TiM1xx

2D LiDAR sensors

SICK
Sensor Intelligence.

Described product

TiM1xx

Manufacturer

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Original document

This document is an original document of SICK AG.

Contents

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 instructions constitute an integral part of the product and are to be stored 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. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.

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.

1.3 Scope of delivery

Included with delivery:

- 2D LiDAR sensor
- Optional: Accessories

Supplied documentation:

- SafetyNotes

NOTE

All available documentation can be found online at

► **www.sick.com/TiM1xx**

2   Safety information

2.1   Intended use

The 2D LiDAR sensor TiM1xx is an intelligent sensor for invisibly detecting objects in areas (fields) to be monitored. It is designed for mobile or stationary use indoors in standalone operation, with a scanning range of up to 3 m (TiM10x) or 10 m (TiM15x).

The device features a configurable detection field, the shape of which can be freely defined. If the device detects that the field has been breached, it signals this at the digital output.

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 the documentation must be strictly observed.
- Shut down the product immediately in case of damage.

2.3   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

2.4   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.

2.5 Cybersecurity

Overview

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive cybersecurity concept. A suitable concept consists of organizational, technical, procedural, electronic, and physical levels of defense and considers suitable measures for different types of risks. The measures implemented in this product can only support protection against cybersecurity threats if the product is used as part of such a concept.

You will find further information at www.sick.com/psirt, e.g.:
- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

2.6 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.

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	▪ Basic practical technical training ▪ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	▪ Practical electrical training ▪ Knowledge of current electrical safety regulations ▪ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	▪ 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	▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment for the particular application

2.7 Operational safety and specific hazards

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

> ⚠️ **CAUTION**
> **Optical radiation: Class 1 Laser Product**
>
> 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.

It is not possible to entirely rule out temporary disorienting optical effects, particularly in conditions of dim lighting. Disorienting optical effects may come in the form of dazzle, flash blindness, afterimages, photosensitive epilepsy, or impairment of color vision, for example.

> ⚠️ **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 Product characteristics

Measurement principle

The device is an opto-electronic LiDAR sensor 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.
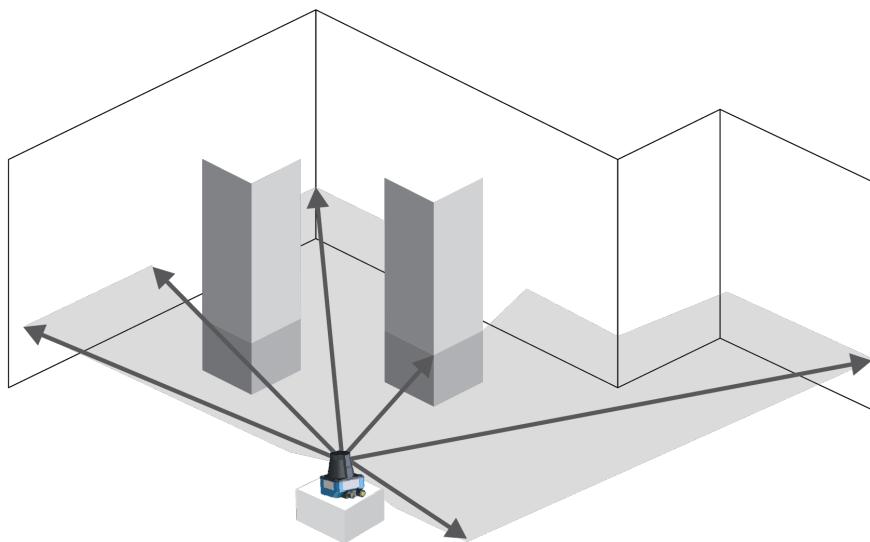

Figure 1: The 2D LiDAR sensor measurement principle

Range finding

The device emits beams pulsed by a laser diode. If a laser pulse hits an object or person, it is reflected on the surface of the object or person in question. The reflection is registered by a photosensitive element in the device receiver. The device uses SICK's own HDDM+ (High Definition Distance Measurement plus) technology. With this measurement process, a measured value is formed by evaluating multiple single pulses. The device calculates the distance from the object based on the elapsed time that the light requires between emitting the beam and receiving the reflection. Radar systems apply this "pulse time-of-flight measurement" principle in a similar way.

Direction measurement

The device uses a rotating mirror to deflect the emitted laser beams, thereby scanning its surroundings in a circular pattern. The measurements are triggered internally by an encoder in regular angle increments. The device has a scanning frequency of 14.5 Hz. The measuring procedure uses a histogram of multiple pulses to determine individual measured values.
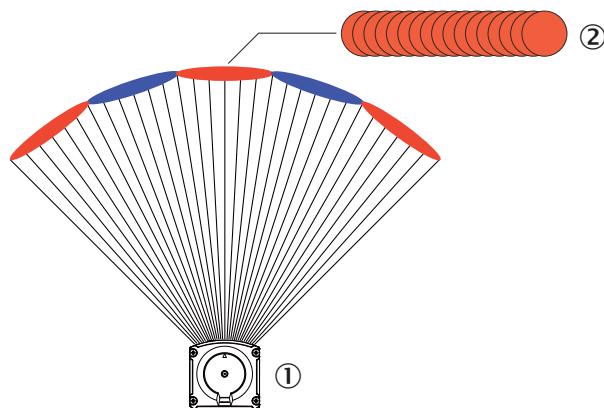
①   Device
②   Laser pulse

