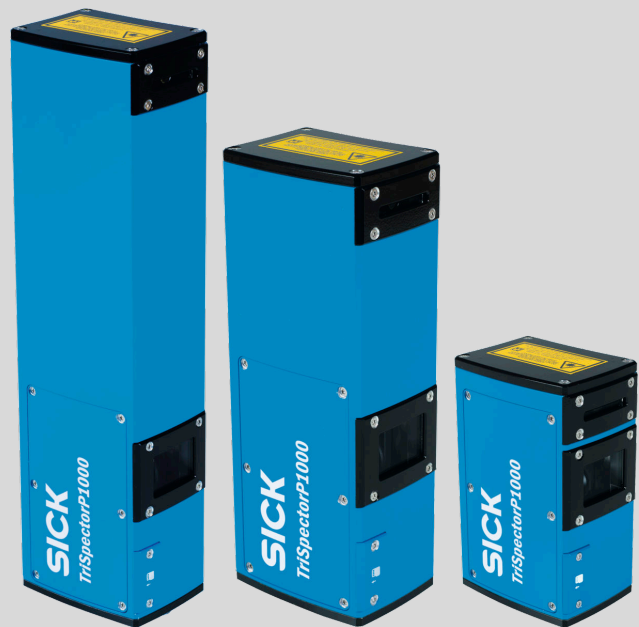# TriSpectorP1000

3D vision

SICK
Sensor Intelligence.

Described product

TriSpectorP1000

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

Legal information

Original document

This document is an original document of SICK AG.

Contents

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   Further information

> **NOTE**
> Further documentation for the device can be found on the online product page at:
>
> - **www.sick.com/TriSpectorP1000**
>
> There, additional information has been provided depending on the product, such as:
>
> - Model-specific online data sheets for device types, containing technical data, dimensional drawing, and specification diagrams
> - EU declarations of conformity for the product family
> - Dimensional drawings and 3D CAD dimension models of the device types in various electronic formats
> - Other publications related to the devices described here
> - Publications dealing with accessories

2 Safety information

2.1 Intended use

The TriSpectorP1000 is a programmable industrial 3D sensor that uses laser triangulation on objects to produce 3D images. The results are sent to a control system via external interfaces.

The device is programmed on a PC by using the development environment software SICK AppSpace. Depending on the application, a browser-based, graphical user interface (HMI) can be created, which provides opportunities defined by the application developer to influence an application at operator level. The device offers various interfaces for controlling, programming, and operating purposes, which can be activated as necessary via development environments, control systems (programmable logic controllers), or applications. However, configuration, programming, and control requires various technical skills, depending on how the device is connected and used.

The TriSpectorP1000 series is primarily designed for use in industrial and logistics areas, and it meets the requirements for industrial ruggedness, interfaces and data processing.

2.1.1 Operating restrictions

> **!** NOTICE
> **Radio interference may occur when the device is used in residential areas!**
>
> ▪ Only use the device in industrial environments (EN 61000-6-4).

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:
>
> ▪ Device should be used only in accordance with its intended use.
> ▪ All information in these operating instructions must be strictly observed.

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 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
- 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.

2.4.1 Programmable product

For programmable products, the respective programmer is responsible for his/her programming performance and the resulting working principle of the product.

The liability and warranty of SICK AG is limited to the product specification (functionality and any programming interfaces) according to the agreed conditions.

Therefore, SICK AG is not liable, among other things, for damages that are caused by programming of the customer or third parties.

2.5 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.

2.5.1 Exception: temporarily opening the cover on the device

The user may open the housing only in order to obtain temporary access to the slot for the optional memory card. For this purpose, the corresponding card slot cover can be opened temporarily.

In open state, the device does not conform to a specified enclosure rating. The device must be protected appropriately against moisture and dust. To ensure compliance with the specified IP67 enclosure rating, see see "Mounting a microSD memory card", page 18

For further warranty provisions, see the General Terms and Conditions of SICK AG, e.g. on the delivery note of the device.

2.6   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** .

2.7   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	- 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 - Knowledge of the programming of image-processing systems and network components

Activities	Qualification
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

2.8 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.

The product is fitted with LEDs in risk group 0. The accessible radiation from these LEDs does not pose a danger to the eyes or skin.

If the product is operated in conjunction with external illumination systems, the risks described here may be exceeded. This must be taken into consideration by users on a case-by-case basis.

⚠️ **CAUTION**
Optical radiation: Laser class 2

The human eye is not at risk when briefly exposed to the radiation for up to 0.25 seconds. Exposure to the laser beam for longer periods of time may cause damage to the retina. The laser radiation is harmless to human skin.

- Do not look into the laser beam intentionally.

- Never point the laser beam at people's eyes.

- If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.

- Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.

- 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 System overview

The TriSpectorP1000 creates 3D images of objects by laser triangulation. This means that the object is illuminated with a laser from one direction, and the camera acquires an image of the laser line from another direction.

