | Voltage               |
| <b>Voltage output</b>                 | 0.5 V DC ... 4.5 V DC |

## Electrical data

|                                    |                                                                                    |
|------------------------------------|------------------------------------------------------------------------------------|
| <b>Connection type</b>             | Male connector, M12 type S (20x20 mm), 4-pin                                       |
| <b>PIN assignment</b>              | 1=V DC; 2=n.c.; 3=GND; 4=SIG                                                       |
| <b>Supply voltage</b>              | 24 V DC (8 ... 32 V DC)                                                            |
| <b>Residual ripple</b>             | < 1% S-S                                                                           |
| <b>Power consumption</b>           | ≤ 0.75 W                                                                           |
| <b>Current consumption</b>         | ≤ 30 mA                                                                            |
| <b>Load resistance</b>             | Voltage signal<br>RL ≥ 10 kΩ                                                       |
| <b>Switch-on current</b>           |                                                                                    |
| <b>Over voltage protection</b>     | ≤ 36 V at all poles during power-up (60 s)<br>≤ 48 V To GND during power-up (60 s) |
| <b>Reverse polarity protection</b> | ≤ 36 V (at all poles) (ISO 16750-2)                                                |
| <b>Insulation resistance</b>       | Riso ≥ 10 MΩ, 60 s (ISO 16750-2)                                                   |
| <b>Dielectric strength</b>         | 500 V DC, 0 V against housing (ISO 16750-2)                                        |

## Mechanical data

|                   |                    |                                                                      |
|-------------------|--------------------|----------------------------------------------------------------------|
| <b>Dimensions</b> |                    |                                                                      |
|                   | Housing            | 48 mm, 48f7 for IN cylinder mounting – cylinder bore hole 48H8       |
|                   | Ø pressure pipe    | 10 mm                                                                |
|                   | Ø O-ring           | 40.87 mm x 3.53 mm                                                   |
|                   | Ø support ring     | 42.6 mm x 48 mm x 1.4 mm                                             |
|                   | M12 flange         | M12 flange type S: DM 20x20 mm - hole pattern 14 mm (EN 61076-2-101) |
|                   | Wire length        | 80 mm                                                                |
| <b>Material</b>   |                    |                                                                      |
|                   | Housing            | Stainless steel 1.4305, AISI 303                                     |
|                   | Pressure pipe      | Stainless steel 1.4404, AISI 316L                                    |
|                   | Housing cover      | Plastic                                                              |
|                   | O-ring             | NBR 70                                                               |
|                   | Support ring       | PTFE                                                                 |
|                   | M12 male connector | Glass fiber reinforced polyamide, nickel-/gold-plated brass contacts |
|                   | M12 flange         | Nickel-plated brass with O-ring (NBR)                                |
|                   | Strands            | PVC                                                                  |