Spot diameter (mm) ①
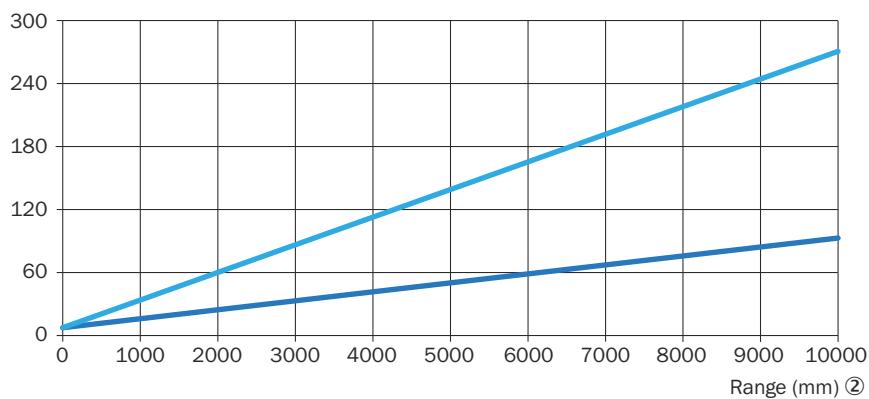
————   Spot diameter of a submeasuring point.
         Divergence 9 mrad, spot diameter on the front screen 6 mm ③

————   Elongation of the overlayed submeasuring points in direction of deflection
         at angle step 1°.
         Divergence 26.5 mrad, spot diameter on the front screen 6 mm ④

①   Spot diameter (mm)

②   Range (mm)

③   Spot diameter of a submeasuring point.

        Divergence 9 mrad, spot diameter on the front screen 6 mm

④   Elongation of the overlayed submeasuring points in direction of deflection at angle step 1°.

        Divergence 26.5 mrad, spot diameter on the front screen 6 mm

3.2   Particle filter

By using a digital particle filter to pre-process and optimize the measured distance values, the device can be tailored to the specific requirements of the respective application.

The particle filter blanks small, irrelevant reflection pulses in dusty environments which are caused by dust particles or the like. In doing so, successive scans are continuously evaluated in order to detect static objects.

> **NOTE**
> When using a particle filter, the measurement result is delayed by one cycle scan due to the additional calculation steps.

3.3 Setup and dimensions
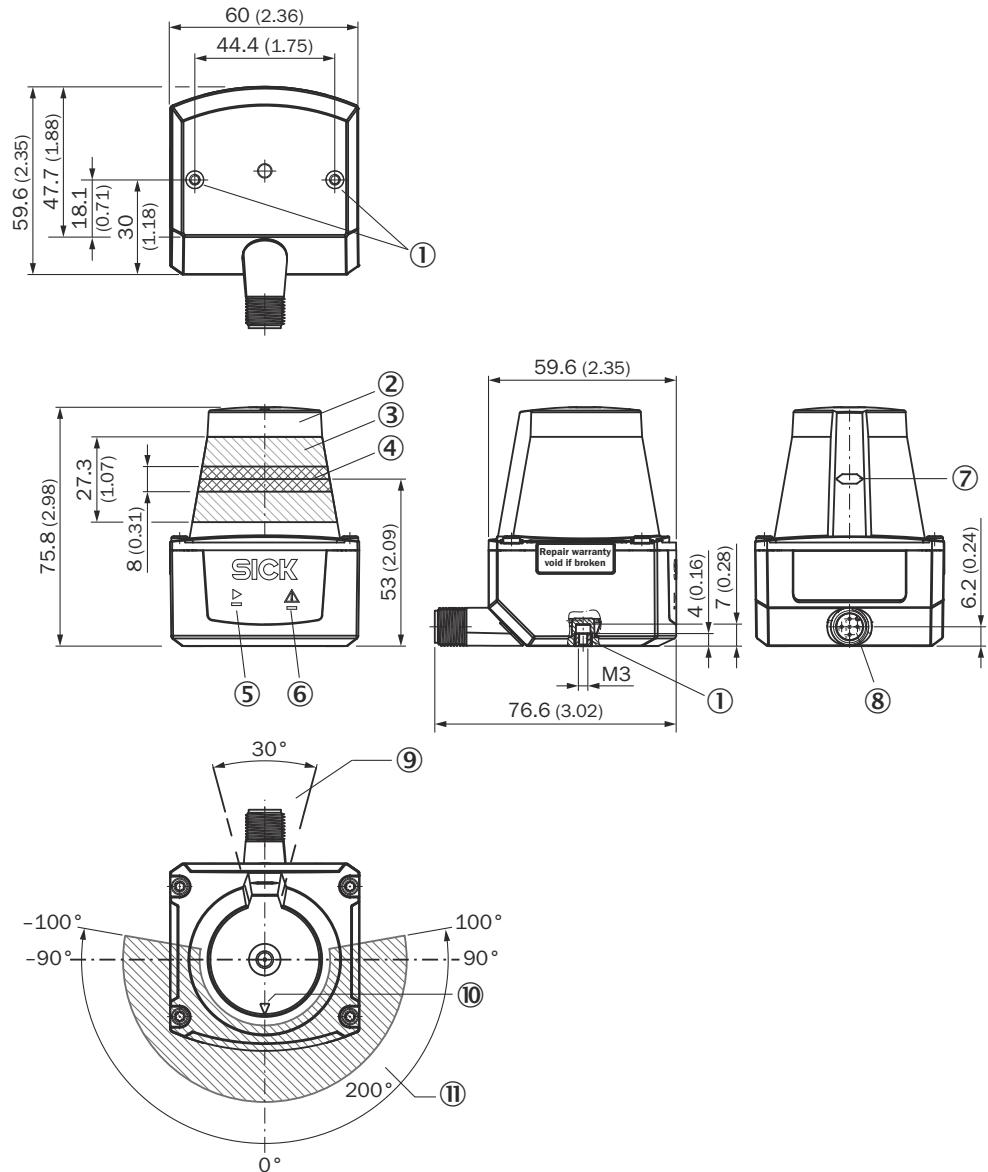
Figure 2: Setup and dimensions TiM1xx

① M3 threaded mounting hole, 2.8 mm deep (blind hole thread), tightening torque 0.7 Nm
② Optics cover
③ Receiving range (light inlet)
④ Transmission range (light emission)
⑤ Green LED
⑥ Red LED
⑦ Marking for the position of the light emission level
⑧ 5-pin M12 male connector, rotatable
⑨ Area in which no reflective surfaces are permitted when the device is mounted
⑩ Bearing marking to support alignment (0° axis)
⑪ 200° aperture angle (visual range)