Each acquired image contains a height profile, which corresponds to a cross-section of the object. By making a scan, which means collecting height profiles across the object while it moves, a complete 3D image can be acquired.
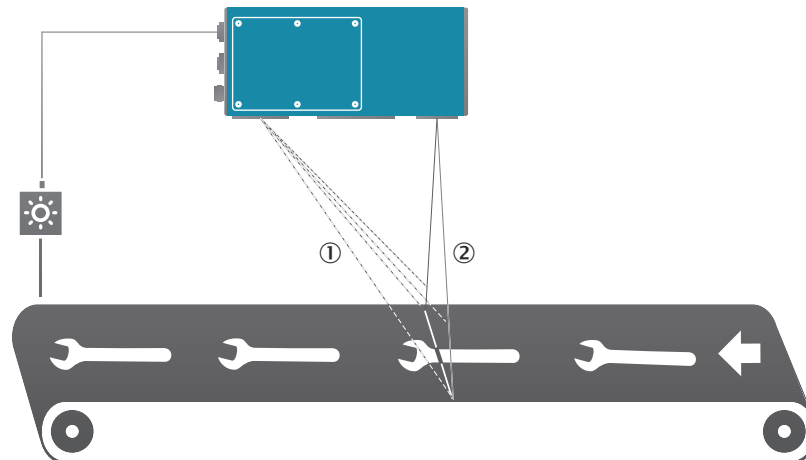
Figure 1: Laser triangulation principle

① Field of view
② Laser

Figure 2: Height profile
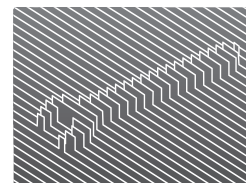
Figure 3: 3D image

Definitions

The **3D image**, which is also called heightmap or range data, contains all the acquired height profiles.

The **reflectance** is the reflected intensity along the laser line. The reflectance and the heightmap are acquired in parallel.

3.2 Scope of delivery

The delivery of the device includes the following components:

Table 2: Scope of delivery

Item	Component	Comments
1	Device in the version ordered	Depending on version
1	Set of class 2 laser warning labels in German/US English and French/US English	Self-adhesive to be applied over the warning label on the housing of the device (if necessary)

Item	Component	Comments
1	Printed safety notes, multilingual	Short information and general safety notes

Accessories

Accessories, such as brackets and connecting cables, are only supplied if ordered separately (see "Accessories", page 47).

3.3   Device variants

The device is available with three different field of view (FoV) sizes and two different window materials. PMMA is a plastic material used as an alternative material to glass in food processing environments.

Table 3: TriSpectorP1008 (Small FoV)

Window material	No.
Glass	1091322
PMMA	1091318

Table 4: TriSpectorP1030 (Medium FoV)

Window material	No.
Glass	1091321
PMMA	1091319

Table 5: TriSpectorP1060 (Large FoV)

Window material	No.
Glass	1091323
PMMA	1091320

3.4   System requirements

- Operating system: Windows 10
- Intel Core I5 540M, 2.53 GHz
- 4GB RAM
- 1024x768 resolution
- Graphics card: Intel® HD Graphics Video Card (or NVIDIA® NVS 3100M 512MB gDDR3)
- 450 MB free hard disk space
- Ethernet: 100 Mbit/s or better
- Hard drive: Minimum 550 MB
- Support for OpenGL 2.0 or higher
- Supported web browsers: Google Chrome (recommended due to advanced support of WebGL and WebSockets)
- SD memory card (optional): SICK microSD memory card (part no 4051366 and 4077575) or any SDHC card
- A mouse with at least three buttons (or a scroll wheel) is recommended

3.5   SICK AppSpace

The TriSpectorP1000 product family is part of the SICK AppSpace ecosystem, which consists of software tools and programmable sensors or devices. See figure 4 for an overview of SICK AppSpace.
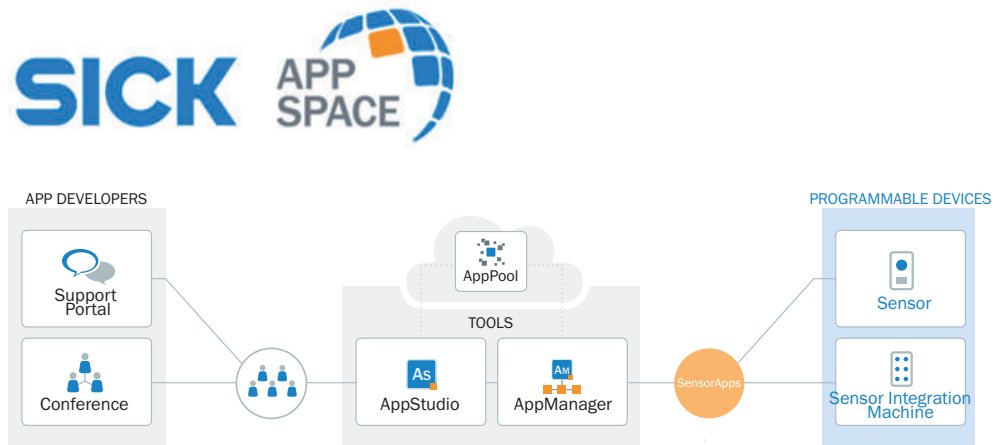
Figure 4: SICK AppSpace

SICK AppSpace includes the following components and resources:
- SICK AppManager: A software tool used for the installation and management of SensorApps and device firmware updates.
- SICK AppPool: A cloud-based repository for storing and sharing SensorApps. SICK AppPool can be accessed directly from SICK AppManager, SICK AppStudio and from the web.
- SICK AppStudio: A Software Deployment Kit (SDK) for developing SensorApps on programmable SICK devices. Its user interface for machine operators can be created individually as a web GUI.
- The SICK Support Portal (supportportal.sick.com) contains tutorials and instructions for programming the TriSpectorP1000 in SICK AppStudio.

For more information about downloading SensorApps and programming the device, see "Commissioning", page 34.

For more information about SICK AppSpace, see www.sick.com/SICK_AppSpace.