## Ambient data

|                                                                          |                                                                                                                                                                                                |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EMC</b>                                                               | EU Directive 2014/30 / EU CE marking                                                                                                                                                           |
| <b>Generic standards</b>                                                 | According to EN 61000-6-2:2005 and EN 61000-6-3:2007                                                                                                                                           |
| <b>Agricultural and forestry machinery<br/>Construction machinery</b>    | EN ISO 14982:2009 / EN 13309:2010 / EN ISO 13766-1:2018                                                                                                                                        |
| <b>Transient pulses</b>                                                  | ISO 7637-2                                                                                                                                                                                     |
| <b>ESD (air and contact discharge)</b>                                   | EN 61000-4-2<br>ISO/TR 10605                                                                                                                                                                   |
| <b>Enclosure rating</b>                                                  |                                                                                                                                                                                                |
| Housing with connecting cable                                            | IP67 (EN 60529)                                                                                                                                                                                |
| M12 male connector                                                       | IP69k (ISO 20653) <sup>1)</sup>                                                                                                                                                                |
| <b>Temperature</b>                                                       |                                                                                                                                                                                                |
| Operating temperature range (electronics)                                | -40 °C ... +105 °C <sup>2)</sup>                                                                                                                                                               |
| Ambient temperature (fluid)                                              | -30 °C ... +95 °C <sup>3)</sup>                                                                                                                                                                |
| Storage temperature range                                                | -20 °C ... +65 °C <sup>4) 5)</sup>                                                                                                                                                             |
| <b>Permissible relative humidity</b>                                     | 90 % (Condensation not permitted)                                                                                                                                                              |
| <b>Resistance to shocks</b>                                              | Drop test in acc. with IEC 60068-2-31<br>100 g, 11 ms (Single shock in acc. with IEC 60068-2-27)<br>50 g, 11 ms (Continuous shocks, 1,000 shocks per spatial axis in acc. with IEC 60068-2-27) |
| <b>Resistance to vibration</b>                                           |                                                                                                                                                                                                |
| Sine                                                                     | 20 g, 24 h / spatial axis, 55 ... 2.000 Hz (IEC 60068-2-6)                                                                                                                                     |
| Sine over noise                                                          | 18 g (r.m.s), 36 h / spatial axis, 10 ... 2.000 Hz (IEC 60068-2-80)                                                                                                                            |
| Broadband noise (resonance peaks removed)                                | 20 g (r.m.s), 48 h / spatial axis, 10 ... 2.000 Hz (IEC 60068-2-64)                                                                                                                            |
| <b>Nominal operating pressure (P<sub>N</sub>)</b>                        | 400 bar                                                                                                                                                                                        |
| <b>Max. overload pressure during operation<br/>(P<sub>N</sub> x 1.2)</b> | 480 bar                                                                                                                                                                                        |
| <b>Max. test pressure in cylinder (P<sub>N</sub> x 1.5)</b>              | 600 bar                                                                                                                                                                                        |
| <b>Note</b>                                                              | For details of applied tests and descriptive standards, please see document 8021473                                                                                                            |

<sup>1)</sup> With suitable coupling (sealing through O-ring in M12 coupling nut).

<sup>2)</sup> Taking into account self-heating, generated through constant electrical operation with supply voltage.

<sup>3)</sup> Caused by the permitted temperature range of the O-ring seal, the hydraulic oil and the temperature-dependent signal quality of the position magnet.

<sup>4)</sup> Relative humidity 55 %.

<sup>5)</sup> Caused by dry storage of the O-ring in uninstalled state (no coating with oil).

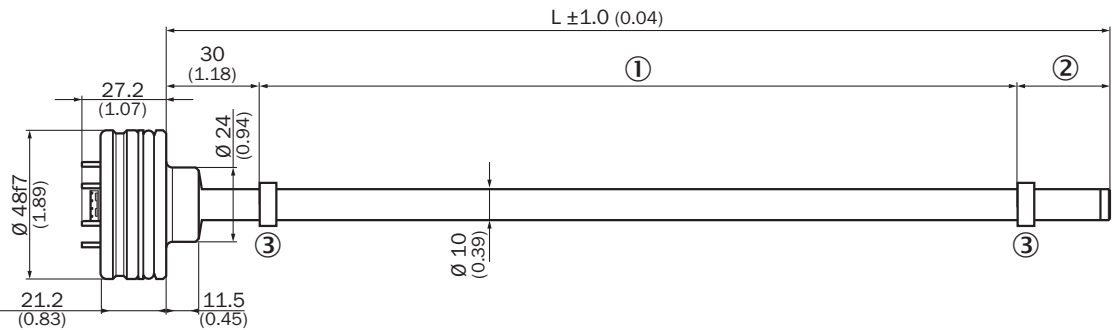
## Classifications

|                     |          |
|---------------------|----------|
| <b>ECl@ss 5.0</b>   | 27270705 |
| <b>ECl@ss 5.1.4</b> | 27270705 |
| <b>ECl@ss 6.0</b>   | 27270705 |
| <b>ECl@ss 6.2</b>   | 27270705 |
| <b>ECl@ss 7.0</b>   | 27270705 |
| <b>ECl@ss 8.0</b>   | 27270705 |
| <b>ECl@ss 8.1</b>   | 27270705 |
| <b>ECl@ss 9.0</b>   | 27270705 |
| <b>ECl@ss 10.0</b>  | 27270705 |
| <b>ECl@ss 11.0</b>  | 27270705 |

|                |          |
|----------------|----------|
| ETIM 5.0       | EC002544 |
| ETIM 6.0       | EC002544 |
| ETIM 7.0       | EC002544 |
| ETIM 8.0       | EC002544 |
| UNSPSC 16.0901 | 41111613 |

