TR10 Lock

TRIED-AND-TESTED SAFETY WITH ADVANCED FEATURES – SAFETY LOCKING DEVICE WITH RFID MONITORING

Safety switches

SICK

Sensor Intelligence.

A SAFETY LOCKING DEVICE
WHICH LIVES UP TO WHAT IT PROMISES

TR10 Lock is a safety locking device for personal and process protection which ensures secure interlocking of movable physical guards such as doors, flaps and hoods. With the high safety level (performance level PL e and safety integrity level SIL3), the safety locking device reliably prevents access to or interference in a hazardous area. Equipped with a bistable solenoid, the TR10 Lock works with very low power consumption, regardless of whether the safety locking device is locked or unlocked.

The TR10 Lock safety locking device unites the best properties of the proven technologies: the security of non-contact RFID transponder technology and of monitored semiconductor outputs (OSSDs) as well as the reliability of mechanical locking.

Safe

- Performance level PL e for door and lock monitoring, also in series connection
- Monitored semiconductor outputs (OSSDs) detect errors
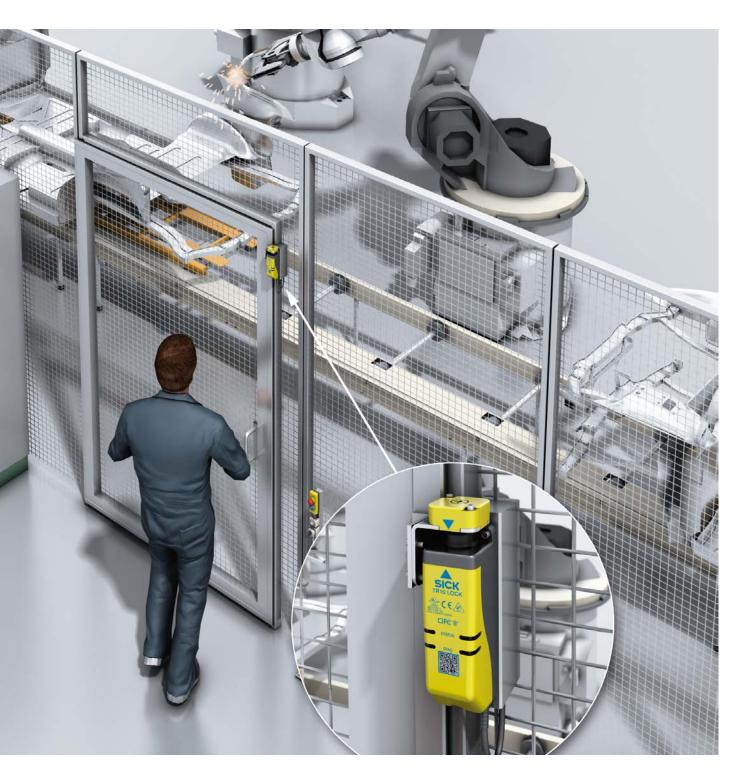- Unique and universally coded versions

Flexible

- Four approach directions of the actuator
- Power to lock and power to release variants

Robust

- IP 67 and IP 69K
- Locking force of 1,690 N

SIMPLY CLEVER – NON-CONTACT RELIABILITY

Due to the use of modern RFID technology, the functionality of the TR10 Lock is simple as it is clever. Thanks to its bistable solenoid, the safety locking device is low on power consumption – but definitely not on positive attributes.

Functionality

The TR10 Lock consists of a non-contact actuated safety switch and a coded actuator. If the actuator moves into the response range of the safety switch when closing the movable guard, the code of the actuator is read out and verified via RFID. If the code is valid, the locking bolt is extended and the protective device is reliably locked with a maximum locking force of 1,690 N. When locking is successful, the two safe semiconductor outputs (OSSDs) are switched – that's it.

But the TR10 Lock does not stop there. The safety locking device also continuously monitors whether the locking bolt is properly inserted in the actuator. Together with the self-monitoring semiconductor outputs (OSSDs), which reliably detect any occurring errors such as short-circuits and cross-circuits, it ensures the highest performance level PL e (EN ISO 13849) for door and lock monitoring.

The movable physical guard is open, the semiconductor outputs (OSSDs) are switched off.