3.6 Dimensional drawings

> **ⓘ NOTE**
> The dimensional drawings can also be downloaded as CAD files from the online product page:
> www.sick.com/TriSpectorP1000
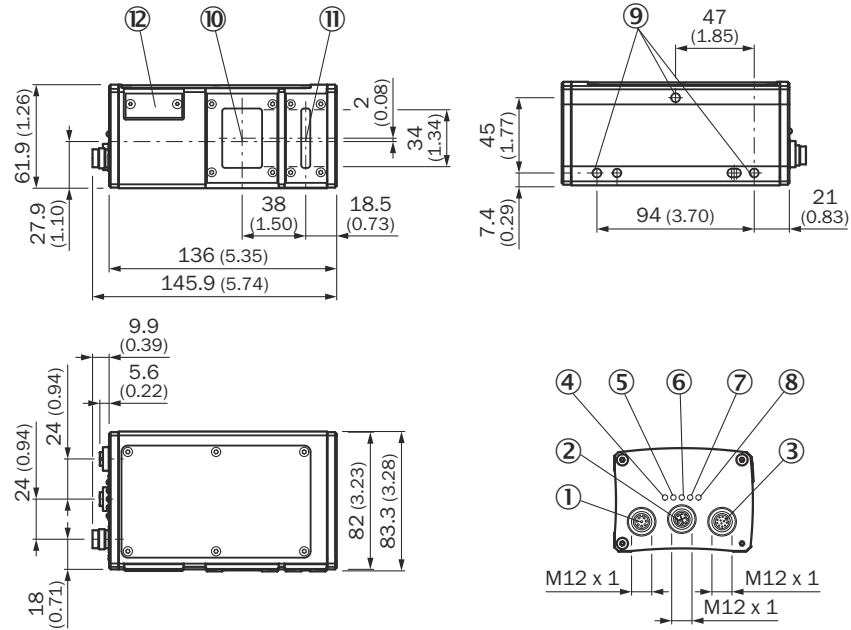
TriSpectorP1008

① Connector Encoder (thread inside)
② Connector Gigabit Ethernet (Gig E)
③ Connector Power I/O (thread outside)
④ LED: On
⑤ LED: State
⑥ LED: Link/Data
⑦ LED: Result
⑧ LED: Laser
⑨ Fastening threads (M5x8.5 length)
⑩ Optical receiver (center)
⑪ Optical sender (center)
⑫ SD-card

TriSpectorP1030
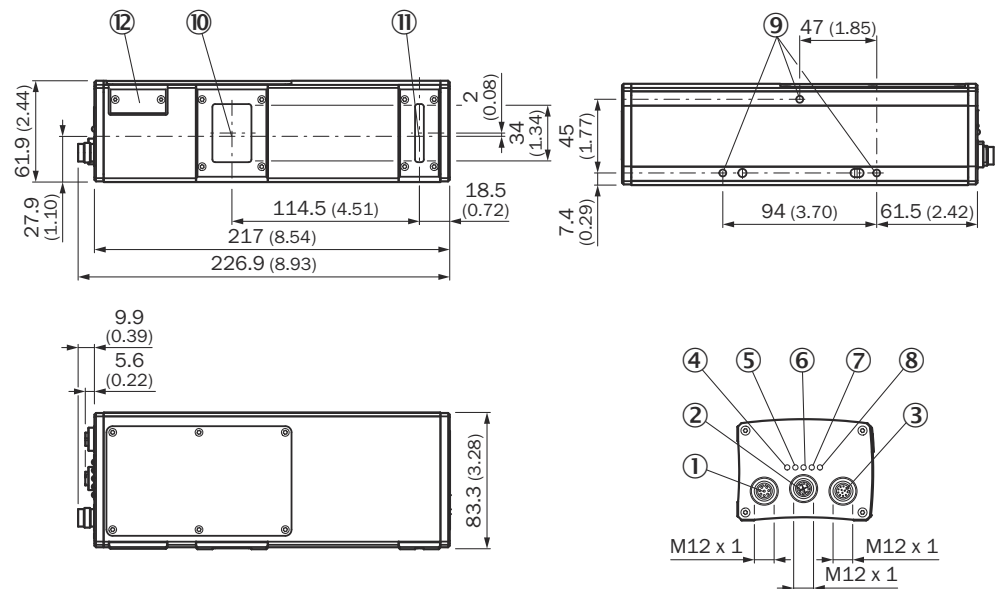
①   Connector Encoder (thread inside)
②   Connector Gigabit Ethernet (Gig E)
③   Connector Power I/O (thread outside)
④   LED: On
⑤   LED: State
⑥   LED: Link/Data
⑦   LED: Result
⑧   LED: Laser
⑨   Fastening threads (M5x8.5 length)
⑩   Optical receiver (center)
⑪   Optical sender (center)
⑫   SD-card

TriSpectorP1060
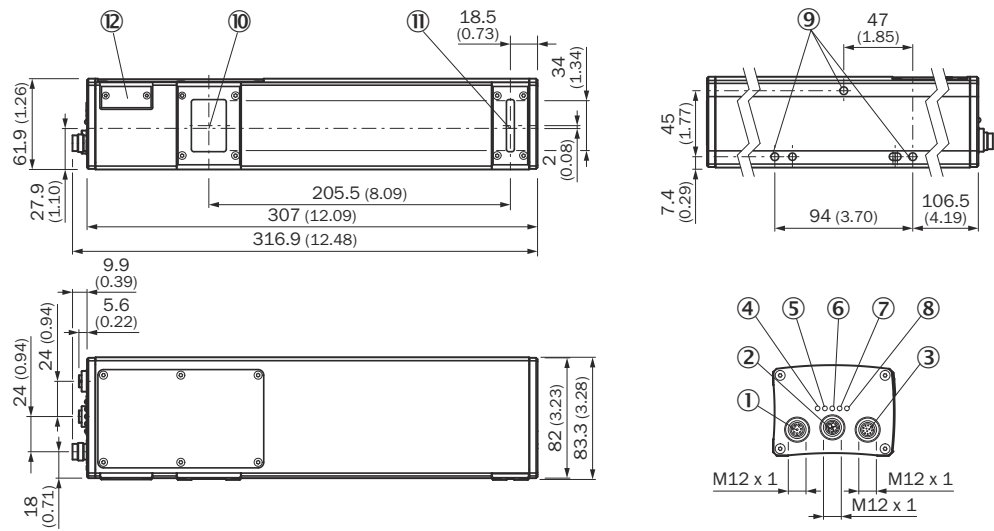
①   Connector Encoder (thread inside)
②   Connector Gigabit Ethernet (Gig E)
③   Connector Power I/O (thread outside)
④   LED: On
⑤   LED: State
⑥   LED: Link/Data
⑦   LED: Result
⑧   LED: Laser
⑨   Fastening threads (M5x8.5 length)
⑩   Optical receiver (center)
⑪   Optical sender (center)
⑫   SD-card

