

TiM8xx DistanceGuard

2D LiDAR sensors

SICK
Sensor Intelligence.



Described product

TiM8xx DistanceGuard (type code: TiM8xxA-xx01xxx)

Manufacturer

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Legal information

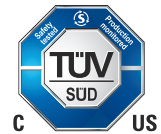
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Original document

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1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use devices from SICK AG.

Prerequisites for safe work are:

- Compliance with all safety notes and handling instructions supplied.
- Compliance with local work safety regulations and general safety regulations for device applications

The operating instructions are intended to be used by qualified personnel and electrical specialists.



NOTE

Read these operating instructions carefully to familiarize yourself with the device and its functions before commencing any work.

The operating instructions are an integral part of the product. Store the instructions in the immediate vicinity of the device so they remain accessible to staff at all times. Should the device be passed on to a third party, these operating instructions should be handed over with it.

These operating instructions do not provide information on operating the machine or system in which the device is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 Explanation of symbols

Warnings and important information in this document are labeled with symbols. Signal words introduce the instructions and indicate the extent of the hazard. To avoid accidents, damage, and personal injury, always comply with the instructions and act carefully.



DANGER

... indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.



WARNING

... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.



CAUTION

... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.



NOTICE

... indicates a potentially harmful situation, which may lead to material damage if not prevented.



NOTE

... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

2 Safety information

2.1 Intended use

The TiM8xx DistanceGuard is a combination of a 2D LiDAR sensor (**TiM8xx**) and a SensorApp (**DistanceGuard**) developed for a distance monitoring application.

The 2D LiDAR sensor scans its environment in a plane without making contact, merges distance clusters into anonymous objects using the app and determines their distance to one another.

If the distance between two people undercuts an adjustable threshold value, the device sends a signal.

The number of identified objects can also be output, and a maximum number can be set for this purpose as well. Distancing rules, for example when standing in line, are therefore easy to follow. Adjustments can be made easily and on short notice if the rules change.

SICK AG assumes no liability for losses or damage arising from the use of the product, either directly or indirectly. This applies in particular to use of the product that does not conform to its intended purpose and is not described in this documentation.

2.2 Improper use

Any use outside of the stated areas, in particular use outside of the technical specifications and the requirements for intended use, will be deemed to be incorrect use.

- The device does not constitute a safety component in accordance with the respective applicable safety standards for machines.
- The device must not be used in explosion-hazardous areas, in corrosive environments or under extreme environmental conditions.
- Any use of accessories not specifically approved by SICK AG is at your own risk.



WARNING

Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- Product should be used only in accordance with its intended use.
 - All information in these operating instructions must be strictly observed.
 - Shut down the product immediately in case of damage.
-

2.3 Internet protocol (IP) technology



NOTE

SICK uses standard IP technology in its products. The emphasis is placed on availability of products and services.

SICK always assumes the following prerequisites:

- The customer ensures the integrity and confidentiality of the data and rights affected by its own use of the aforementioned products.
 - In all cases, the customer implements the appropriate security measures, such as network separation, firewalls, virus protection, and patch management.
-

2.4 Cybersecurity

Protection against cybersecurity threats requires a comprehensive and holistic cybersecurity concept that must be continuously monitored and maintained. Such a concept consists of organizational, technical, process-related, electronic and physical defense levels and sets up appropriate measures for the different types of risk. SICK's products and solutions must be regarded as an integral part of this concept.

Information on Cybersecurity can be found at: www.sick.com/psirt.

2.5 Limitation of liability

Relevant standards and regulations, the latest technological developments, and our many years of knowledge and experience have all been taken into account when compiling the data and information contained in these operating instructions. The manufacturer accepts no liability for damage caused by:

- Non-adherence to the product documentation (e.g., operating instructions)
- Incorrect use
- Use of untrained staff
- Unauthorized conversions or repair
- Technical modifications
- Use of unauthorized spare parts, consumables, and accessories

With special variants, where optional extras have been ordered, or owing to the latest technical changes, the actual scope of delivery may vary from the features and illustrations shown here.

2.6 Modifications and conversions



NOTICE

Modifications and conversions to the device may result in unforeseeable dangers.

Interrupting or modifying the device or SICK software will invalidate any warranty claims against SICK AG. This applies in particular to opening the housing, even as part of mounting and electrical installation.

2.7 Requirements for skilled persons and operating personnel



WARNING

Risk of injury due to insufficient training.

Improper handling of the device may result in considerable personal injury and material damage.

- All work must only ever be carried out by the stipulated persons.

This product documentation refers to the following qualification requirements for the various activities associated with the device:

- **Instructed personnel** have been briefed by the operator about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks delegated to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions, to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. The electrician must comply with the provisions of the locally applicable work safety regulation.

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"> ▪ Basic practical technical training ▪ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	<ul style="list-style-type: none"> ▪ Practical electrical training ▪ Knowledge of current electrical safety regulations ▪ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	<ul style="list-style-type: none"> ▪ Basic knowledge of the computer operating system used ▪ Basic knowledge of the design and setup of the described connections and interfaces ▪ Basic knowledge of data transmission
Operation of the device for the particular application	<ul style="list-style-type: none"> ▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment for the particular application

2.8 Operational safety and particular hazards

Please observe the safety notes and the warnings listed here and in other chapters of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.



CAUTION

Optical radiation: Laser class 1

The accessible radiation does not pose a danger when viewed directly for up to 100 seconds. It may pose a danger to the eyes and skin in the event of incorrect use.

- Do not open the housing. Opening the housing may increase the level of risk.
- Current national regulations regarding laser protection must be observed.

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**WARNING****Electrical voltage!**

Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
 - The power supply must be disconnected when attaching and detaching electrical connections.
 - The product must only be connected to a voltage supply as set out in the requirements in the operating instructions.
 - National and regional regulations must be complied with.
 - Safety requirements relating to work on electrical systems must be complied with.
-

**WARNING****Risk of injury and damage caused by potential equalization currents!**

Improper grounding can lead to dangerous equipotential bonding currents, which may in turn lead to dangerous voltages on metallic surfaces, such as the housing. Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
 - Follow the notes in the operating instructions.
 - Install the grounding for the product and the system in accordance with national and regional regulations.
-

3 Product description

3.1 Scope of delivery

The delivery of the device includes the following components:

Table 2: Scope of delivery

No. of units	Component	Notes
1	Device in the type ordered, 2 fastening clips, 2 M3 x 5 mm screws, TiMxx1 only: TX6 screwdriver (for the plastic cover of the micro USB female connector)	Without connecting cables
1	Printed safety notes, multilingual	Quick guide and general safety notes