The movable physical guard is locked with a maximum locking force of 1,690 N, the semiconductor outputs (OSSDs) are switched on.
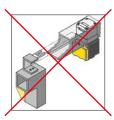
Conformity in accordance with EN ISO 14119

Every attempt to manipulate or bypass installed protective device creates a critical situation. In order to satisfy the requirements on protection against manipulation, SICK offers the TR10 Lock safety locking device in product variants with a low (universally coded) or high (unique coded) coding level. "Universally coded" accepts all universally coded actuators, while the "unique coded" variant only accepts previously taught-in actuators.

The unique coded variant of the TR10 Lock thereby saves on additional measures for protection against manipulation during mounting and still fulfills the requirements of standard EN ISO 14119.

EN ISO 14119

The table and graph show that with the unique coded variant of the TR10 Lock (type 4, high coding level), measures and elaborate modifications to the machine structure for protection against manipulation are a thing of the past.

Principles and measures	Type 2 and type 4	
	with low coding level	with high coding level
Mounting out of reach		
Physical obstruction, shielding		
Mounting in hidden position		
Status monitoring or cyclic testing		
Additional interlocking device and checking for plausibility		
Non-detachable fixing of actuator		

▢ = No measures required.
▢ = Mandatory measure.
▢ = Mandatory to apply at least one of these measures.
▢ = Recommended measure.

Type 2: locking device with mechanically actuated position switch with coded actuator.
Type 4: locking device with non-contact actuated position switch with coded actuator.

Excerpt from Table 3 from EN ISO 14119, modified. Additional measures against defeating interlocking devices.

FLEXIBLE, ROBUST, EFFICIENT

The TR10 Lock is not only reliable, but also offers many other benefits which make the choice for this safety locking device simple.

High level of flexibility when mounting

The TR10 Lock can be easily integrated into the machine structure. Thanks to its flat housing design and the option of four different approach directions of actuator, mounting is extremely flexible.

▸ **Flexible adaptation to different installation situations**

Very robust due to IP 69K

The TR10 Lock withstands high stresses in heavily contaminated environments. On the other hand, the safety locking device with its rugged IP 69K housing and other device parts (locking bolt, plug connector, actuator bracket) made of stainless steel is also optimally suited for use in applications with stringent hygienic requirements.
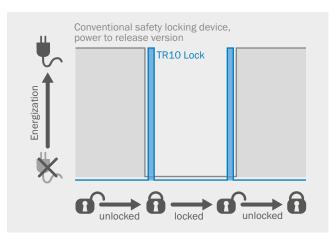
▸ **Reliable functionality and long service life**

Excellent energy efficiency thanks to bistable solenoid

The TR10 Lock locking bolt is actuated by a bistable solenoid. The power supply only slightly increases when the locking pin changes states (from unlocked to locked and vice versa). The safety locking device therefore not only consumes very little power, but also generates very little heat. Depending on the variant, the function of the safety locking device is implemented by the electronics according to power to release or power to lock principle.

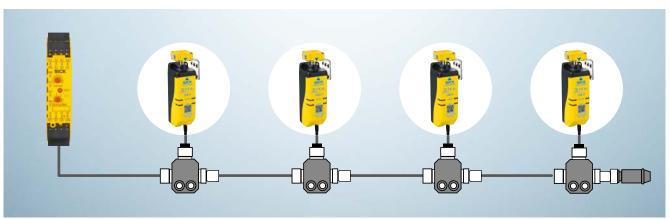▸ **Low power consumption and low heat dissipation**

Energization with change of state from "unlocked" to "locked".

Series connection without reduction in safety

With T-connectors, the TR10 Lock can be connected in series quickly, easily and independently of control units. And all this without losing out on safety (PL e/SIL3), since the OSSD semi-conductor outputs reliably detect any possible errors. Sensors can be easily diagnosed via highly visible LEDs. As an alternative, safe series connection with the same safety level is possible via Flexi Loop. Different sensors can be cascaded in this solution. In addition, the Flexi Soft evaluation unit allows for detailed diagnostics (which device switched and why). In addition to a standard 3 m or 10 m cable, a Flexi Loop-compatible M12 plug connector is available for connection.