3.7   LED indicators

Name	Color	Function
On	🟢 Green	Power on
State	🟢 Green	Ready for trig input and image acquisition
Link/Data	🟢 Green	Gigabit Ethernet (Gig E) Link: LED on Activity: LED blink

Name	Color		Function
Result	🟢	Green	Programmable
	🔴	Red	Programmable
	🔵	Blue	Programmable
		No light	Programmable
Laser	🟢	Green	Laser on

3.8 TriSpectorP1000 variants

TriSpectorP1000 is available with three different field of view (FoV) sizes and two different window materials: glass and PMMA plastics. See the table below for part numbers.

Table 6: TriSpector1008 (Small FoV)

Variant	Glass	PMMA
TriSpectorP1008 (Small FoV)	1091322	1091318
TriSpectorP1030 (Medium FoV)	1091321	1091319
TriSpectorP1060 (Large FoV)	1091323	1091320

3.9 Mounting a microSD memory card

The TriSpectorP1000 has a card slot integrated in the housing. This slot accommodates a memory card in microSD format.

> **!** **NOTICE**
> The screws for the microSD memory card lid must be tightened with a torque of 0.3 Nm to keep the IP67 classification.

Follow the steps below to insert or remove a microSD memory card. The microSD memory card slot is located next to the camera window.

1. Release the two screws to remove the lid.
2. Insert or remove the microSD memory card.
3. Re-mount the lid and tighten the screws with a torque of 0.3 Nm.

For a specification of supported microSD memory cards, .

3.9.1 Conditions for specified enclosure rating

To ensure compliance with the specified IP67 enclosure rating of the device during operation, the following requirements must be met: If these requirements are not met, the device does not fulfill any specified enclosure rating.

- The cables plugged into the two electrical M12 connections must be screwed on tightly.
- Any electrical M12 connections (Ethernet connection) that are not being used must be sealed with a tightly-fastened protective cap (as in the delivery condition).
- The black cover (flap) on the rear of the device must be flush with the device and screwed tight.

> **!** **NOTICE**
>
> **Operate the device with open card slot cover only for a short time for the following tasks as required:**
>
> - Inserting or removing the optional memory card
>
> During this time, protect the device against moisture and dust.

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.
- To avoid ingress of dust and water, only remove the protective caps of the electrical connections just before attaching the connecting cable.

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

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 44.

- Relative humidity: see "Technical data", page 44.
- 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.
- 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.
- 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 47.
- Use a stable bracket with sufficient load-bearing capacity and suitable dimensions for the device.
- Ensure that the device has a clear view of the object to be detected.
- Protect the device from moisture, contamination, and damage.
- Ensure a sufficient level of cooling using ambient air/convection and/or heat dissipation through mechanical mounting. Observe the permitted operating temperature, see "Technical data", page 44.

5.2 Mounting the device

Mount the device in a position above the surface to be scanned. See "Field of view diagrams", page 22 for field of view diagrams and mounting distances. The default scan direction is shown in figure 5. If a scan is performed in the opposite direction, the acquired image will be mirrored.
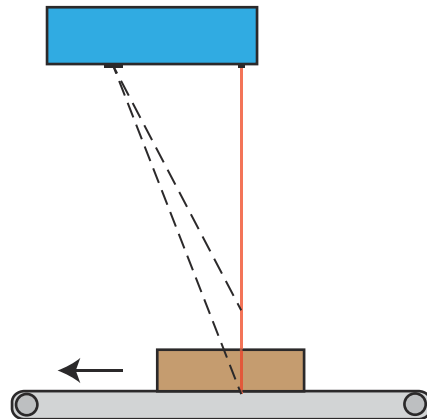
Figure 5: Mounting position

5.3 Field of view diagrams

The maximum guaranteed image acquisition area in mm (inch) is shown for each device variant. The brighter areas represent typical image acquisition areas.

TriSpectorP1008

H		56 (2.20)
40 (1.57)		60 (2.36)
65 x 15 (2.56 x 0.59)		
W	75 (2.95)	

Typical field of view ①

TriSpectorP1000

Y = Max. height range ②
X = Width at max.
     working distance ③

TriSpectorP1030

H		141 (5.55)
90 (3.54)		400 (15.75)
270 x 100 (10.63 x 3.94)		
W	330 (12.99)	

TriSpectorP1008
TriSpectorP1030
TriSpectorP1060

TriSpectorP1060

H		291 (11.46)
180 (7.09)		800 (31.50)
540 x 200 (21.26 x 7.87)		
W	660 (25.98)	

Y

X

Figure 6: Field of view diagrams

①   Typical field of view
②   Maximum height range
③   Width at maximum working distance

5.4   Replacing the windows

The laser window and the camera window on the device are replaceable and available as spare parts. Each spare part contains one window (in glass or PMMA) and four screws.

Figure 7: Laser (sender) window to the left, camera (receiver) window to the right

The following spare parts are available:

Glass windows
- Laser window: 2078269
- Camera window: 2078266

PMMA windows
- Laser window: 2078268
- Camera window: 2078267

Mounting instructions

General:
- Switch off the power to the device before replacing the window.
- At delivery, the PMMA spare part windows are sealed with a white protective foil. Remove the foil before replacing the window.
- Replace the window in a clean area, to avoid getting dust or dirt inside the camera housing.