3.4 Status indicators

Status indicators

Figure 3: Status indicators

①   Green LED

②   Red LED

LED (green)	LED (red)	Description
●	-	Device ready/monitoring mode
●	●	Field breach (if there are lots of field breaches in a short space of time, the red LED lighting up might look like flashing)
	☀ Light pattern: 1x long, 1x short	Service mode (e.g., firmware update, device diagnostics, parameter configuration)
-	● or ☀ Light pattern depending on error cause	Error, details see "Errors", page 30
-	-	Device without supply voltage

● = illuminated; ☀ = flashing

3.5 Product ID

Type label

The following information can be read from the type label on the device:
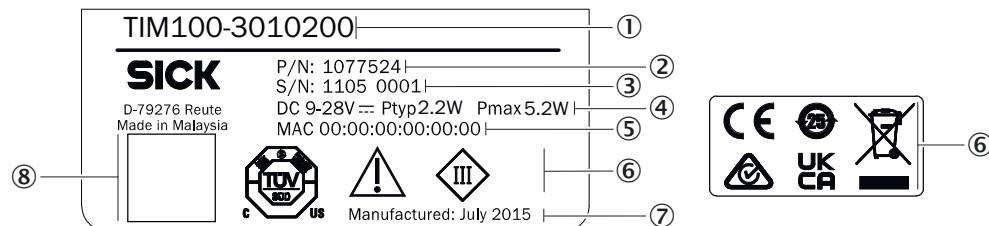
Figure 4: TiM1xx type label (example)

①   Type designation

②   Part number

③   Serial number

④   Electrical connections

⑤   MAC address

⑥   Conformity mark/certification mark

⑦   Production date

⑧   QR code with part number and serial number

4   Transport and storage

4.1   Transport

> **!**   **NOTICE**
> **Damage due to improper transport!**
>
> - The product must be packaged with protection against shock and damp.
> - Recommendation: Use the original packaging.
> - 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.

> **i**   **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

- Electrical connections are provided with a protective cap.
- Do not store outdoors.
- Store in a place protected from moisture and dust.
- Recommendation: Use the original packaging.
- 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 32.
- Relative humidity: see "Technical data", page 32.
- 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 34.
- 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 34). 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 13.
- 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 "Mounting multiple devices", page 17.
- 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.
- Do not subject the device to excessive shock or vibrations. In systems subjected to heavy vibrations, secure the fixing screws with screw-locking devices.

5.2   Mounting device

1. Mount the LiDAR sensor using the designated fixing holes, see "Setup and dimensions", page 13.

> **! NOTICE**
> **Risk of damage to 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. Observe the maximum screw-in depth.

2. Make the electrical connection. Attach and tighten a voltage-free cable, see "Electrical connection of the sensor", page 19 .
3. Switch on the supply voltage.
✓ The green operating LED lights up.
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.

5.3   Mounting multiple devices

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.
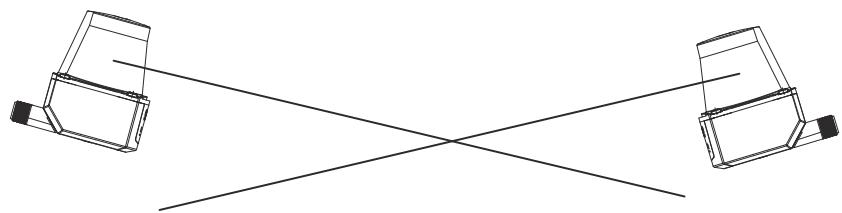
6 Electrical installation

6.1 Safety

> ⚠ **WARNING**
> **Personal injury due to improper supply voltage!**
>
> ▪ Only operate the device using safety extra-low voltage and safe electrical insulation as per protection class III.

> ❗ **NOTICE**
> **Equipment damage or unpredictable operation due to working with live parts.**
>
> Working with live parts may result in unpredictable operation.
>
> ▪ Only carry out wiring work when the power is off.
> ▪ Only connect and disconnect electrical connections when the power is off.

6.2 Electrical connection of the sensor

> ❗ **NOTICE**
> All electrical circuits must be connected to the device with safety extra-low voltage (SELV or PELV).
>
> Protect the device with an external 0.8 A slow-blow fuse at the beginning of the supply cable.

1. Ensure that the voltage supply is not connected.
2. Connect the device as shown in the connection diagram and electrical block diagrams.

brn	1	L+
wht	2	Q_2
blu	3	M
blk	4	IO-Link/Q_1
gra	5	In/MF
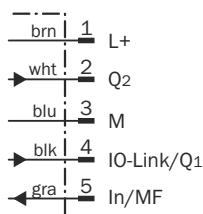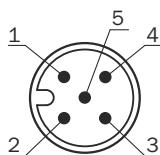
*Figure 5: Connection diagram TiM1xx, 5-pin male connector*

Table 2: Legend for connection diagram

Contact	Identification	Wire color	Description
1	L+	Brown	Supply voltage V_S
2	Q_2	White	Digital output 2
3	M	Blue	Supply voltage GND
4	IO-Link/Q_1	Black	IO-Link/digital output 1
5	In/MF	Gray	Input/multifunctional input

Electrical block diagrams
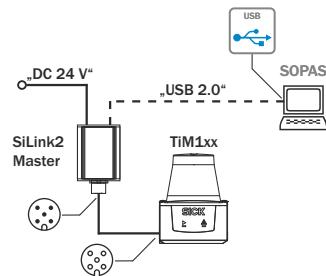
Figure 6: Electrical block diagram for configuration with SiLink2 Master
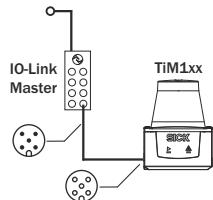
Figure 7: Electrical block diagram for configuration and operation with IO-Link Master