▶ **Maintenance of performance level e, also with safe series connection**

Safe series connection with T-connectors: the economic solution with easy diagnostic options via the LEDs on the sensors. Only sensors of the same type can be connected in series.

Safe series connection with Flexi Loop: up to 32 different sensors can be connected in series. Detailed diagnostics is possible using the Flexi Soft evaluation unit.

TRIED-AND-TESTED SAFETY WITH ADVANCED FEATURES – SAFETY LOCKING DEVICE WITH RFID MONITORING

Product description

The TR10 Lock safety locking device combines the best features of tried-and-tested technology: outstanding manipulation-proofing for the RFID technology that monitors the actuator, plus a high-strength, highly reliable mechanical locking mechanism. The sensor's self-monitoring semiconductor outputs (OSSDs) can be cascaded and, thanks to a PL e performance level (EN ISO 13849), ensure maximum safety – for both door monitoring and locking monitoring. Two codings are available, affording applications more flexibility. The universally coded sensors accept all suitable actuators, while uniquely coded sensors only allow actuators that have previously been taught in. The bistable solenoid coil consumes only a small amount of power and produces no heat when the system is either locked or unlocked.

At a glance

- PL e for door and locking monitoring (EN ISO 13849)
- 1,690 N locking force
- RFID actuator with low or high coding level (EN ISO 14119)
- Enclosure rating IP 67, IP 69K
- Power to lock or power to release variants
- Reliable series connection of safety outputs (OSSDs)
- Four actuation directions
- Flexi-Loop-ready

Your benefits

- The high coding level of the actuator meets all the EN ISO 14119 requirements relating to manipulation-proofing without additional measures
- Self-monitoring semiconductor outputs (OSSDs) afford a high level of safety
- Reliable series connection reduces installation work
- Rugged IP 69K housing ideally suited to use in heavily contaminated environments
- Slim housing design with flexible actuator installation options enables simple machine integration
- Bistable solenoid coil consumes only a small amount of power and produces no heat when the system is either locked or unlocked
- Fast diagnosis via LED status indicator

Additional information

→ **www.sick.com/TR10_Lock**

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

Detailed technical data

More detailed data can be found in the operating instructions. Download ➜ www.sick.com/TR10_Lock

Features

Sensor principle	Transponder (RFID)
Number of safe outputs	2
Coding	Universally coded / unique coded (depending on type)
Locking force F_{max}	1,690 N (EN ISO 14119)
Locking force F_{Zh}	1,300 N (EN ISO 14119)
Actuation directions	4
Approach speed	≥ 2 mm/s

Safety-related parameters

Safety integrity level	SIL3 (IEC 61508)
Category	Category 4 (EN ISO 13849)
Performance level	PL e (EN ISO 13849)
PFH_D (mean probability of a dangerous failure per hour)	9.1×10^{-10} (EN ISO 13849)
T_M (mission time)	20 years (EN ISO 13849)
Type	Type 4 (EN ISO 14119)
Actuator coding level	
Model universally coded	Low coding level (EN ISO 14119)
Model unique coded	High coding level (EN ISO 14119)
Safe state in the event of a fault	At least one safety-related semiconductor output (OSSD) is in the OFF state.

Functions

Cascading	✔

Interfaces

Connection type	Cable with plug M12, 8-pin / cable (depending on type)
Flexi-Loop-ready	✔ [1]
Cable length	0.2 m / 3 m / 10 m (depending on type)
Cable material	PVC
Connecting cable length	≤ 200 m

[1] Ordering information Flexi Loop node ➜ page 17

Electrical data

Protection class	II (IEC 61140)
Classification according to cULus	Class 2
Usage category	DC-13 (IEC 60947-5-1)
Rated operating current (voltage)	200 mA (24 V DC)
Rated insulation voltage U_i	75 V
Rated impulse withstand voltage U_{imp}	1,000 V
Supply voltage V_S	24 V DC (20.4 V DC … 26.4 V DC)
Type of output	Semiconductor (OSSD)
Output current	≤ 200 mA
Peak current	400 mA, 100 ms [1]
Power consumption	2.5 W
Response time	100 ms for the first switch, 50 ms for each subsequent switch [2]
Enable time	600 ms
Risk time	100 ms
Locking principle	Power to release / power to lock (depending on type)
Contamination rating	3

[1] At turn on or after lock/unlock operation.