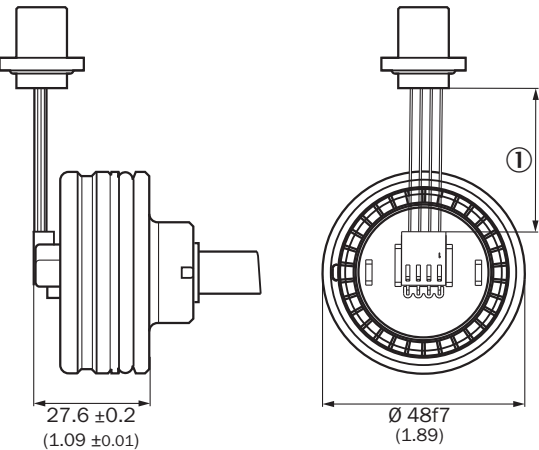
Dimensional drawing (Dimensions in mm (inch))

MAX48



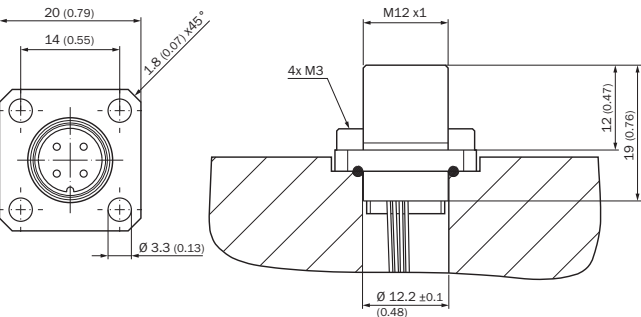
- ① Measuring range
- ② Damping zone
- ③ Position magnet

Male connector M12

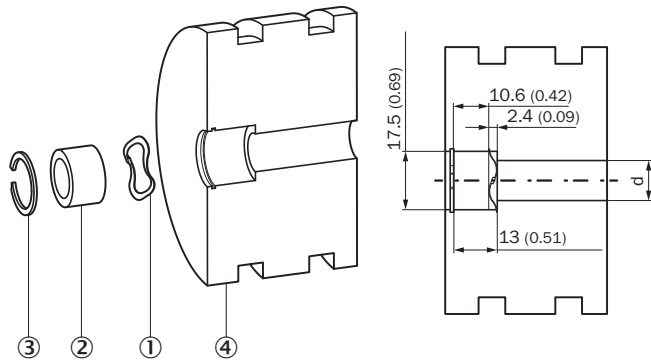


- ① Wire length (according to type code)