3.2 Setup and dimensions

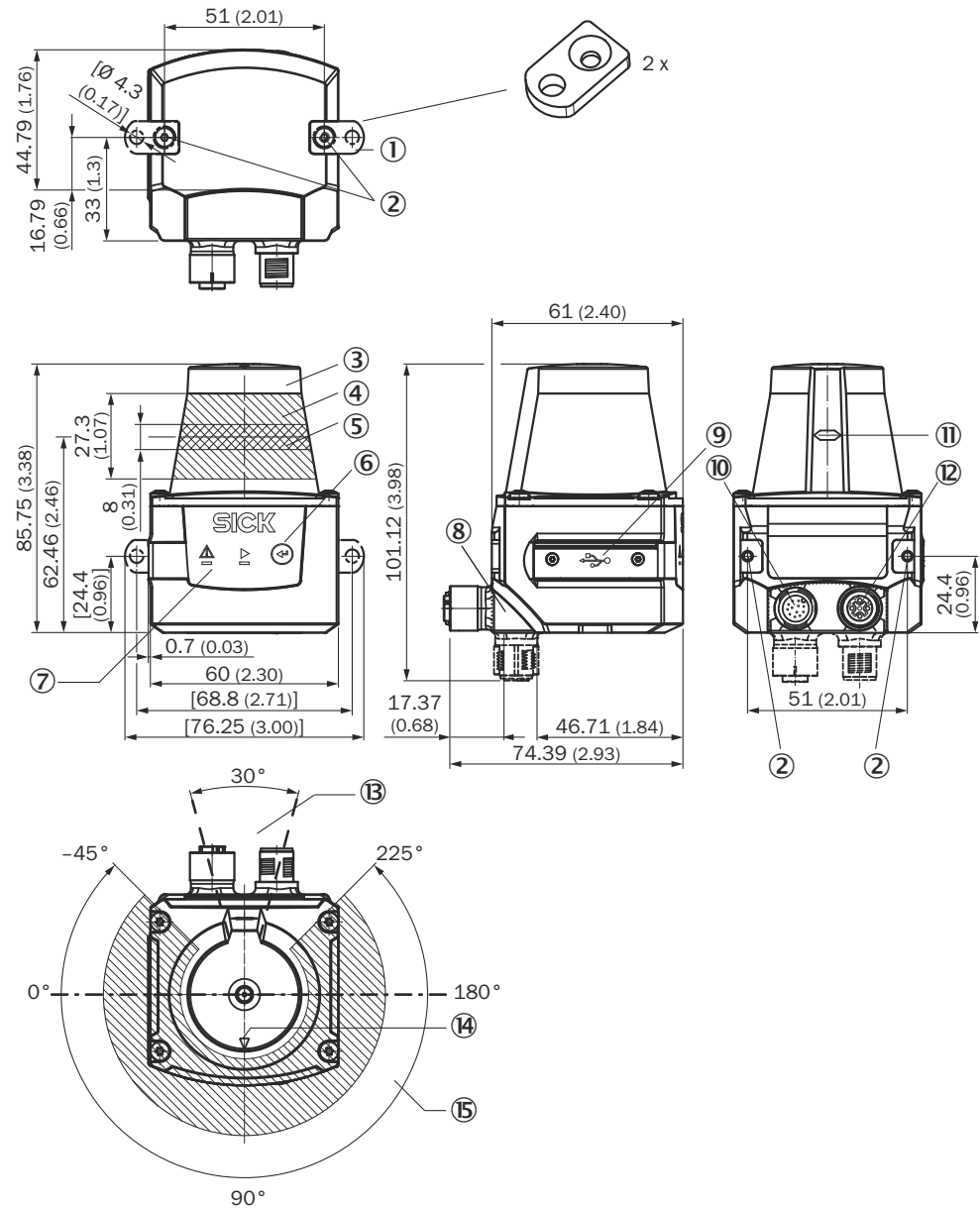


Figure 1: Structure and dimensions, unit: mm (inch), decimal separator: period

- ① 2x fastening clip with M3 x 5 mm countersunk screw, self-locking (included in scope of delivery)
- ② M3 threaded mounting hole, 2.8 mm deep (blind hole thread), max. tightening torque 0.8 Nm
- ③ Optics cover
- ④ Receiving range (light inlet)
- ⑤ Transmission range (light emission)
- ⑥ Pushbutton
- ⑦ Red and green LED (status indicators)
- ⑧ Swivel connector unit with electrical connections
- ⑨ Micro USB port behind black plastic cover
- ⑩ Voltage supply connection, digital in/outputs, 12-pin. M12 female connector
- ⑪ Marking for the position of the light emission level

- ⑫ Ethernet connection, 4-pin M12 female connector
- ⑬ Area in which no reflective surfaces are permitted when the device is mounted
- ⑭ Bearing marking to support alignment (90° axis)
- ⑮ 270° aperture angle (visual range)

3.3 Display and control elements

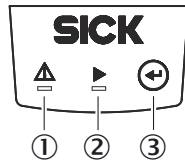


Figure 2: Display and control elements

- ① Red LED (status indicator)
- ② Green LED (status indicator)
- ③ Teach-in pushbutton (teaching in the background)

Status indicators

LED (red)	LED (green)	Description
● (approx. 6 s), ● (approx. 6 s)	-	Initialization phase, firmware update
-	●	Normal operation
-	●	Teach-in
●	-	No background taught in
●	●	Fault: Reboot device
-	-	Device without supply voltage

● = illuminated; ● = flashing

3.4 Type code

The devices of the product family are arranged according to the following type code:

TIM	x	y	z		-	aa	bb	c	dd
1	2	3	4	5		6	7	8	9

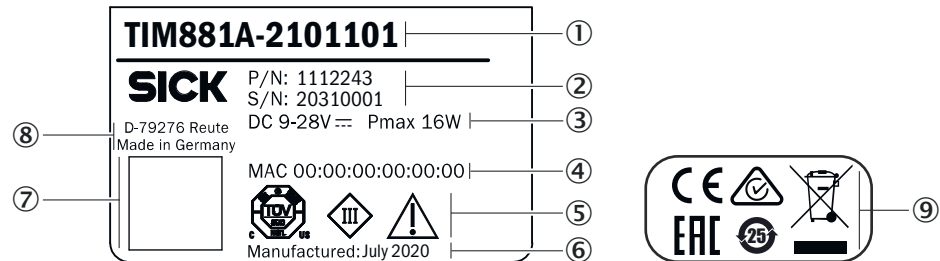
Table 3: Type code

Position	Description	Characteristic
1	Device name	TIM: Short range 2D-LiDAR sensor
2	Device type	8. AppSpace device
3	Performed by	8: 25 m measuring range, 0.33° angular resolution, performance professional, HDDM+
4	Housing	1: Housing IP67 without heating
5		A: SensorApp
6	Connection	21: Rotating connection unit, 1 x M12 male connector, 12-pin, D-coded (Power + I/O); 1x M12 female connector, 4-pin, A-coded (Ethernet)
7	Application	01: DistanceGuard app
8	Laser type	1: Pulse power up to 880 mW, pulse width up to 5 ns, pulse rate 1,500 kHz

Position	Description	Characteristic
9	Color	01: Gray

3.5 Product identification

The type label gives information for identification of the product variant.



3.6 Principle of operation

3.6.1 Measurement principle

The device is an opto-electronic LiDAR sensor (laser scanner) that uses laser beams for non-contact scanning of the outline of its surroundings on a plane. The device measures its surroundings in two-dimensional polar coordinates, relative to its measurement origin. Its measurement origin is marked by a circular indentation in the center of the optics cover. If a laser beam strikes an object, the position of that object is determined in terms of distance and direction.