[2] Time until the outputs are switched off.

Mechanical data

Weight	0.4 kg
Housing material	ABS
Locking bolt material	Stainless steel 304
Mechanical life	5×10^5 switching cycles

Ambient data

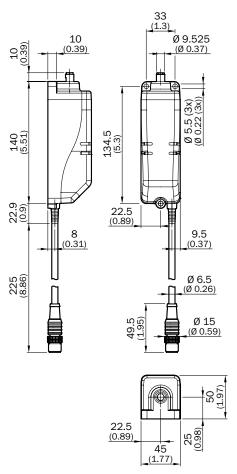|	
Enclosure rating	IP 66 (IEC 60529) IP 67 (IEC 60529) IP 69K (IEC 60529)
Ambient operating temperature	0 °C … +55 °C
Storage temperature	−25 °C … +75 °C
Vibration resistance	10 Hz … 55 Hz (IEC 60068-2-6)
Shock resistance	30 g, 11 ms (EN 60068-2-27)
EMC	IEC 60947-5-3

Ordering information

Items supplied TR10 Lock:
- Safety switch
- Actuator
- Mounting brackets for actuator
- 2 T10 hexalobular fixing screws for actuator
- Alignment aid
- Safety instruction
- Mounting instructions
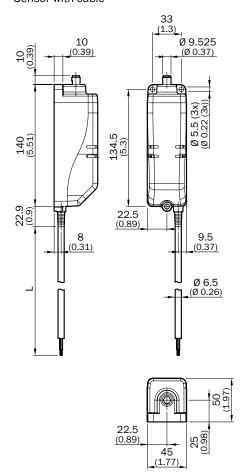- Operating instructions for download ➜ www.sick.com/TR10_Lock

Coding	Locking principle	Connection type	Cable length	Type	Part no.
Universally coded	Power to release	Cable with plug M12, 8-pin	0.2 m	TR10-SRM01C	6054758
		Cable	3 m	TR10-SRM03P	6054756
			10 m	TR10-SRM10P	6054757
	Power to lock	Cable with plug M12, 8-pin	0.2 m	TR10-SLM01C	6054761
		Cable	3 m	TR10-SLM03P	6054759
			10 m	TR10-SLM10P	6054760
Unique coded	Power to release	Cable with plug M12, 8-pin	0.2 m	TR10-SRU01C	6054764
		Cable	3 m	TR10-SRU03P	6054762
			10 m	TR10-SRU10P	6054763
	Power to lock	Cable with plug M12, 8-pin	0.2 m	TR10-SLU01C	6054768
		Cable	3 m	TR10-SLU03P	6054766
			10 m	TR10-SLU10P	6054767

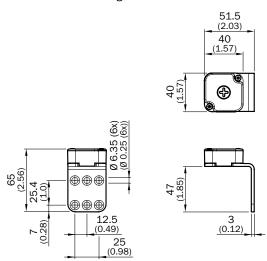## Dimensional drawings (Dimensions in mm (inch))

Sensor with cable and male connector
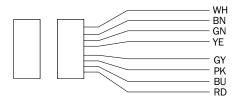
Sensor with cable

Actuator and mounting bracket

Connection diagram

Connection type: cable with male connector M12, 8-pin

Connection type: cable

1	Aux output (not safe)
2	Voltage supply 24 V DC
3	Lock control
4	OSSD 2 input
5	OSSD 1 output
6	OSSD 2 output
7	Voltage supply 0 V DC
8	OSSD 1 input

White	Aux output (not safe)
Brown	Voltage supply 24 V DC
Green	Lock control
Yellow	OSSD 2 input
Gray	OSSD 1 output
Pink	OSSD 2 output
Blue	Voltage supply 0 V DC
Red	OSSD 1 input

Mounting (Dimensions in mm (inch))
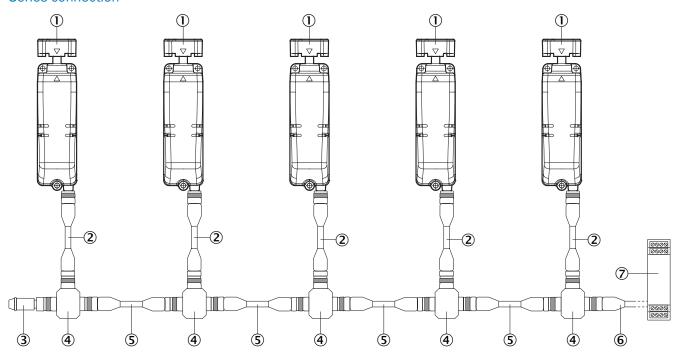
Minimum distance to neighboring sensors, horizontal mounting