> **!** **NOTICE**
>
> If the max. current of the IO-Link Master is not limited to 1 A: Protect the device with an external 0.8 A slow-blow fuse.
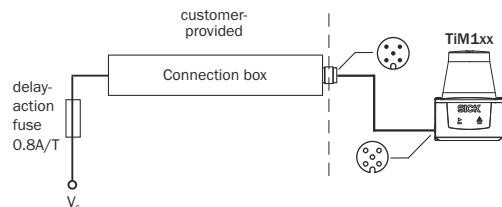
Figure 8: Electrical block diagram for operation with direct connection

Digital output PNP or NPN

> **!** **NOTICE**
>
> With NPN wiring, the digital output is already activated during the device initialization phase.
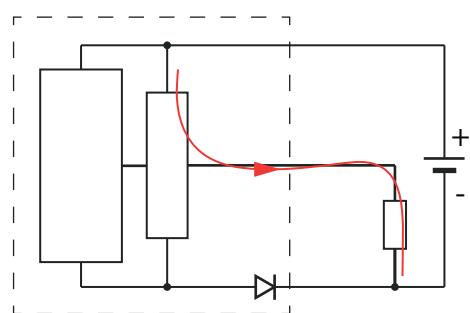
PNP   NPN
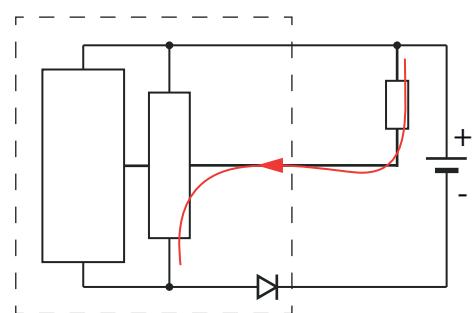
Figure 9: Connection example digital output

7 Operation

7.1 Operation via SOPAS ET

Version 3.3.3 and higher of the SOPAS Engineering Tool (SOPAS ET) software can be used for parameterization of the device and for service and diagnostic purposes.

The following components are needed for parameterization of the device:

- A computer with SOPAS ET installed and a free USB2.0-compatible port
- SICK SiLink2 Master (Order No. 1061790)
- Connection cable with M12 male and female connectors, 5-pin (e.g. Order No. 2096006)

Use the connection cable to connect the device to the SiLink2 Master and use the wall plug supplied to connect the SiLink2 Master to the power network. Use the USB cable supplied with the SiLink2 Master to connect it to the computer.

> **NOTE**
> The most up-to-date version of the SOPAS ET software can be downloaded from **www.sick.com/SOPAS_ET**. The respective system requirements for installing SOPAS ET are also specified there.

> **NOTE**
> To use SOPAS ET with the device, you need a device description file (*.sdd) for this device. You can install this in SOPAS ET using the device catalog. An Internet connection is required to install the file.

Following installation of the device description file, the device can be selected from the device catalog and added to a project.

A connection to the device is established via the IO-Link communication interface. The connection must be activated for data transmission (**online**).

Information about the device is displayed in the device window and the device can also be configured here (**Device**> **Open** menu).

The device window features various views supporting a selection of functions:

- **Start:** Display of information about the device (left-hand side) and display of the current scan (right-hand side).
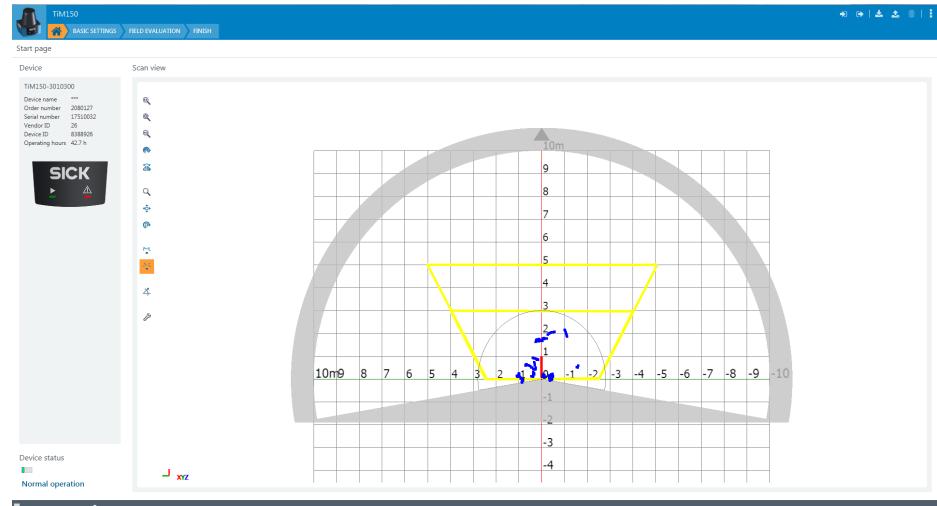
The scan view can be customized with the assistance of various tools (to the left of the scan view).