M12 connector type S/ flange - axial seal

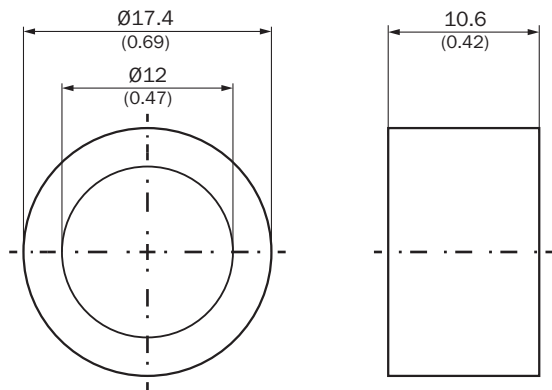


### Installation of position magnet

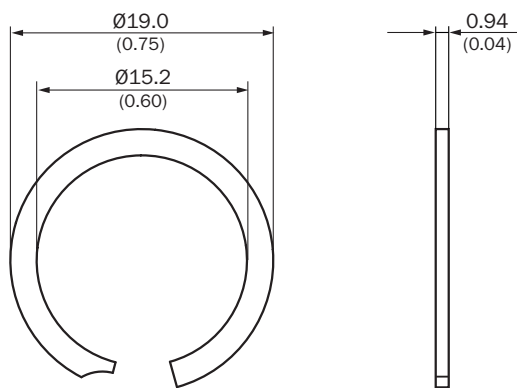


- ① Corrugated spring washer
- ② Position magnet
- ③ Circlip
- ④ Piston

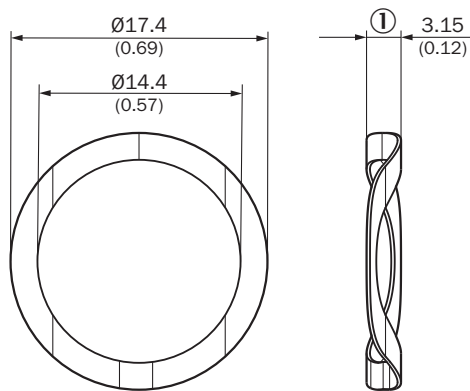
### Position magnet



### Circlip



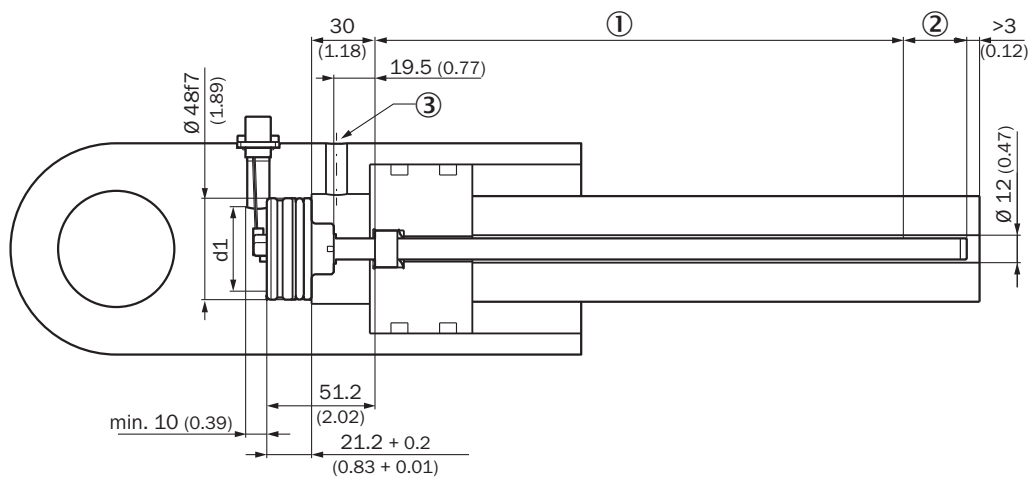
## Corrugated spring washer



① Free height

## Attachment specifications

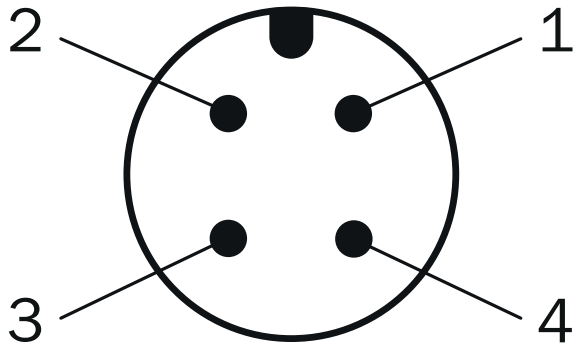
### Installation space for cylinders



Please note the information in the operating instructions ( $d: 32 \leq d1 \leq 40$ ).