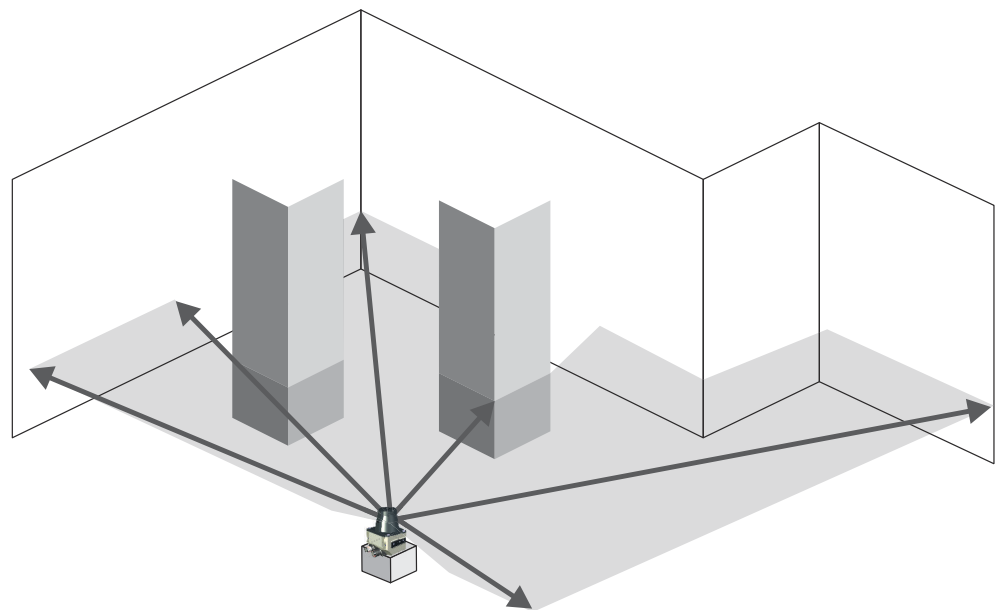


Figure 3: The 2D LiDAR sensor measurement principle

3.6.2 Distance monitoring application

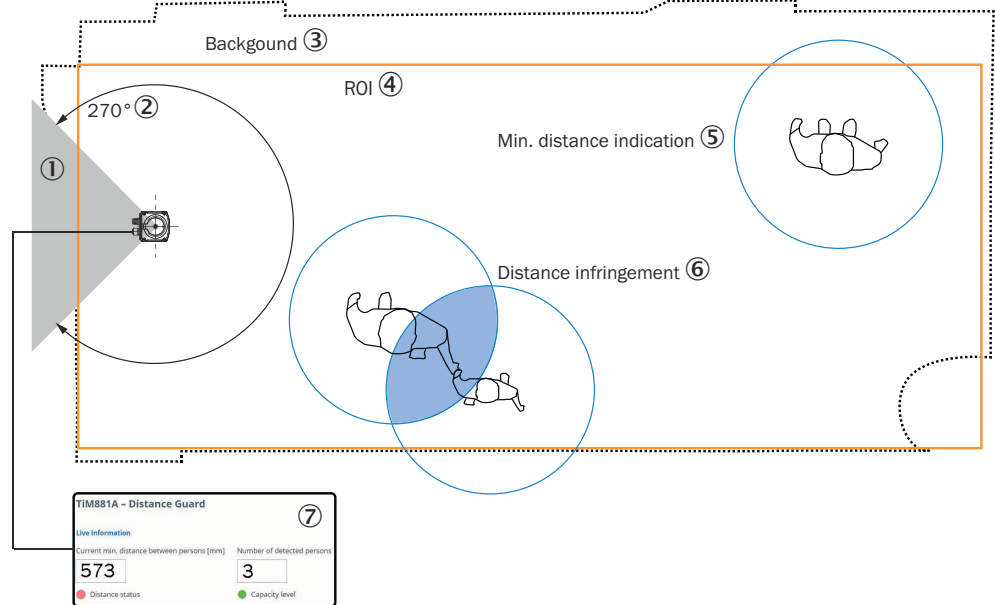
The SensorApp developed for the DistanceGuard application uses the 2D measurement data of the 2D LiDAR sensor for creating distance clusters and identifying people from a defined object width. To do so, first an area is defined and the background is hidden. The algorithm is able to assign arms and legs to a person, preventing multiple counting.

In addition to the number, the 2D LiDAR sensor determines the distance between all identified people and makes it possible to set a permissible maximum value.

If there are changes to the environment, the background must be taught in again.

Objects which move through the measuring range during operation and correspond to the width of a person are also counted as such.

The recorded results can be output via the digital outputs or the Ethernet interface.



- ① Sensor blind spot
- ② Scanning area
- ③ Taught-in background
- ④ Defined region of interest (ROI)
- ⑤ Blue circle: Defined minimum distance around a person
- ⑥ Circles intersect: Defined minimum distance undercut
- ⑦ Software output: Distance between two people who are currently closest to one another and the number of currently detected people. An example: Distance 0.573 m → status display for distance turns red; number 3 → status display for distance turns green

4 Transport and storage

4.1 Transport

For your own safety, please read and observe the following notes:



NOTICE

Damage to the product due to improper transport.

- The device must be packaged for transport with protection against shock and damp.
- Recommendation: Use the original packaging as it provides the best protection.
- Transport should be performed by trained specialist staff only.
- The utmost care and attention is required at all times during unloading and transportation on company premises.
- Note the symbols on the packaging.
- Do not remove packaging until immediately before you start mounting.

4.2 Unpacking

- To protect the device against condensation, allow it to equilibrate with the ambient temperature before unpacking if necessary.
- Handle the device with care and protect it from mechanical damage.

4.3 Transport inspection

Immediately upon receipt in Goods-in, check the delivery for completeness and for any damage that may have occurred in transit. In the case of transit damage that is visible externally, proceed as follows:

- Do not accept the delivery or only do so conditionally.
- Note the scope of damage on the transport documents or on the transport company's delivery note.
- File a complaint.



NOTE

Complaints regarding defects should be filed as soon as these are detected. Damage claims are only valid before the applicable complaint deadlines.

4.4 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Electrical connections are provided with a protective cap (as in the delivery condition).
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- To allow any residual dampness to evaporate, do not package in airtight containers.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: see "Technical data", page 35.

- Relative humidity: [see "Technical data", page 35.](#)
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

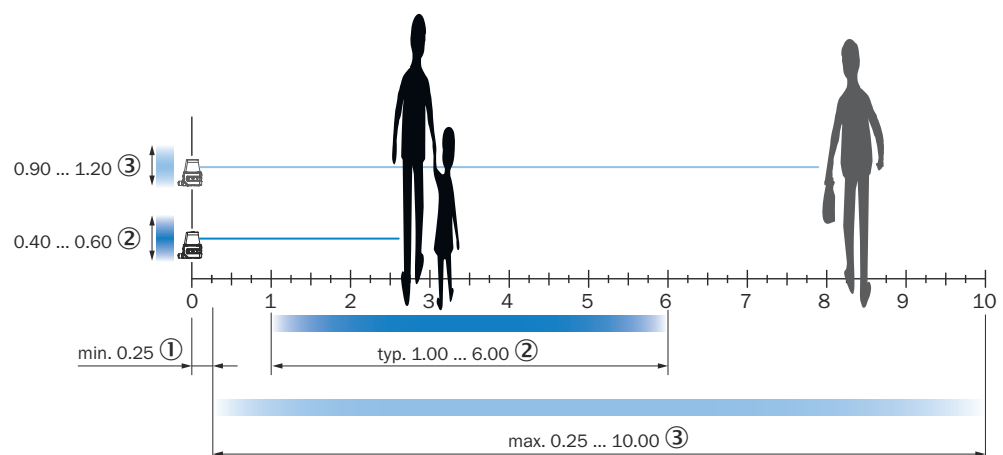
5 Mounting

5.1 Mounting instructions

- Observe the technical data.
- Protect the sensor from direct and indirect sunlight.
- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- The mounting site has to be designed for the weight of the device.
- The device can be mounted in any position.
- It should be mounted so that it is exposed to as little shock and vibration as possible. Optional mounting accessories are available, [see "Accessories", page 38](#).
- In application areas with severe vibrations or shocks caused by vibrations, jolts or abrupt changes in directions (e.g., when mounted to a manned forklift truck), mounting with vibration dampers is to be carried out ([see "Accessories", page 38](#)). Mount the device in a freely suspended manner.
- During mounting, make sure there is no reflective surface behind the reference target, [see "Setup and dimensions", page 11](#).
- To avoid inaccurate measurements when installing multiple devices: Make sure that the laser spot of one device is not in the visible range of another device, [see "Mutual interference", page 18](#).
- Avoid having shiny or reflective surfaces in the scanning range, e.g., stainless steel, aluminum, glass, reflectors, or surfaces with these types of coatings.
- Protect the device from moisture, contamination, and damage.
- Make sure that the status indicator is clearly visible.
- The M3 x 5 screws included with delivery are intended for mounting the fastening clips via the blind hole threads on the rear or underside of the device, [see "Setup and dimensions", page 11](#). If the mounting clamps are not used or if other screws are used, the screws must not be screwed into the thread by more than 2.8 mm. The maximum tightening torque is 0.8 Nm.