- **Basic settings:** Device parameters can be configured, available parameters depend on the device type.
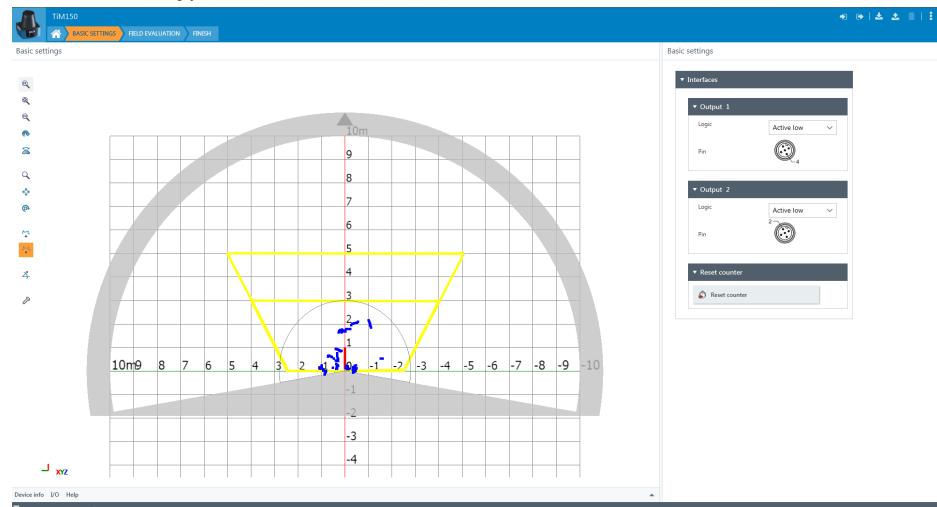
- **Field evaluation:** Scan display for adapting the field geometry (left-hand side) and entering detection parameters (right-hand side):
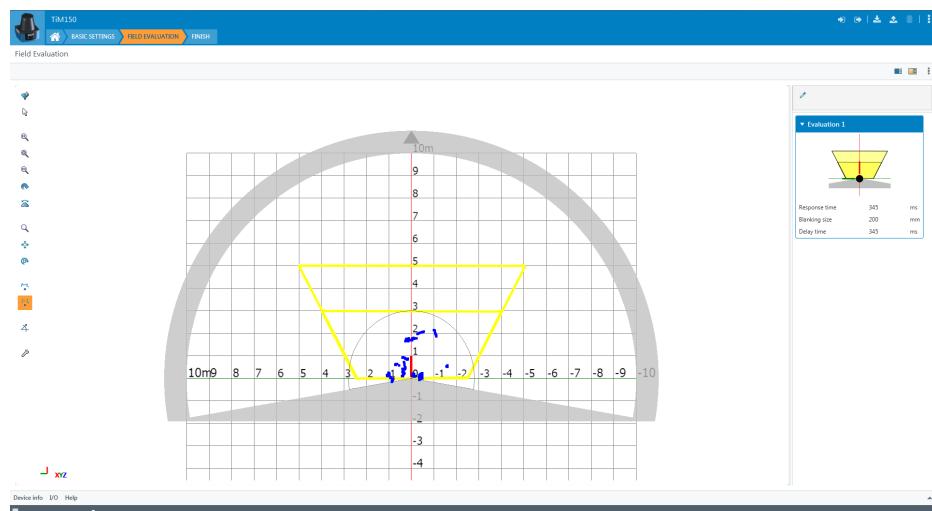
The **Edit field points** tool (mouse pointer in the list of tools to the left of the scan view) can be used to customize the field geometry with the assistance of the mouse pointer. Alternatively, the field vertices can also be customized by entering the coordinate values in the **Field coordinates** mask.

Table 3: Options for editing the field geometry with the mouse pointer

| Function	Procedure
Scale field	Drag square red handle.
Rotate field	Drag round black handle.
Customize field shape	Drag square green handle.
Add field vertices	Double-click in required position.
Delete field vertices	Click to select square green handle and press the [del] key.
Delete field	Press the [del] key without first selecting a green handle.
Insert new field	Select the **Insert field points** tool, click to set field vertices, and double-click last field vertex to close the field.

- **Complete:** Scan display (left-hand side) and buttons to finalize the device parameterization, report display and system diagnostics (right-hand side of the **Configuration** tab), along with text boxes to describe the configuration (right-hand side of the **Description** tab).

> **NOTE**
> The device requires a detection field to operate and will go into service mode if there is no detection field. Factory reset the device to restore the default detection field.

> **NOTE**
> Changes to parameters that are made in SOPAS ET are not saved automatically in the device. After you have completed the configuration, you must save it in the device permanently by pressing the **Save permanently** button.

7.2 Operation via IO-Link

The device can exchange process data and parameters via IO-Link. To do this, it is connected to a suitable IO-Link Master.

The IO-Link interface of the device has the following properties:

Table 4: Properties of the IO-Link interface

IO-Link specification	V 1.1

| Minimum cycle time	2.3 ms
Transmission rate	COM3 (230.4 kBaud)
Process data width	16-bit outgoing (from the sensor to the master)
Process data type	UINT (unsigned integer)
Parameter configuration server function (data storage)	Yes

7.2.1 Process data

Process data format:

- Reserved2 (8 bits) + device status (4 bits) + reserved1 (2 bits) + output Q_2 (1 bit) + output Q_1 (1 bit)

Numeric values for device status:

- 0 = Unknown State
- 1 = Start Up
- 2 = Service Mode
- 3 = Normal Operation
- 4 = Suspended Operation
- 5 = Service Recommended
- 6 = Service Required
- 7 = Recoverable Error
- 8 = Fatal Error

Record: 2 Byte								
Bitoffset								8
Byte 0	Reserved2	15	14	13	12	11	10	9	8
TypeSubIndex	Unsigned Integer 8							1

Bitoffset				4		2	1	0
Byte 1	Device Status	7	6	5	4 Reserved1	3	2 Output Q2	1 Output Q1	0
TypeSubIndex	Unsigned Integer 4			2 Unsigned Integer 2	3 Boolean	4 Boolean	5
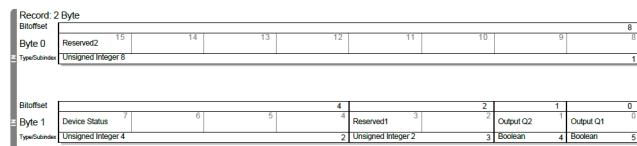
7.2.2 Device data

In addition to the process data, device data (parameters, identification data, and diagnostic information) can be transmitted to and from the device. To use this function, a sensor-specific device description file (IODD) is needed in the IO-Link Master.

A download package with the IODD and supplementary documentation (no. 8022616, German/English) is available at **www.sick.com/TiM1xx**.