- ① Measuring range
- ② Damping zone
- ③ Hydraulic port

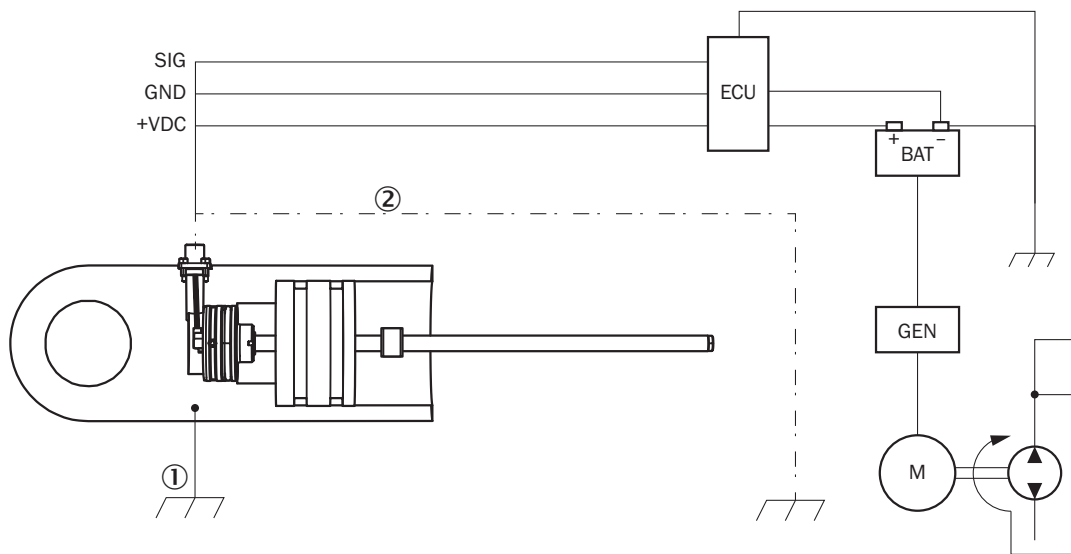
## PIN assignment



### PIN assignment A (type S)

- ① V DC
- ② N.C.
- ③ GND
- ④ Signal

## Connection diagram



### Connection diagram

- ① Chassis GND
- ② Cable shielding (optional)

## Recommended accessories

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

|                                                                                                                                                                              | Brief description                                                                                                                                 | Type           | Part no. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|
| Magnets                                                                                                                                                                      |                                                                                                                                                   |                |          |
|                                                                                             | Position magnet for magnetostrictive linear encoder, Ø 17.4 mm, max. axial surface pressure 40 N/mm², temperature range –30 °C ... +95 °C         | MAG-O-174-01   | 2112714  |
|                                                                                                                                                                              |                                                                                                                                                   | MAG-O-174-05   | 2112713  |
|                                                                                                                                                                              |                                                                                                                                                   | MAG-O-174-10   | 2115045  |
|                                                                                                                                                                              |                                                                                                                                                   | MAG-O-174-50   | 2112711  |
| Flanges                                                                                                                                                                      |                                                                                                                                                   |                |          |
|                                                                                             | 1 piece, Flange for M12 male connector, type S square flange (20 mm x 20 mm) with axial seal, 1 piece, nickel-plated brass                        | BEF-FA-M12S-01 | 2117507  |
|                                                                                                                                                                              | 5 pieces, Flange for M12 male connector, type S square flange (20 mm x 20 mm) with axial seal, 5 pieces, nickel-plated brass                      | BEF-FA-M12S-05 | 2117508  |
|                                                                                                                                                                              | 10 pieces, Flange for M12 male connector, type S square flange (20 mm x 20 mm) with axial seal, 10 pieces, nickel-plated brass                    | BEF-FA-M12S-10 | 2117509  |
| Other mounting accessories                                                                                                                                                   |                                                                                                                                                   |                |          |
| <br><br> | 1 piece, Circlip for installing the position magnets in the piston of the hydraulic cylinder, Stainless steel 1.4319                              | BEF-MK-SR-01   | 2116437  |
|                                                                                                                                                                              | 5 pieces, Circlip for installing the position magnets in the piston of the hydraulic cylinder, Stainless steel 1.4319                             | BEF-MK-SR-05   | 2116438  |
|                                                                                                                                                                              | 10 pieces, Circlip for installing the position magnets in the piston of the hydraulic cylinder, Stainless steel 1.4319                            | BEF-MK-SR-10   | 2116439  |
|                                                                                                                                                                              | 50 pieces, Circlip for installing the position magnets in the piston of the hydraulic cylinder, Stainless steel 1.4319                            | BEF-MK-SR-50   | 2116440  |
|                                                                                                                                                                              | 1 piece, Corrugated spring washer for installing the position magnets in the piston of the hydraulic cylinder, 1.4568 (17-7 PH Condition CH900)   | BEF-MK-WF-01   | 2116431  |
|                                                                                                                                                                              | 5 pieces, Corrugated spring washer for installing the position magnets in the piston of the hydraulic cylinder, 1.4568 (17-7 PH Condition CH900)  | BEF-MK-WF-05   | 2116432  |
|                                                                                                                                                                              | 10 pieces, Corrugated spring washer for installing the position magnets in the piston of the hydraulic cylinder, 1.4568 (17-7 PH Condition CH900) | BEF-MK-WF-10   | 2116433  |
|                                                                                                                                                                              | 50 pieces, Corrugated spring washer for installing the position magnets in the piston of the hydraulic cylinder, 1.4568 (17-7 PH Condition CH900) | BEF-MK-WF-50   | 2116435  |

## 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)