200
(7.87)

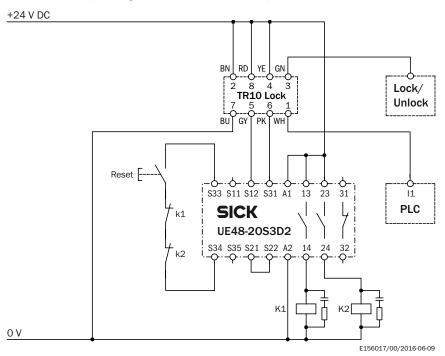Minimum distance to neighboring sensors, vertical mounting

200
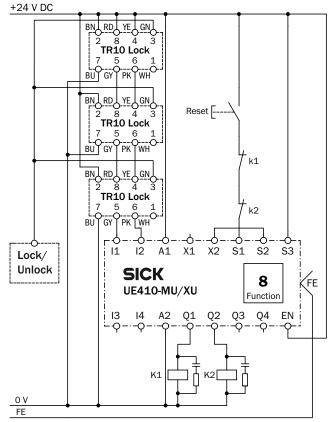(7.87)

Series connection

① TR10 Lock safety locking device
② Connection cable with 8-pin, M12 male connector and 8-pin, M12 female connector (e.g., DSL-1208-xxxxx)
③ TR4-AL002C end connector
④ TR4-AK004C T-connector
⑤ Connection cable with 5-pin, M12 male connector and 5-pin, M12 female connector (e.g., DSL-1205-xxxxx)
⑥ Connecting cable with 5-pin, M12 female connector and flying leads (e.g., DOL-1205-xxxxx)
⑦ Safe evaluation unit

Wiring examples

TR10 Lock safety locking device to UE48-2OS safety relay

+24 V DC

E156017/00/2016-06-09

Series connection of three TR10 Lock safety locking devices to a Flexi Classic safety controller

+24 V DC

E156014/00/2016-06-09

Accessories required for commissioning

Description	Number	Items supplied	Further information
Connecting cable (only required for variants with an M12 male connector)	1	–	➜ Plug connectors and cables
Operating instructions	1	✔	➜ www.sick.com/TR10_Lock
Mounting brackets for actuator	1	✔	–
T10 hexalobular fixing screws	2	✔	–
Safety screws M5 x 10	2	–	➜ Nuts and screws
Alignment aid	1	✔	–

Accessories

Mounting systems

Mounting brackets and mounting plates

Mounting brackets

Figure	Description	Packing unit	Type	Part no.
	Mounting bracket for actuator, stainless steel 304	1 piece	TR10-MA0000	5329552
	Mounting bracket for safety locking device, 6061-T6 aluminum	1 piece	TR10-MS0000	5329553

Dimensional drawings ➜ page 19

Nuts and screws

Screws

Description	Packing unit	Type	Part no.
Safety screws for mounting bracket of actuator	10 pieces	Safety screws M5 x 10	5334497

Connection systems

Plug connectors and cables

Connecting cables with female connector

- **Model:** PUR, halogen-free, unshielded

Figure	Connection type		Conductor cross-section	Cable length	Type	Part no.
	Female connector, M12, 5-pin, straight	Cable	0.34 mm²	2 m	DOL-1205-G02MC	6025906
				5 m	DOL-1205-G05MC	6025907
				10 m	DOL-1205-G10MC	6025908
				20 m	DOL-1205-G20MC	6050247
	Female connector, M12, 8-pin, straight	Cable	0.25 mm²	2.5 m	DOL-1208-G2M5C	6058863
				5 m	DOL-1208-G05MC	6035621
				10 m	DOL-1208-G10MC	6035622
				20 m	DOL-1208-G20MC	6038560