7.3 Operation using teach-in

For the field evaluation application, it is possible to configure the device using the field teach-in function rather than configuring it via SOPAS ET. Configuration is performed by teaching in of the surrounding contour to automatically generate a field with any shape. Teach-in can be activated via an input circuit, via SOPAS ET or via IO-Link. By default, teach-in (EasyTeach) is activated via an input circuit using input IN5. Only one field may be taught-in at any one time. Default teach-in via EasyTeach is field 1.
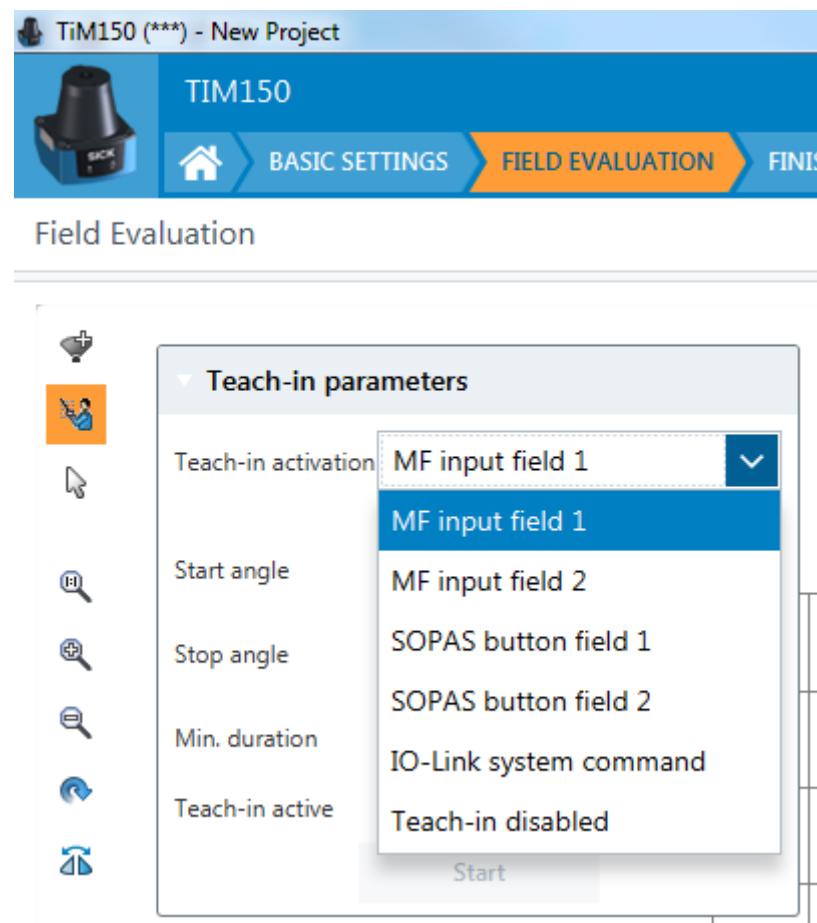
Figure 10: Teach-in activation options

7.3.1 Teach-in parameters

- The default teach-in angle range is -100° … 100°.
- The default teach-in duration is 30 s and the minimum duration is 10 s.
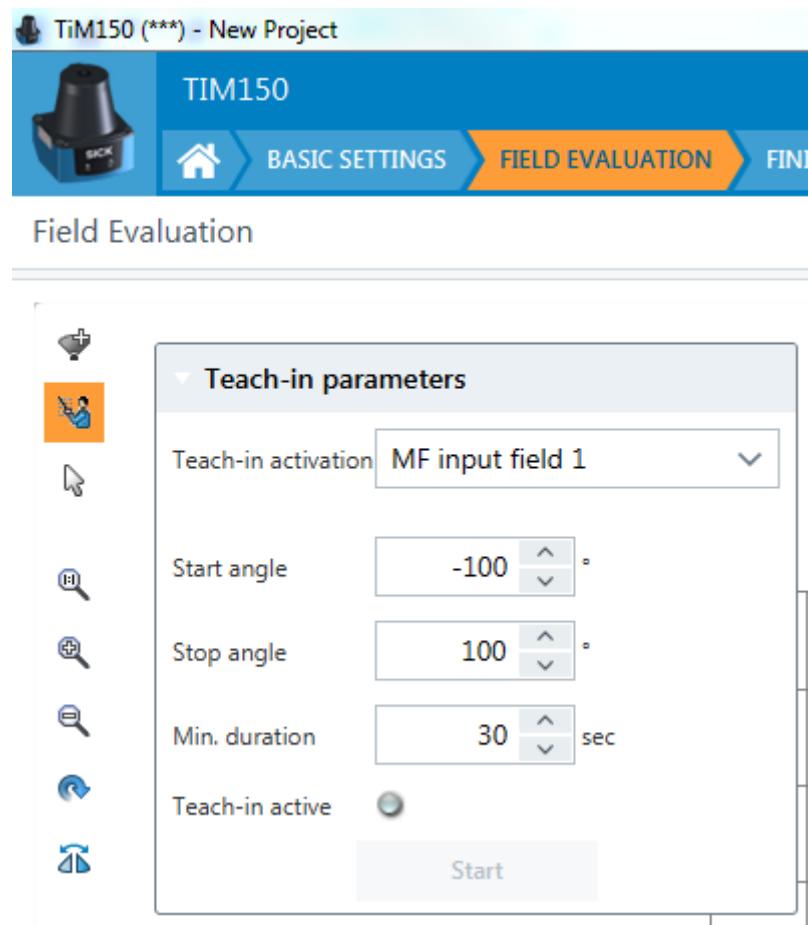
7.3.2 Preparations and procedure for teach-in

Preparations

- Remove all objects that will not permanently be in the field of view in monitoring mode.
- The field shape to be formed can be defined by pacing out the limits during the teach-in phase. It is important to make sure that the person can always be unequivocally detected.
- Distance yourself sufficiently from the device during the teach-in phase and do not enter the monitored area, so that you are not detected as part of the field contour.