5.2 Mounting position

For reliable function, observe the following framework conditions when positioning the device.



- ① Minimum distance from device to detected people
- ② Recommendation: Measurement at knee/upper thigh height (device height 0.4 m to 0.6 m) at a monitoring distance of typ. 1.00 m to 6.00 m.
- ③ Recommendation: Measurement at hip/stomach height (device height 0.90 m to 1.20 m) when the maximum monitoring distance of 0.25 m to 10.00 m is utilized.

5.3 Mounting the device

1. Mount the LiDAR sensor using the designated fixing holes, see ["Setup and dimensions", page 11](#).



NOTICE

Risk of damaging the device!

the device will be damaged if the tightening torque of the mounting screws is too high or if the maximum screw-in depth of the blind hole threads is exceeded.

- ▶ Observe maximum tightening torque.
- ▶ Use suitable mounting screws for the blind hole threads of the device and observe the maximum screw-in depth.

2. Make the electrical connection. Attach and tighten a voltage-free cable, see ["Connecting the device electrically", page 25](#).
3. Switch on the supply voltage.
 - ✓ The red operation LED flashes.
4. Align the vertical center line of the field of view of the device with the center of the area to be monitored. The marking (90° axis) on the upper side of the optics cover serves as a alignment aid. View live measurement data on the PC for exact alignment (see ["Operation", page 27](#)) and use alignment aid or scan finder (see ["Accessories", page 38](#))
5. Push teach-in pushbutton to teach in the background. When doing so, make sure that there is no one in the measuring range.
 - ✓ The green operating LED lights up.

5.4 Mutual interference



NOTE

Optical sensors and other IR light sources can influence the measurement and detection capabilities of the device.

The device has been designed to minimize the probability of mutual interference with devices of the same type. To rule out even the slightest effects on the measurement accuracy, the devices should be arranged such the laser beams are not received by another device.

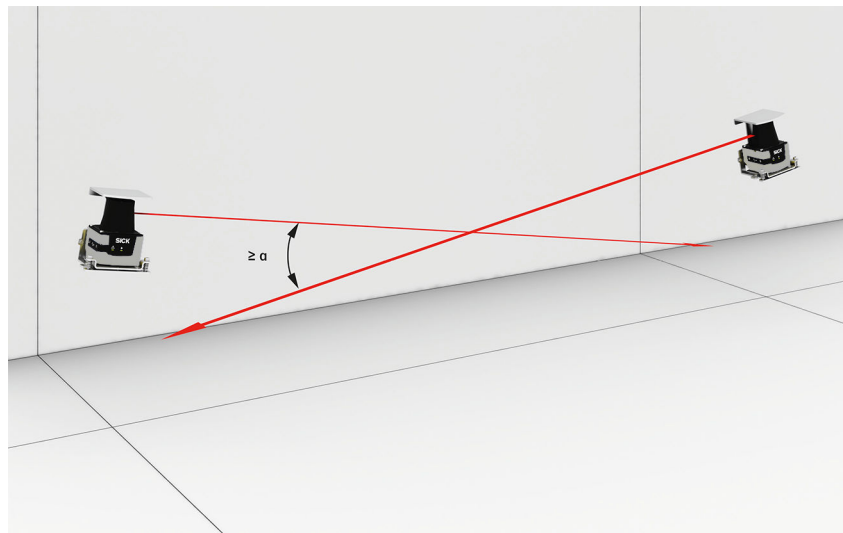


Figure 4: Angle $\geq 6^\circ$

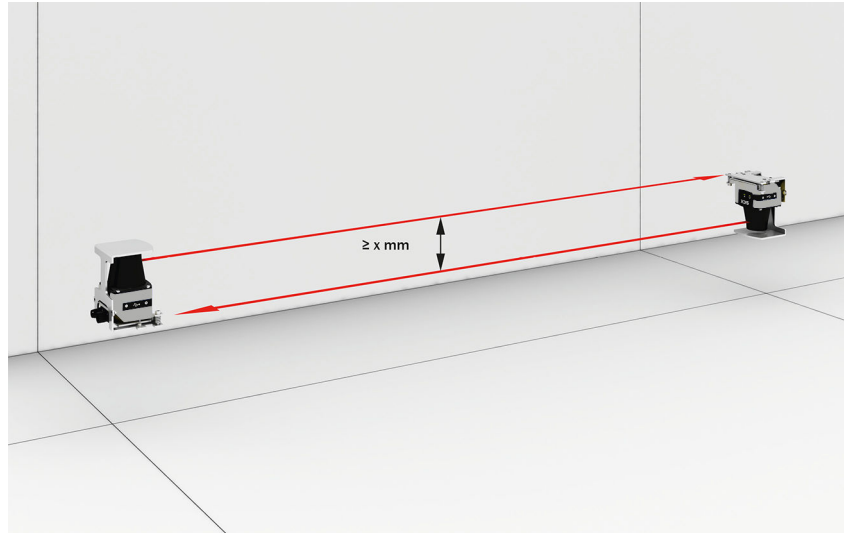


Figure 5: Distance $\geq 200 \text{ mm}$

6 Electrical installation

6.1 Prerequisites for safe operation of the device



WARNING

Risk of injury and damage caused by electrical current!

As a result of equipotential bonding currents between the device and other grounded devices in the system, faulty grounding of the device can give rise to the following dangers and faults:

- Dangerous voltages are applied to the metal housings.
- Devices will behave incorrectly or be destroyed.
- Cable shielding will be damaged by overheating and cause cable fires.

Remedial measures

- Only skilled electricians should be permitted to carry out work on the electrical system.
- If the cable insulation is damaged, disconnect the voltage supply immediately and have the damage repaired.
- Ensure that the ground potential is the same at all grounding points.
- Where local conditions do not meet the requirements for a safe earthing method, take appropriate measures (e.g., ensuring low-impedance and current-carrying equipotential bonding).

The device is connected to the peripheral devices (voltage supply, any local trigger sensor(s), system controller) via shielded cables. The cable shield – for the data cable, for example – rests against the metal housing of the device. The device can be grounded through the cable shield or through a blind tapped hole in the housing, for example.

If the peripheral devices have metal housings and the cable shields are also in contact with their housings, it is assumed that all devices involved in the installation have the **same ground potential**.

This is achieved by complying with the following conditions:

- Mounting the devices on conductive metal surfaces
- Correctly grounding the devices and metal surfaces in the system
- If necessary: low-impedance and current-carrying equipotential bonding between areas with different ground potentials

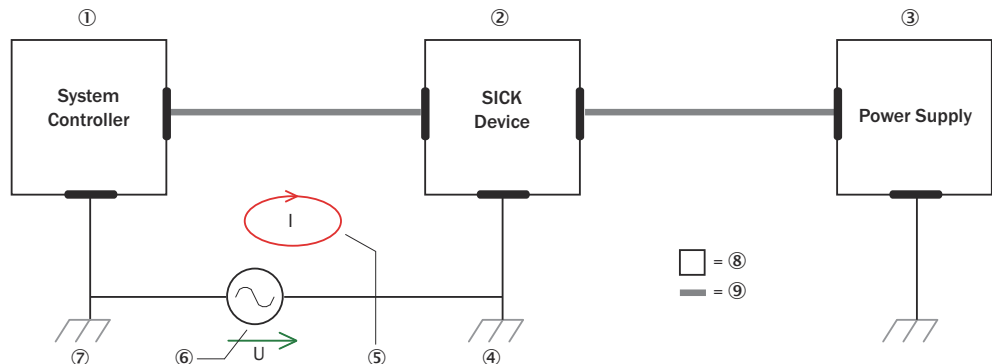


Figure 6: Example: Occurrence of equipotential bonding currents in the system configuration

- ① System controller
- ② Device
- ③ Voltage supply

- ④ Grounding point 2
- ⑤ Closed current loop with equalizing currents via cable shield
- ⑥ Ground potential difference
- ⑦ Grounding point 1
- ⑧ Metal housing
- ⑨ Shielded electrical cable

If these conditions are not fulfilled, equipotential bonding currents can flow along the cable shielding between the devices due to differing ground potentials and cause the hazards specified. This is, for example, possible in cases where there are devices within a widely distributed system covering several buildings.