To keep the IP67 classification:
- Make sure that the protective seal around the window is correctly re-assembled.
- Tighten the screws with a torque of 0.7 - 0.8 Nm.

5.5 Mounting an external trigger sensor (optional)

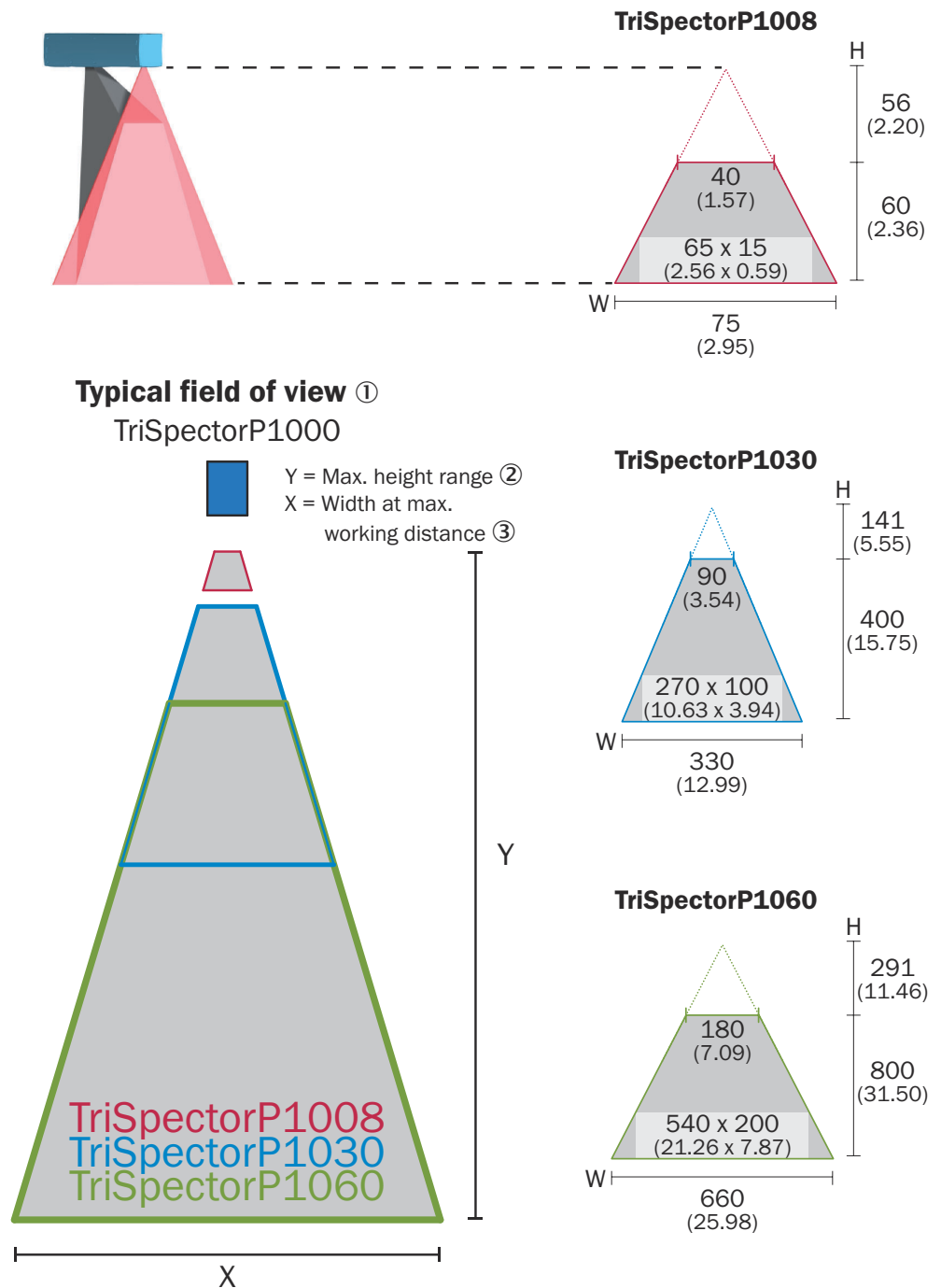If the device is triggered by an external trigger sensor, it is recommended to place the trigger sensor beyond the device (see left image).

Place the trigger sensor so that the distance b between the trigger sensor and the device is smaller than the distance a between the device and the part of the object to be inspected Adjust the mounting location of the external trigger sensor so that the correct part of the object is inspected when the object activates the trigger sensor (see left image).

The API contains functionality for delaying the external trigger signal. For SensorApps where this functionality is implemented, the sensor can delay the external trigger signal so that the mounting of the external trigger is more flexible (see right image).

6 Electrical installation

6.1 Wiring instructions

> **NOTE**
> Pre-assembled cables can be found online at:
>
> - www.sick.com/TriSpectorP1000

> **NOTICE**
> **Faults during operation and device or system defects!**
> Incorrect wiring may result in operational faults and defects.
>
> ▪ Follow the wiring notes precisely.

Recommendation: use shielded cables.

The 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.

Configure the circuits connected to the device as ES1 circuits or as SELV circuits (SELV = Safety Extra Low Voltage). The voltage source must meet the requirements of ES1 and PS2 (EN 62368-1) or SELV and LPS (EN 60950-1).

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.

In the case of open end cables, make sure that bare wire ends do not touch. Wires must be appropriately insulated from each other.

If the supply voltage for the device is not supplied via the CDB650-204 connection module, the device must be protected by a separate slow-blow fuse at the start of the supply circuit. The required fuse rating (nominal value) is maximum 2 A slow-blow.