Procedure

1. When teach-in is initiated, the green LED blinks for 15 seconds. This is the time window to clear the field of view of the device.
2. The device forms the field from the surrounding contour with a negative offset of 250 mm. Both the green and red LEDs are illuminated during this time.
3. The device stores the shortest value measured during the teach-in phase as a field limit for each angle. The green LED is blinking during this time and turns solid green when this step has been completed.

ℹ **NOTE**
A parameter upload is required in order to display the newly taught-in field contour in SOPAS ET.

For an example of field 1 and 2 after teach-in, see figure 11.
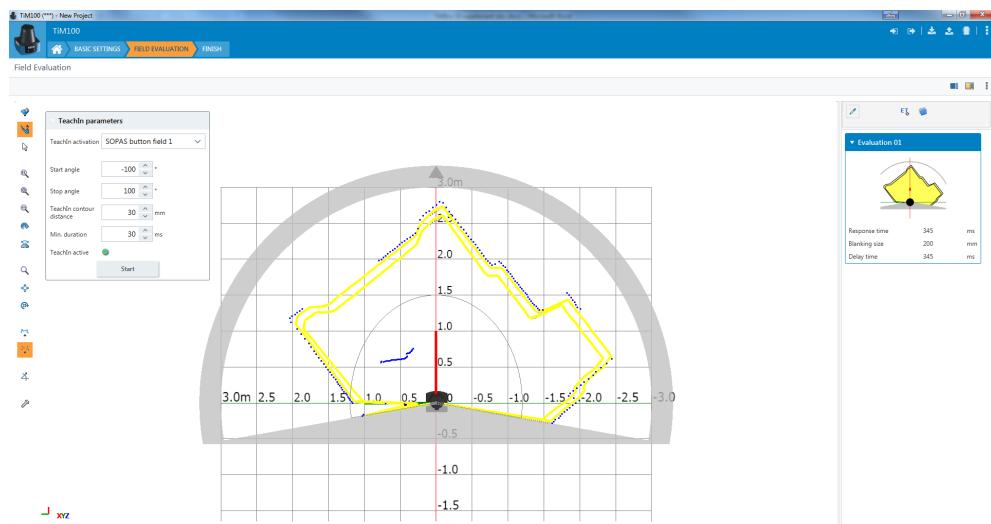
Figure 11: Field examples after teach-in

7.3.3 Field evaluation via input circuit

Configuration is performed by teach-in (EasyTeach) of the surrounding contour in order to automatically generate a field with any shape, including more complex shapes.

In the as-delivered configuration, the teach-in phase is activated and deactivated using the wiring for input IN5.

> **NOTE**
> Only one field may be taught-in at any one time. The default field is Field 1.

Preparing EasyTeach

- Remove all objects that will not permanently be in the field of view.
- Distance yourself sufficiently from the device during the teach-in phase and do not enter the monitored area, so that you are not detected as part of the field contour.

Teaching in the field contour

- The device forms the field from the surrounding contour with a negative offset of 250 mm.
- The field shape to be formed can be defined by pacing out the limits during the teach-in phase. It is important to make sure that the person can always be unequivocally detected.
- The device stores the shortest value measured during the teach-in phase as a field limit for each angle.

> **NOTE**
> A parameter upload is required to display the newly taught-in field parameters in SOPAS ET.

1. Install the device.
2. Carry out the EasyTeach wiring.
3. Set the EasyTeach input signal to start the teach-in phase (active high).
4. Define the field (e.g. using the existing surrounding contour or by pacing out the field).
5. Remove the EasyTeach input signal to end the teach-in phase (active high).
6. Thoroughly check correct detection of the field borders by performing a functional check in which field infringements are intentionally caused.

7.3.4 Field evaluation via SOPAS ET

The teach-in phase is activated via the SOPAS ET **Teach-In** button for field 1 and 2.

7.3.5 Field evaluation via IO-Link

Teach-in via IO-Link can be accomplished for a device that is connected to an IO-Link network.

- Set index 2 to a value of 65 to perform teach-in for field 1.
- Set index 2 to a value of 66 to perform teach-in for field 2.
- Set index 2 to a value of 225 to save the fields permanently in the device.

Standard command					
index dec (hex)		Access	Value	Name	Remark [Unit]
2 (0x02)	Standard command	Write-only	65	Determine Teach-point1 for Setpoint1	
			66	Determine Teach-point1 for Setpoint2	
			130	Restore Factory Settings	Load factory defaults
			225	Save Permanent	
			226	Reset Counter Output field 1	
			227	Reset result field 1	
			229	Reset Counter Output field 2	
			230	Reset result field 2	

8 Maintenance

8.1 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 cover at regular intervals and in the event of contamination with a lint-free lens cloth (part number 4003353) and plastic cleaning agent (part number 5600006). Rinse off coarse dirt first with water. The cleaning interval essentially depends on the ambient conditions.

8.2 Maintenance plan

The product does not require regular maintenance.

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

Table 5: 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 that all unused connections are sealed with protective caps.	Depends on ambient conditions and climate. Recommended: At least every 6 months.	Specialist

9 Troubleshooting

9.1 Errors

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

Errors are signaled by the red LED. The light pattern is determined by the cause of the error. When an error is being displayed by the red LED, the green LED is always off.

Table 6: Flashing pattern of the red LED in the event of an error

LED light pattern (red)	Cause of error/Rectification
1x long, 3x short	Device function faulty: Check ambient conditions (temperature, ambient light, vibration)
1x long, 5x short	Contact Service, device is still operational
1x long, 7x short	Contact Service, device is operational subject to restrictions
Long	Device malfunction: Disconnect the device from the supply voltage and restart. If malfunction persists: Contact Service.
Short	Contact Service

9.2 Detecting and displaying errors

Error memory

The device has an error memory where its internal error states are recorded. The content of the error memory is retained when the device is switched off and when the "Restore Factory Settings" function is used.

The SOPAS ET software can be used to create a diagnostics report containing error information (**Complete** view, **Configuration** tab, **Start Diagnosis** button).