Remedial measures

The most common solution to prevent equipotential bonding currents on cable shields is to ensure low-impedance and current-carrying equipotential bonding. If this equipotential bonding is not possible, the following solution approaches serve as a suggestion.



NOTICE

We expressly advise against opening up the cable shields. This would mean that the EMC limit values can no longer be complied with and that the safe operation of the device data interfaces can no longer be guaranteed.

Measures for widely distributed system installations

On widely distributed system installations with correspondingly large potential differences, the setting up of local islands and connecting them using commercially available **electro-optical signal isolators** is recommended. This measure achieves a high degree of resistance to electromagnetic interference.

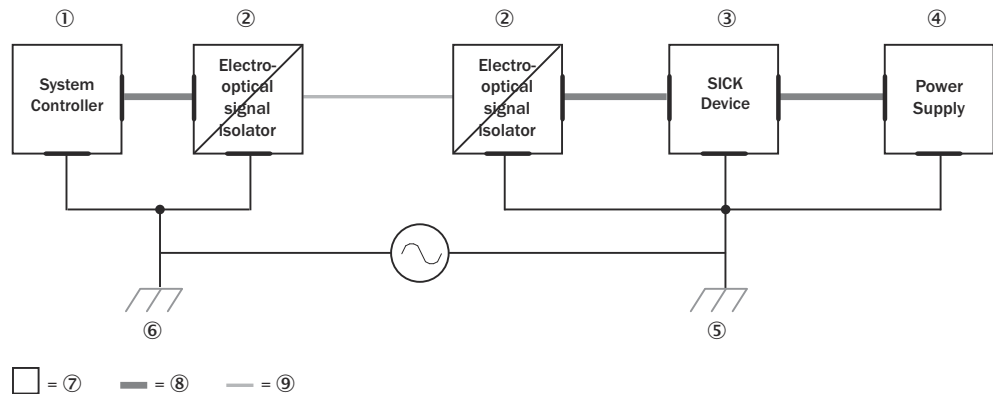


Figure 7: Example: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators

- ① System controller
- ② Electro-optical signal isolator
- ③ Device
- ④ Voltage supply
- ⑤ Grounding point 2
- ⑥ Grounding point 1
- ⑦ Metal housing
- ⑧ Shielded electrical cable
- ⑨ Optical fiber

The use of electro-optical signal isolators between the islands isolates the ground loop. Within the islands, a stable equipotential bonding prevents equalizing currents on the cable shields.

Measures for small system installations

For smaller installations with only slight potential differences, insulated mounting of the device and peripheral devices may be an adequate solution.

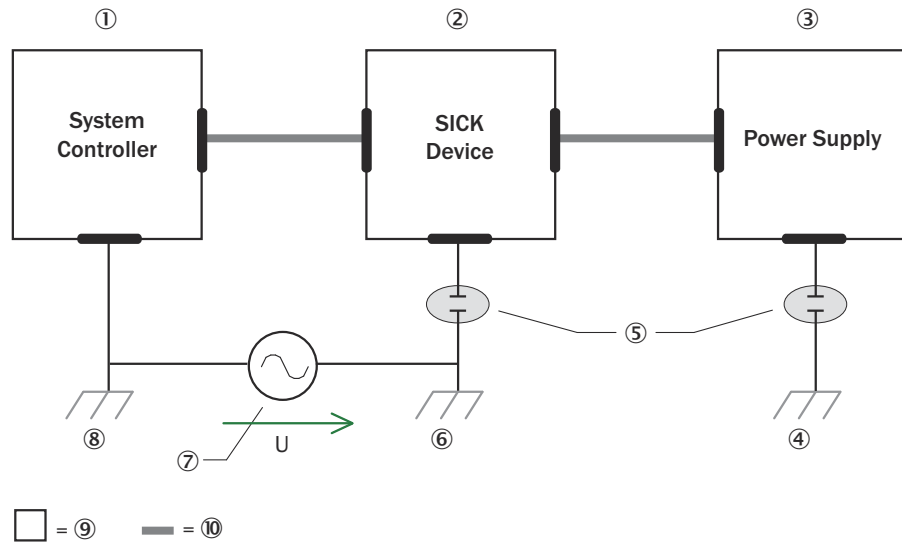


Figure 8: Example: Prevention of equipotential bonding currents in the system configuration by the insulated mounting of the device

- ① System controller
- ② Device
- ③ Voltage supply
- ④ Grounding point 3
- ⑤ Insulated mounting
- ⑥ Grounding point 2
- ⑦ Ground potential difference
- ⑧ Grounding point 1
- ⑨ Metal housing
- ⑩ Shielded electrical cable

Even in the event of large differences in the ground potential, ground loops are effectively prevented. As a result, equalizing currents can no longer flow via the cable shields and metal housing.



NOTICE

The voltage supply for the device and the connected peripheral devices must also guarantee the required level of insulation.

Under certain circumstances, a tangible potential can develop between the insulated metal housings and the local ground potential.

6.2 Electrical block diagram for commissioning

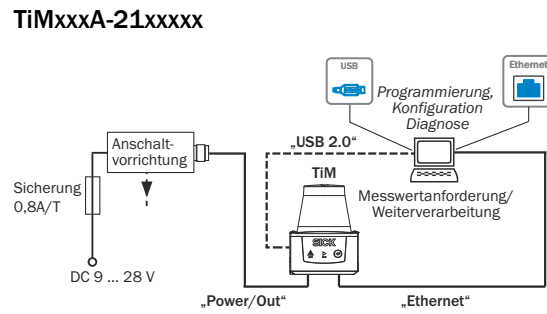


Figure 9: "Power, I/O" connection: With M12 male connector, 12-pin, A-coded; "Ethernet" connection: M12 female connector, 4-pin, D-coded

6.3 Wiring instructions



NOTE

Pre-assembled cables can be found online at:

- www.sick.com/DistanceGuard



NOTICE

Faults during operation and device or system defects!

Incorrect wiring may result in operational faults and defects.

- Follow the wiring notes precisely.

All electrical connections of the device are configured as M12 round connectors.

The protection class stated in the technical data is achieved only with screwed plug connectors or protective caps.

Protect the device from dust and moisture when the plastic USB cover is open.

All circuits connected to the device must be configured as SELV or PELV circuits. SELV = safety extra-low voltage, PELV = protective extra-low voltage.

Protect the device with an external 0.8 A slow-blow fuse at the beginning of the supply cable.

Connect the connecting cables in a de-energized state. Do not switch on the supply voltage until installation is complete and all connection work on the device and controller has been finished.

Wire cross-sections in the supply cable from the customer's power system must be implemented in accordance with the applicable standards.

6.4 Connection diagram



NOTE

The recommended connecting cables and their associated technical data can be found online at:

- www.sick.com/DistanceGuard

6.4.1 TiMxxxA-21xxxx

“Power/I/O” connection

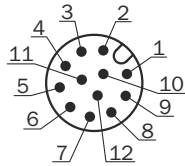


Table 4: Male connector, M12, 12-pin, A-coded

PIN	Signal	Function	Wire colors connecting cable part no. 6054974 (5 m), 6054973 (10 m), 6054972 (20 m) ¹
1	GND	Ground	Blue
2	DC 9 V ... 28 V	Supply voltage	Brown
3	IN 1	Switching input 1: Reserved	Red
4	IN 2	Switching input 2: Reserved	Green
5	OUT 1	Switching output 1: Minimum distance undercut	Pink
6	OUT 2	Switching output 2: Maximum number of people exceeded	Yellow
7	OUT 3	Switching output 3: Device overloaded	Black
8	OUT 4	Switching output 4: Reserved	Gray
9	INGND	Common ground for all inputs: Reserved	White
10	IN 3	Switching input 3: Reserved	Violet
11	IN 4	Switching input 4: Reserved	Gray + pink
12	-	Not wired	Red + blue
-	-	Screen	-

¹ Example values when using the specified connecting cable(s). Signal assignment and wire colors can vary when using other connecting cables.