Connection cables with female connector and male connector

- **Model:** PUR, halogen-free, unshielded

Figure	Connection type		Conductor cross-section	Cable length	Type	Part no.
	Female connector, M12, 5-pin, straight	Male connector, M12, 5-pin, straight	0.34 mm²	1 m	DSL-1205-G01MC	6029280
				5 m	DSL-1205-G05MC	6029282
				10 m	DSL-1205-G10MC	6038954
	Female connector, M12, 8-pin, straight	Male connector, M12, 8-pin, straight	0.25 mm²	1 m	DSL-1208-G01MC	6051940
				5 m	DSL-1208-G05MC	6051943
				10 m	DSL-1208-G10MC	6051944

Adapters and distributors

T-connectors

Figure	Description	Type	Part no.
	T-connector for safe series connection	TR4-AK004C	5325889

Other adapters and distributors

Figure	Description	Type	Part no.
	End connector for serial connection in combination with TR4-AK004C T-connector	TR4-AL002C	5325890

Further accessories

Actuators

Figure	Description	Type	Part no.
	Replacement actuator for TR10-SLMxxx	TR10-RLM000	5329549
	Replacement actuator for TR10-SLUxxx	TR10-RLU000	5329551
	Replacement actuator for TR10-SRMxxx	TR10-RRM000	5329548
	Replacement actuator for TR10-SRUxxx	TR10-RRU000	5329550

Enhanced system solutions

Safe sensor cascade

Flexi Loop

Figure	Description	Type	Part no.
	Flexi Loop node for safety sensors with dual-channel OSSD outputs, 8-pin version	FLN-OSSD1100108	1061710
	Flexi Loop terminator module to terminate the safe sensor cascade on the last Flexi Loop node	FLT-TERM00001	1061716

Other models and accessories ➜ www.sick.com/Flexi_Loop

Safety controllers

Flexi Classic

Figure	Configuration method	Description	Type	Part no.
Illustration may differ		Flexi Classic input expansion module: 8 safety inputs	UE410-8DI3	6026139
Illustration may differ	Via rotary switch	Flexi Classic main module: 4 safety capable inputs and 1 safety output, 2 inputs and 2 outputs for the global emergency stop function	UE410-GU3	1072177
Illustration may differ		Flexi Classic main module: 4 safety capable inputs and 4 safety outputs	UE410-MU3T5	6026136
Illustration may differ		Flexi Classic input/ouput extension: 4 safety inputs and 4 safety outputs	UE410-XU3T5	6032470

Other models and accessories ➜ www.sick.com/Flexi_Classic

Flexi Soft

Figure	Configuration method	Description	Type	Part no.
System plug not included with delivery	Via software	Flexi Soft main module with RS-232 interface	FX3-CPU000000	1043783
		Flexi Soft input/output extension: 8 safety inputs and 4 safety outputs (according to SIL3)	FX3-XTIO84002	1044125
		Flexi Soft input extension: 8 safety inputs and 8 test pulse outputs	FX3-XTDI80002	1044124
		System plug for FX3-CPU0, for storing the system configuration	FX3-MPL000001	1043700

Other models and accessories ➜ **www.sick.com/Flexi_Soft**
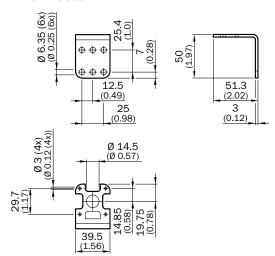
Safety relays

UE48-20S

Figure	Description	Type	Part no.
Illustration may differ	Safety relay for the evaluation of emergency stop pushbuttons, safety switches, safety light curtains, safety laser scanners and pressure-sensitive safety mats	UE48-20S3D2	6024916

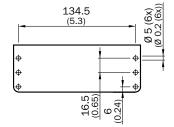Other models and accessories ➜ **www.sick.com/Safety_Relays**

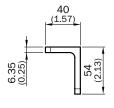## Dimensional drawings for accessories (Dimensions in mm (inch))

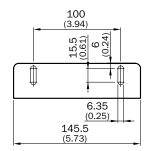### Mounting brackets and mounting plates

TR10-MA0000

TR10-MS0000

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,000 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, we are always close to our customers. 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 various 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 round out 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:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hong Kong, Hungary, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations ➔ **www.sick.com**

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