Shielding requirements

- To ensure a fault-free data transmission, an effective and comprehensive shielding solution must be implemented.
- Apply a cable shield at each end, i.e. in the control cabinet and at the device. The cable shield of the pre-assembled cables is connected to the knurled nut and thus also to a large area of the device housing.
- The cable shield in the control cabinet must be connected to a large area of the signal ground.
- Take appropriate measures to prevent equipotential bonding currents flowing through the cable shield.
- During installation, pay attention to the different cable groups. The cables are grouped into the following four groups according to their sensitivity to interference or radiated emissions:
    - Group 1: cables very sensitive to interference, such as analog measuring cables
    - Group 2: cables sensitive to interference, such as device cables, communication signals, bus signals

- o Group 3: cables that are a source of interference, such as control cables for inductive loads and motor brakes
- o Group 4: cables that are a powerful source of interference, such as output cables from frequency inverters, welding system power supplies, power cables
- ▶ Cables in groups 1, 2 and 3, 4 must be crossed at right angles (see figure 8).
- ▶ Route the cables in groups 1, 2 and 3, 4 in different cable channels or use metallic separators (see figure 9 and see figure 10). This applies particularly if cables of devices with a high level of radiated emission, such as frequency converters, are laid parallel to device cables.
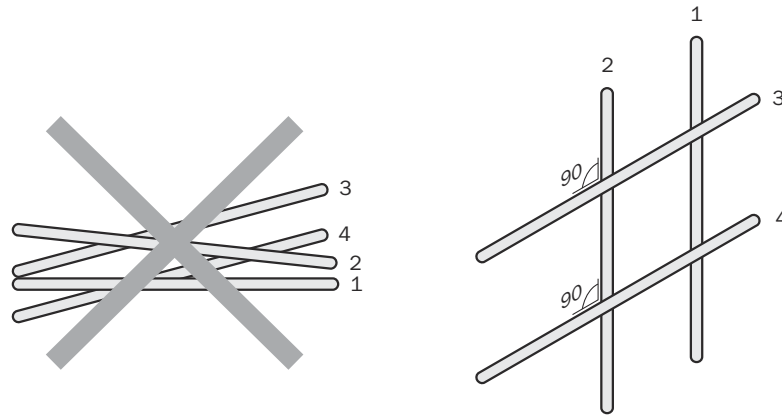

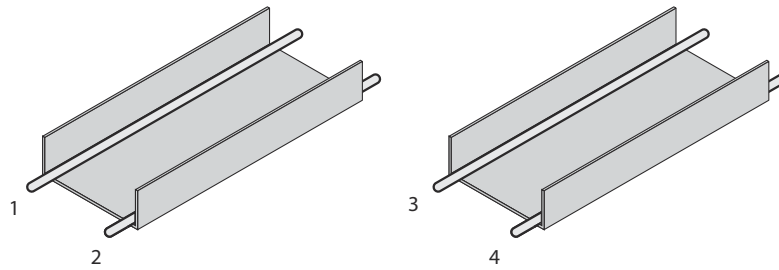*Figure 8: Cross cables at right angles*

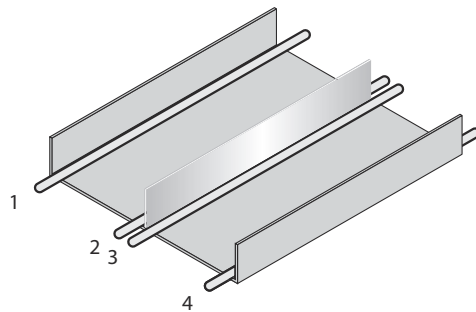*Figure 9: Ideal laying – Place cables in different cable channels*

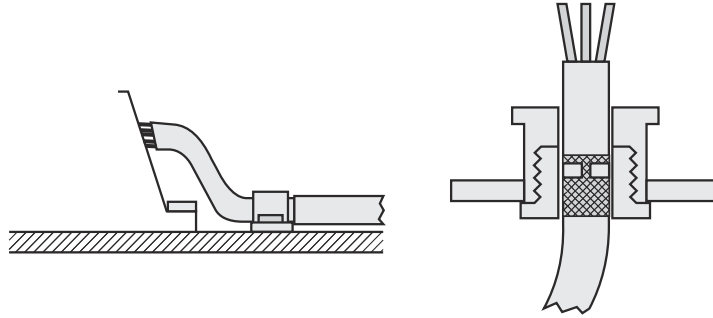*Figure 10: Alternative laying – Separate cables with metallic separators*

Figure 11: Shield connection in plastic housings

> **ⓘ NOTE**
> Use an appropriate earthing method to prevent equipotential bonding currents flowing through the cable shield. If necessary, ground currents on the EtherNet/IP cabling can be prevented by using an EtherNet/IP adapter (part no. 2044264).

6.2 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
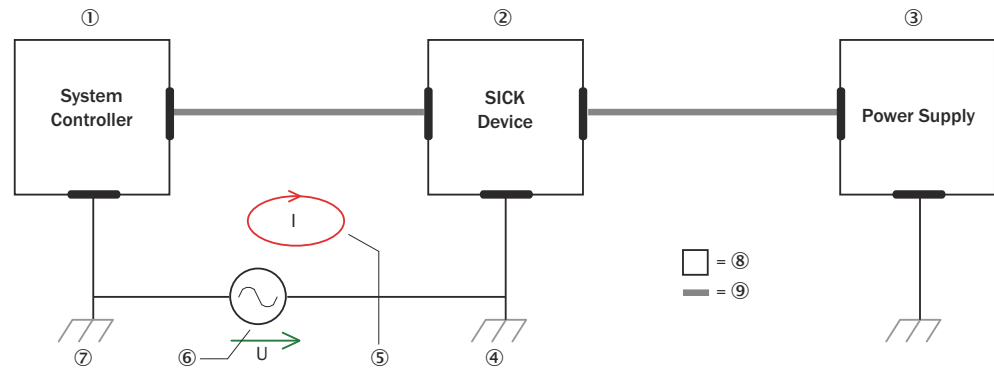
Figure 12: Example: Occurrence of equipotential bonding currents in the system configuration

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.