“Ethernet” connection

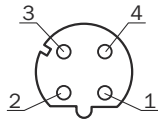


Table 5: Female connector, 4-pin, D-coded

Contact	Labeling	Description
1	TX+	Sender+
2	RX+	Receiver+
3	TX-	Sender-
4	RX-	Receiver-

6.5 Connecting the device electrically



NOTICE

Observe the wiring instructions, see "Wiring instructions", page 23.

1. Ensure the voltage supply is not connected.
2. Connect the device according to the connection diagram, see "Connection diagram", page 23.

6.6 Wiring the digital outputs

The device has 4 switching digital outputs.

Digital output OUT1 signals that the defined minimum distance has been undercut.

Digital output OUT2 signals that the permissible maximum number of people has been exceeded.

Digital output OUT3 signals a device overload situation.

Digital output OUT4 is reserved and cannot be used.

The structure and wiring principle of the digital outputs are shown below.

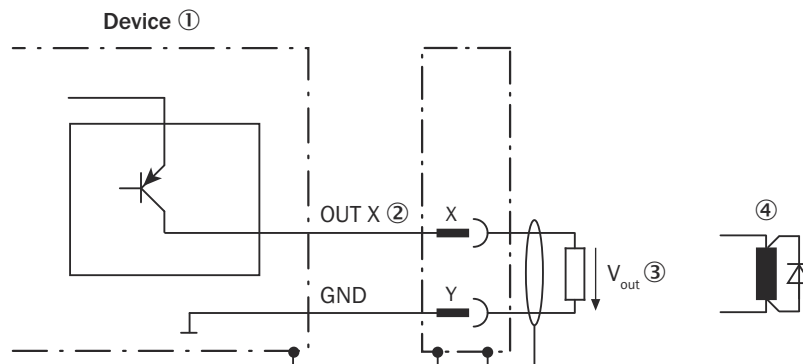


Figure 10: Wiring of digital output (PNP version)

- ① Device
- ② Signal OUT X
- ③ Output voltage V_{out}
- ④ If an inductive load is present: Provide an arc-suppression circuit at the digital switching output. Attach a freewheeling diode directly to the load for this purpose.

Position	Signal	TiM8xxA-21xxx (male connector M12, 12-pin): PIN	Wire colors connecting cable part no. 6054974 (5 m), 6054973 (10 m), 6054972 (20 m)
X1	OUT 1	5	Pink
X2	OUT 2	6	Yellow
X3	OUT 3	7	Black
X4	OUT 4	8	Gray
Y	GND	1	Blue

Features	Short-circuit protected and temperature protected Not electrically isolated from supply voltage U_V
Electrical values	$0\text{ V} \leq V_{out} \leq V_S$ $(V_S - 1.5\text{ V}) \leq V_{out} \leq V_S$ at $I_{out} \leq 100\text{ mA}$

Longer connecting cables at the digital outputs of the device should be avoided due to the resulting fall in voltage. This is calculated as follows:

$$\Delta U = (2 \times \text{length} \times \text{current}) : (\text{conductance value} \times \text{cross-section})$$

Conductance value for copper: 56 m/Ω mm².

7 Operation

7.1 Calling up user interface

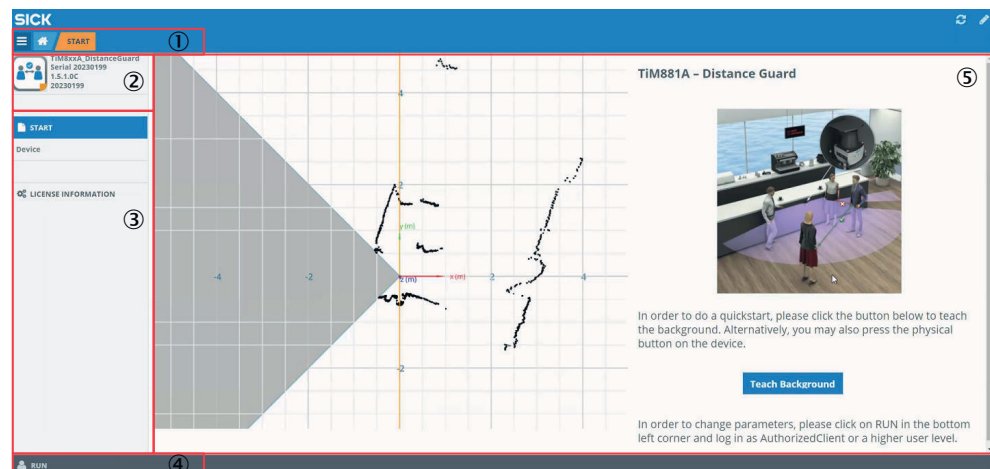
Before opening the user interface, perform the following work steps

- Connect the device to the PC via Ethernet.
- Set up the voltage supply for the device.
- Ensure that the PC and device are located in the same network.
- Ensure that the PC uses a different IP address than the device.

Opening SOPASair user interface via a web browser:

1. Open web browser window (recommendation: Google Chrome).
 2. Enter the device IP address into the address line. The standard IP address is: 192.168.0.1
- ✓ The SOPASair user interface is displayed.

7.2 Overview



- ① Show/Hide menu bar buttons and open start menu; display of open menu
- ② Device information display
- ③ Menu bar
- ④ User level button and display
- ⑤ Workspace

7.3 User levels

The device has different user levels.

The current user level is displayed in the lower area of the user interface.

1. Click on the display of the current user level.
- ✓ The **Login** input mask opens.
2. Select user level (**Username**), enter password (**Password**) and click on **LOGIN**.

User levels	Password	User/Authorizations
Run	-	Customers: Display only, no configuration
AuthorizedClient	client	Technical staff: Install and configure device

User levels	Password	User/Authorizations
Service	servicelevel	Service staff: Make advanced configuration settings

7.4 Scan view & live information

Every menu page shows the scan view of the device and (after the background is taught in) the current status information.

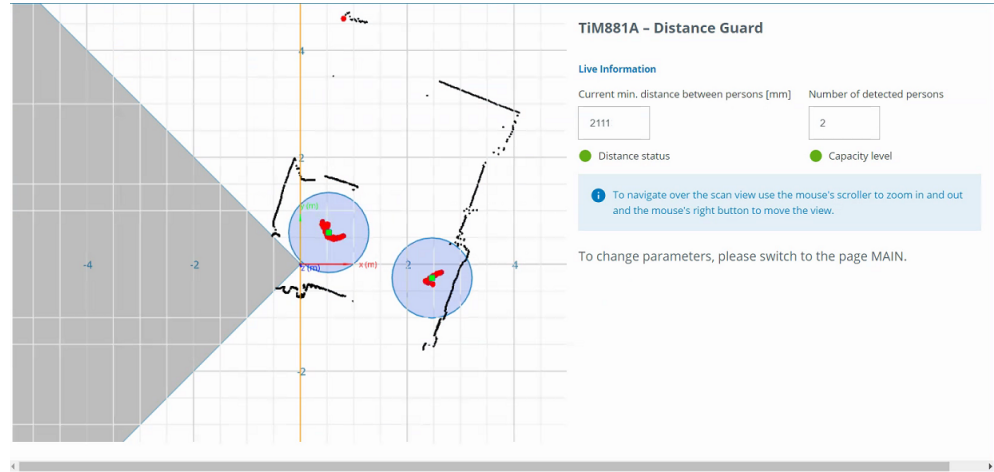


Figure 11: Scan view and live information

Scan view

The detection area of the device is visualized in the scan view. The device is situated in the center of the coordinate system with distance information in meters. The gray area is the sensor blind spot.