9.3 Information for the service case

You should collect and write down the following device information ahead of time if you need to contact the manufacturer's service department:

- Information about the firmware version
- Information about the hardware
- Information about operating hours

The information can be called up in the SOPAS ET software (**Completion** view, **Device Info** tab).

9.4 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.

> **i** **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

9.5 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.

9.6 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

> **i** **NOTE**
> The relevant online product page for your product, including technical data, dimensional drawing, and connection diagrams, can be downloaded, saved, and printed from the Internet.
>
> The product page can be accessed via the **SICK Product ID: pid.sick.com**/{P/N}/{S/N}
>
> {P/N} corresponds to the part number of the product, see type label.
>
> {S/N} corresponds to the serial number of the product, see type label (if indicated).
>
> Please note: This documentation may contain further technical data.

10.1 Features

| Device type	TiM10x	TiM15x
Light source	Infrared (invisible; wavelength 850 nm; pulse length 2.5 ns; max. output power ≤500 mW)	Infrared (invisible; wavelength 850 nm; pulse length 2.5 ns; max. output power ≤1,500 mW)
Laser class	Class 1 Laser Product according to EN 60825-1:2014+A11:2021; IEC 60825-1:2014. Complies with 21CFR1040.10/11 except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No.56, dated May 8, 2019.	
Aperture angle	200°	
Angular resolution	1°	
Scanning frequency	14.5 Hz	
Working range	0.05 m … 3 m	0.05 m … 10 m
Sensing range with 10% remission	At least 1.2 m across enter aperture angle 1.5 m (0° axis)	at least 2.8 m across entire aperture angle 3 m (0° axis)

Sensing range diagram
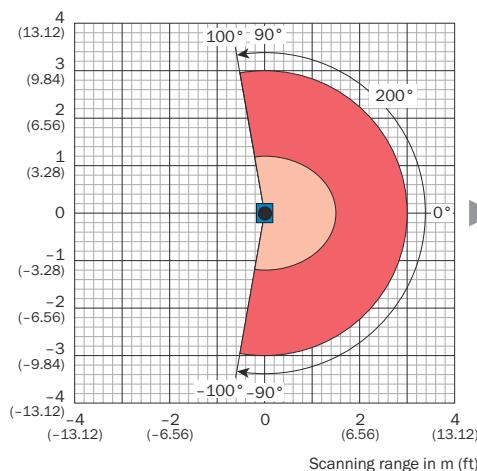
Figure 12: Sensing range diagram TiM10x
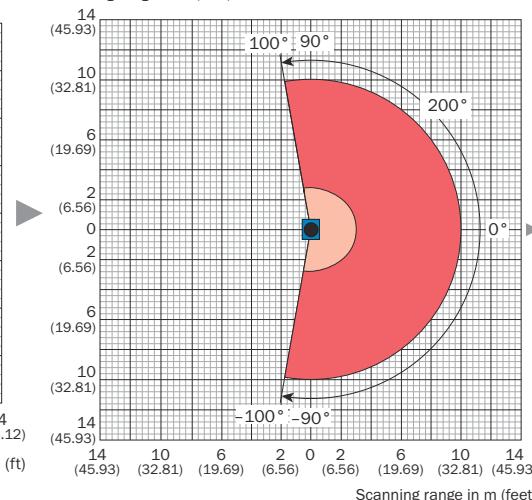
Figure 13: Sensing range diagram TiM15x

10.2   Performance

Device type	TiM10x	TiM15x
Response time	Typ. ≥ 70 ms	
Detectable object shape	Almost any	
Systematic error	± 50 mm [1]	± 40 mm [1]
Statistical error	20 mm [1]	30 mm [1]
Integrated application	Field evaluation	
Number of field sets	1 field set	
Simultaneous analysis cases	1 (2 fields)	1 (2 fields)
Scan field flatness	± 3°	

[1]   Typical value; actual value depends on ambient conditions

10.3   Interfaces

Device type	TiM10x	TiM15x
IO-Link	Function: AUX, configuration	
Digital inputs	1	
Digital outputs	2 (2 x push-pull: PNP/NPN, each ≤ 100 mA, not electrically isolated from the supply voltage)	
Delay time	70 ms … 30,000 ms (programmable)	
Optical indicators	2 LEDs (green, red)	

10.4   Mechanics/electronics

Device type	TiM10x	TiM15x
Supply voltage	9 V DC … 28 V DC	10 V DC … 28 V DC
Power consumption	Typ. 2.2 W, max. 5.2 W	Typ. 2.7 W, max. 8.5 W
Enclosure rating	IP 65 (IEC 60529:1989+AMD1:1999+AMD2:2013)	
Protection class	III (IEC 61140:2016-01)	
Weight	90 g, without connecting cables	122 g, without connecting cables
Dimensions (L x W x H)	see "Setup and dimensions", page 13	

10.5   Ambient data

Device type	TiM10x	TiM15x
Electromagnetic compatibility (EMC)	IEC 61000-6-3:2007-01 / IEC 61000-6-2:2005-08 / IEC 61000-6-1:2007-10	
Vibration resistance	IEC 60068-2-6:2007	
Shock resistance	IEC 60068-2-27:2008	
Ambient operating temperature	-10 °C … +50 °C	
Storage temperature	-30 °C … +70 °C	
Ambient light immunity	Indirect: 80,000 lx	Indirect: 30,000 lx

11 Accessories

> **NOTE**
>
> On the product page you will find accessories and, if applicable, related installation information for your product.
>
> The product page can be accessed via the **SICK Product ID: pid.sick.com**/{P/N}/{S/N}
>
> {P/N} corresponds to the part number of the product, see type label.
>
> {S/N} corresponds to the serial number of the product, see type label (if indicated).

12 Annex

12.1 Declarations of conformity and certificates

You can download declarations of conformity and certificates via the product page.

The product page can be accessed via the **SICK Product ID: pid.sick.com**/{P/N}/{S/N}

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

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