□ = ⑦   ▬ = ⑧   — = ⑨
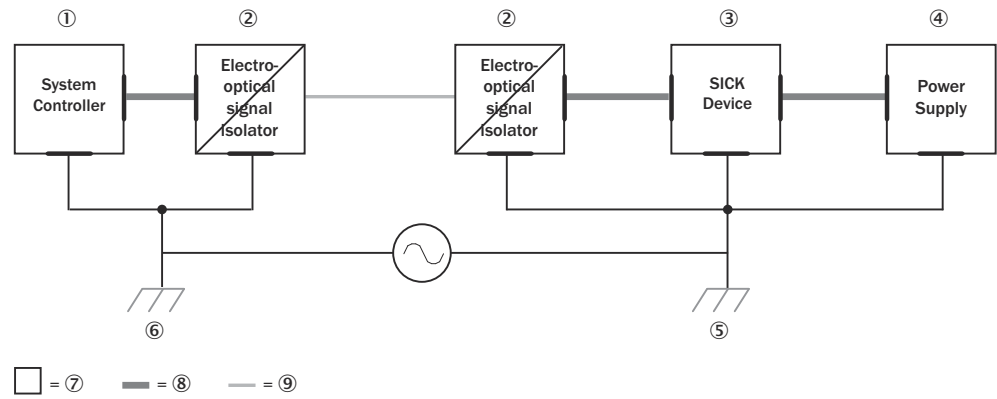
Figure 13: Example: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators

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.

□ = ⑨   ▬ = ⑩
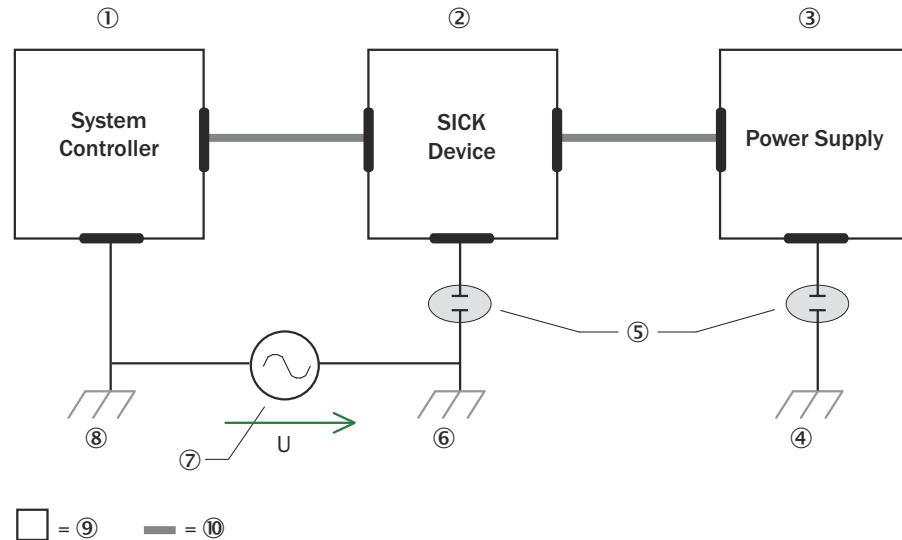
Figure 14: Example: Prevention of equipotential bonding currents in the system configuration by the insulated mounting of the device

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.

6.3   Connection diagram
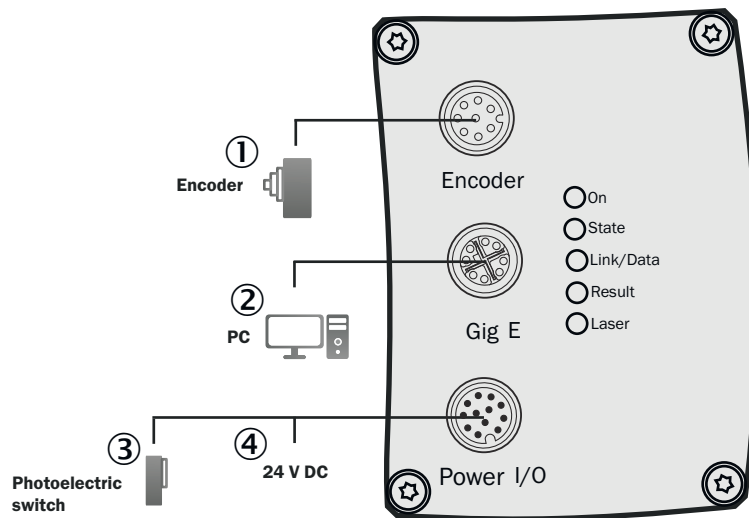
Figure 15: Connection diagram

①   Encoder

②   PC/Network

③   Photoelectric switch

④   24 V DC, voltage supply

6.4   Encoder

> **!** **NOTICE**
> It is strongly recommended to use an encoder for measuring applications, such as shape measuring and volume measuring. If no encoder is used, analysis results may be inaccurate due to object traversing speed variations.

The encoder must fulfill the following requirements:

- The encoder must be an incremental encoder.
- The encoder must have a RS-422/TTL interface. In the case of strong magnetic fields in proximity to the TriSpectorP1000, use a recommended encoder (no. 1068997) to ensure optimal performance.
- The connection requires two encoder channels (A/A⁻ and B/B⁻) to keep track of movement and direction.