A taught-in background is marked with black measurement points.

Measurement points which do not correspond to a taught-in background are merged into measurement point groups (= clusters) and also shown as green points. Depending on the selected object parameters (see "Advanced settings", page 30), a person is identified and surrounded by a blue circle whose diameter corresponds to the minimum distance to be observed. If two circles intersect, the minimum distance has been undercut.

Live information

The live information shows the current distance in mm between the two people who are currently the closest to one another. If the permissible minimum distance is undercut, the color of the status display changes from green to red.

The number of currently detected people is also displayed. If the permissible maximum distance is exceeded, the color of the status display changes from green to red.

If no people or only one person is detected, the current distance is output as 0, but undercutting is not signaled.

7.5 Start

The start menu is called up after the IP address of the device is entered in the address line of the web browser.

The scan view is shown on the left-hand side. The raw measurement data is initially displayed there for device alignment.

If a background has not yet been taught in, the user can do this by pressing the **Teach Background** button. The teach-in process lasts 1.4 seconds. Alternatively, the background can be taught in by pressing the teach-in pushbutton on the device. In this case, the teach-in process is not started until a time delay of 5 seconds has passed. This makes it possible for people to leave the measuring range and not be incorrectly taught in as background.

If a background is available, the scan view changes and the live information appears on the right side of the working range.

A taught-in background is saved directly on the device and is automatically loaded when the device is restarted.

7.6 Main

The main device settings are made in this menu.

The availability of this menu depends on the selected user level, see ["User levels"](#), page 27.

Basic parameters

Function	Description
Min. distance between persons [mm]	Input of the permitted minimum distance between several people (factory setting 1.5 m). If the permissible minimum distance is undercut, the respective status display changes from green to red and switching output OUT1 activates.
Max. number of persons	Input of the total number of people permitted in the region of interest (factory setting 10 people). If the maximum number of people is undercut, the respective status display changes from green to red and switching output OUT2 activates.
Teach Background	Teach in the background (again). It is saved automatically. The previously saved background is overwritten in the process.
Delete Background	Deletion of the taught-in background. This is helpful for (re-)alignment of the device, for example when ambient conditions have changed. The Load function is used to display the background again, also after a device restart. Complete deletion can only be done in combination with the Save Permanently function.
Lock device button	If selected, the pushbutton is locked on the front side of the device (repeated) teach-in of the background.
Show Background	If selected, the taught-in background data is shown in the scan view.

Region of interest

Counting people and their distance is only done in the defined region of interest.

Function	Description
X Range [mm]	Using the slider or the input fields, the limits of the detection range can be adjusted along the longitudinal axis of the device (factory setting 0 m ... 8 m). Negative values are also possible due to the scan range of 270°.
Y Range [mm]	Using the slider or the input fields, the limits of the detection range can be adjusted along the cross-wise axis of the device (factory setting -6 m ... 6 m).

Miscellaneous

Function	Description
Save Permanently	All parameter changes are permanently saved and are maintained after the device is restarted.
Load	All parameters changes since the last save are undone.
Load Application Defaults	All application parameters (including background) are reset to the factory settings with the exception of the parameters of the Ethernet settings menu.

7.7 Advanced settings

Additional device settings can be made in this view.

The availability of this menu depends on the selected user level, see ["User levels"](#), page 27.

Object parameters

Function	Description
Min. object width [mm]	Minimum width a person must have from the point of view of the device in order to be considered for additional evaluation (factory setting 0.3 m).
Min. sensor distance [mm]	Minimum distance to the device which must be upheld so a person is considered for additional evaluation (factory setting 0.25 m).
Max. allowed point distance [mm]	Maximum distance which a measurement point must have to another measurement point in order to be assigned to the same cluster (factory setting 0.2 m).
Max. distance between clusters of one person [mm]	Maximum distance of clusters of the same person. Depends on the installation height of the sensor, arms and legs continue to be correctly assigned (factory setting 0.7 m).

Teach-in parameters

Function	Description
Background threshold [mm]	Distance margin within whose measurement points are still assigned to the background. If there are very dark or very glossy background objects that are very far away, the value should be increased (factory setting 0.3 m).
Teach Background	see "Main", page 29
Delete Background	see "Main", page 29
Lock device button	see "Main", page 29
Show Background	see "Main", page 29

Capacity alarm parameters

Function	Description
Duration of capacity exceedance before alarm [ms]	Time span during which the maximum number of people has to be exceeded before the status display changes to red and switching output OUT2 activates (factory setting 0.8 s).
Duration for capacity fulfillment before alarm is lifted [ms]	Time span during which the maximum number of people has to be upheld before the status display changes from red to green and switching output OUT2 deactivates (factory setting 0.8 s).

Miscellaneous

[see "Main", page 29](#)

7.8 Ethernet settings

Basic device settings are made in this menu.

The availability of this menu depends on the selected user level, see "User levels", page 27.

Function	Description
TCP/IP settings	Configure network address. The device is restarted via the Apply Reboot button. SOPASair must then be opened with the new IP address of the device. If needed, the device can also be configured as a DHCP client via SOPAS ET.
Device name	To facilitate identification, a name can be assigned for every device, e.g. "Checkout 1". The change is saved on the device with the Apply & Reload the page button.

7.9 License information

The license information is displayed in this menu.

7.10 Communication via REST API

Communication with the device is also possible by means of POST via REST API.

Query if minimum distance is undercut:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/getDistanceViolationState
```

The query of the current distance between people who are currently the closest to one another:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/getMinDistance
```

Input of the permitted minimum distance in mm:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/setMinDistanceThreshold
```

Use distance value as JSON Payload or Body (raw). Example for 1 m: {"args": {"value":1000}}

The changed value is not displayed in SOPASair until the website is updated.

Query if maximum number of people exceeded:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/getCapacityViolationState
```

Query of current number of people:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/getNbOfPersons
```

Input of maximum number of people:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/setMaxAllowedPersons
```

Use number as JSON Payload or Body (raw). Example for 5 people: {"args": {"value":5}}

The changed value is not displayed in SOPASair until the website is updated.

Permanently saving the configuration:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/setSaveParameters
```

Resetting password changes:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/setLoadParameters
```

Resetting applications settings (including background) to factory settings:

```
http://192.168.0.1/api/crown/BasicDistanceGuard/setDefaultParameters
```

and

```
http://192.168.0.1/api/crown/BasicDistanceGuard/removeBackground
```

8 Maintenance

8.1 Maintenance plan

Depending on the assignment location, the following preventive maintenance tasks may be required for the device at regular intervals:

Table 6: Maintenance plan

Maintenance work	Interval	To be carried out by
Check device and connecting cables for damage at regular intervals.	Depends on ambient conditions and climate.	Specialist
Clean housing and optics cover.	Depends on ambient conditions and climate.	Specialist
Check the screw connections and plug connectors.	Depends on the place of use, ambient conditions or operating requirements. Recommended: At least every 6 months.	Specialist
Check the mounting accessories and vibration dampers used.	Depends on the place of use, ambient conditions or operating requirements. Recommended: At least every 6 months.	Specialist
Check that all unused connections are sealed with protective caps.	Depends on ambient conditions and climate. Recommended: At least every 6 months.	Specialist

8.2 Cleaning



NOTICE

Equipment damage due to improper cleaning.

Improper cleaning may result in equipment damage.

- Only use recommended cleaning agents and tools.
- Never use sharp objects for cleaning.

-
- ▶ Clean the optics hood at regular intervals and in the event of contamination using a lint-free lens cloth (part no. 4003353) and plastic cleaning agent (part no. 5600006). Rinse off coarse dirt first with water. The cleaning interval essentially depends on the ambient conditions.

9 Troubleshooting

9.1 General faults, warnings, and errors

Possible faults and corrective actions are described in the table below for troubleshooting. In the case of faults that cannot be rectified using the information below, please contact the SICK Service department. To find your agency, see the final page of this document.



NOTE

Before calling, make a note of all type label data such as type designation, serial number, etc., to ensure faster assistance.

Table 7: Troubleshooting questions and replies

Question / status	Response / remedial actions
No distance and number of people values available	Background not taught in or deleted: Teach in background (again) or restore it.
Displayed number of people does not match reality.	People covering each other: Consider organizational change to paths. People do not keep distance (< 0.2 m) so several people are detected as one: Clarify the valid distance rules. Region of interest is too big or too small: Check and adjust the parameters in the Main menu if needed. Ambient conditions have changed: Teach in the background (again). Attachment height of the device unfavorable: Change height and teach in again.
Displayed distance values are imprecise	Optics cover contaminated: Clean the cover Highly glossy objects in the field of view of the sensor: Modify/Remove objects or change angle of inclination and teach in the background (again). Attachment height of the device unfavorable: Change height and teach in again.
Website or SOPASair is not available when accessing the device using the web browser.	Ensure that the PC and device are located in the same network and that the device has an active power and Ethernet connection. Ensure that the PC uses a different IP address than the device (standard device IP address: 192.168.0.1). IP address of the device may have been changed: Download SOPAS-ET (www.sick.com/sopas), install and run the default search for devices.
Other fault, warning or error arises.	Call up the diagnostic information in SOPAS ET.

9.2 Repairs

Repair work on the device may only be performed by qualified and authorized personnel from SICK AG. Interruptions or modifications to the device by the customer will invalidate any warranty claims against SICK AG.

9.3 Returns

- ▶ Do not dispatch devices to the SICK Service department without consultation.
- ▶ The device must be sent in the original packaging or an equivalent padded packaging.



NOTE

To enable efficient processing and allow us to determine the cause quickly, please include the following when making a return:

- Details of the contact person
 - Description of the application
 - Description of the fault that occurred
-

9.4 Disposal

If a device can no longer be used, dispose of it in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations. Do not dispose of the product along with household waste.



NOTICE

Danger to the environment due to improper disposal of the device.

Disposing of devices improperly may cause damage to the environment.

Therefore, observe the following information:

- Always observe the national regulations on environmental protection.
 - Separate the recyclable materials by type and place them in recycling containers.
-

10 Technical data



NOTE

The relevant online data sheet for your product, including technical data, dimensional drawing, and connection diagrams can be downloaded, saved, and printed from the Internet:

- www.sick.com/DistanceGuard

Please note: This documentation may contain further technical data.

10.1 Features

Variant	TiM8xx DistanceGuard
Measurement principle	HDDM+
Application	Outdoor
Light source	Infrared (wavelength 850 nm, max. pulse power 880 mW, max. pulse width 5 ns, pulse frequency 1,500 kHz)
Laser class	1 (IEC 60825-1:2014, EN 60825-1:2014)
Aperture angle	270° (horizontal)
Scanning frequency	15 Hz
Angular resolution	0.33°
Working range	0.25 m ... 10 m

10.2 Performance

Variant	TiM8xx DistanceGuard
Response time	typ. 67 ms
Detectable object shape	Almost any
Systematic error	$\pm 60 \text{ mm}^1$
Statistical error	20 mm^1
Integrated application	DistanceGuard
Maximum number of people in the region of interest	20
Maximum surface area of the region of interest	235 m^2

¹ Typical value at room temperature and up to a sensing range of 10 m at 90% remission, real value depends on ambient conditions, temperature drift: 0.5 mm/K

10.3 Interfaces

Variant	TiM8xx DistanceGuard
Ethernet	TCP/IP Max. data transmission rate: 10 Mbit and 100 Mbit Length of cable: max. 100 m
USB	Type: Micro-USB Function: Diagnostics, Ethernet settings
Digital inputs	4 (reserved)
Digital outputs	4 (PNP; OUT1 = minimum distance undercut, OUT2 = maximum number of people exceeded, OUT3 = device overloaded, OUT4 = reserved), $I_{\text{out}} \leq 100 \text{ mA}$

Variant	TiM8xx DistanceGuard
Optical indicators	2 LEDs (on, "DistanceGuard Ready")
Configuration software	SOPASair web server, SOPAS ET (diagnostics, Ethernet settings)

10.4 Mechanics/electronics

Variant	TiM8xx DistanceGuard
Electrical connection	1 x Ethernet connection, 4-pin M12 female connector 1 x voltage supply connection, 12-pin M12 male connector 1 x micro USB female connector, type B
Supply voltage	9 V DC ... 28 V DC SELV and PELV acc. to IEC 60364-4-41
Power consumption	Typical 4 W with unloaded digital outputs Max. 16 W with 4 loaded digital outputs
Housing	Lower part: Aluminum die cast Optics cover: Polycarbonate with scratch-resistant coating
Housing color	Gray (RAL 7032)
Electrical safety	According to IEC 61010-1 (ed.3)
Enclosure rating	IP67 (IEC 60529:1989+AMD1:1999+AMD2:2013), only valid with closed "Aux interface" plastic cover
Protection class	III (IEC 61140:2016-1)
Weight	250 g, without connecting cables
Dimensions (L x W x H)	60 mm x 60 mm x 86 mm

10.5 Ambient data

Variant	TiM8xx DistanceGuard
Object remission	4% ... 1,000% (reflectors)
Electromagnetic compatibility (EMC)	IEC 61000-6-3:2006+AMD1:2010, IEC 61000-6-2:2005
Vibration resistance	Sine resonance scan: 10 Hz ...1,000 Hz (IEC 60068-2-6:2007) Sine test: 10 Hz ... 500 Hz; 5 g; 20 frequency cycles (IEC 60068-2-6:2007) Noise test: 10 ... 250 Hz; 4.24 grms, 5 h (IEC 60068-2-64:2008)
Shock resistance	50 g; 11 ms; 6 shocks/axis 25 g; 6 ms; 2,000 shocks/axis 50 g; 3 ms ; 10,000 shocks/axis (IEC 60068-2-27:2008)
Ambient temperature	Commissioning/switching on: -10 °C ... +50 °C Operation: -25 °C ... +50 °C Storage: -40 °C ... +75 °C
Ambient humidity	Operation: ≤ 80%, non-condensing Max 95%, non-condensing (EN60068-2-30:2005)
Ambient light immunity	80,000 lx
Altitude	< 5,000 m above sea level

Variant	TiM8xx DistanceGuard
Ambient conditions	Contamination level 3 outside the housing (EN 61010-1:2011-07)
Damp heat	25...55 °C air humidity 6 cycles (EN 60068-2-30:2005)
Temperature change	-25... 50 °C 10 cycles (EN 60068-2-14: 2009)

11 Accessories

**NOTE**

Accessories and where applicable mounting information can be found online at:

- www.sick.com/DistanceGuard
-

Support Portal

**NOTE**

In the SICK Support Portal (supportportal.sick.com, registration required) you will find, besides useful service and support information for your product, further detailed information on the available accessories and their use.

12 Annex

12.1 EU declaration of conformity/Certificates

The EU declaration of conformity and other certificates can be downloaded from the Internet at:

- www.sick.com/DistanceGuard

12.2 Licenses

SICK uses open source software which is published by the rights holders under a free license. Among others, the following license types are used: GNU General Public License (GPL version 2, GPL version 3), GNU Lesser General Public License (LGPL), MIT license, zlib license and licenses derived from the BSD license.

This program is provided for general use without warranty of any kind. This warranty disclaimer also extends to the implicit assurance of marketability or suitability of the program for a particular purpose.

More details can be found in the GNU General Public License. View the complete license texts here: www.sick.com/licensetexts. Printed copies of the license texts are also available on request.

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