6.4.1   Encoder modes

The forward scanning direction is defined as a clockwise encoder shaft movement, as seen from the tip of the shaft. There are five encoder pulse counter-modes: positive/negative movement, forward/backward movement and bidirectional.
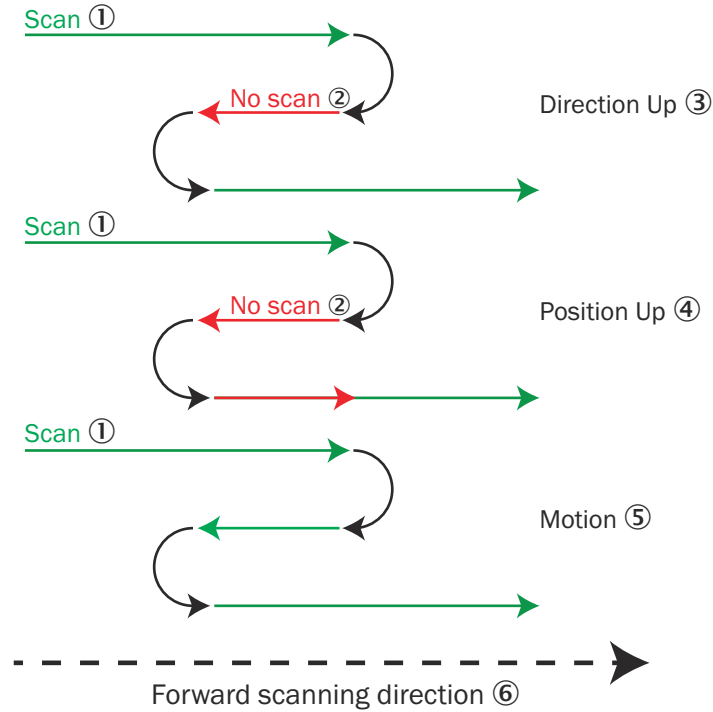
Figure 16: Encoder pulse counter-modes

①   Scan
②   No scan
③   Direction up
④   Position up
⑤   Motion
⑥   Forward scanning direction

6.5   Pin assignment

Encoder I/O
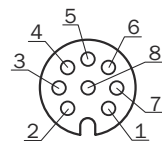
Figure 17: M12 female connector, 8-pin A-coded

Pin	Signal
1	A/ - RS-422 inverted input

Pin	Signal
2	A - RS-422 non-inverted input
3	B/ - RS-422 inverted input
4	B - RS-422 non-inverted input
5	(Not connected)
6	(Not connected)
7	GND (Power / Signal)
8	24 V Voltage supply output

Gigabit Ethernet
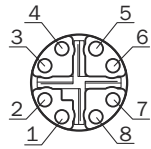
Figure 18: M12 female connector, 8-pin X-coded

Pin	Signal
1	GETH_L1+
2	GETH_L1-
3	GETH_L2+
4	GETH_L3+
5	GETH_L3-
6	GETH_L2-
7	GETH_L4+
8	GETH_L4-

Power I/O
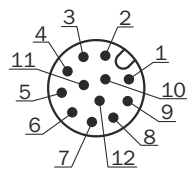
Figure 19: M12 male connector, 12-pin A-coded

Pin	Signal
1	24 V Voltage supply input
2	Ground (Power / Signal)
3	24 V - I/O 3, Trigger in
4	24 V - I/O 4, Programmable
5	24 V - I/O 2, Input
6	24 V - I/O 5, Programmable
7	24 V - I/O 6, Programmable
8	24 V - I/O 1, Input
9	24 V - I/O 7, Programmable
10	Reserved
11	RS-232 Rx

Pin	Signal
12	RS-232 Tx

7 Commissioning

TriSpectorP1000 is a programmable device. To use it, the following options are available:

- Using the default SensorApp ImageAcquisition (see "Default SensorApp: ImageAcquisition", page 35).
- Using other SensorApps that are available for the device (see "Installing SensorApps", page 38).
- Programming SensorApps for the device (see "Programming the device", page 39).

7.1 PC Software

SICK AppManager

The SICK AppManager software can be used for the following actions:

- Installing a SensorApp on a device.
- Reading and changing the device's IP address.
- Starting, stopping or deleting an installed SensorApp.
- Installing firmware updates.

Download SICK AppManager from **www.sick.com/SICK_AppManager**. To install SICK AppManager on the PC, open the installation (.exe) file and follow the instructions on the screen.

SICK AppStudio

The SICK AppStudio development environment is used to program the device and to perform diagnostics in case of faults.

The use of SICK AppStudio requires a valid license. A one-year license (art no 1610199) is available from **www.sick.com/SICK_AppStudio**. After purchasing the license, download the SICK AppStudio software from the SICK Support Portal, **support-portal.sick.com**.

After downloading SICK AppStudio, follow the on-screen instructions to complete the installation.

7.2 Network communication settings

To connect to the device from a PC, make sure that the network communication settings are correctly set up:

- The device must be connected to the PC via Ethernet.
- The PC must be on the same network as the device.
- The PC must not use the same IP address as the device. The device's default IP is 192.168.0.1.

Editing the device's IP address

To change the device's IP address using SICK AppManager:

1. Open SICK AppManager.
✓ All connected devices on the network are listed on the **Device search** tab.
2. Select the correct device in the list.
3. Click **Edit IP address**.
4. Enter the new IP address for the device.

7.3 Default SensorApp: ImageAcquisition

The TriSpectorP1000 has a pre-installed SensorApp called ImageAcquisition, which helps the user configure the camera's image acquisition settings. By default, the ImageAcquisition SensorApp starts when the camera is powered on.

To open ImageAcquisition:
1. Open a web browser window.
2. Type the IP address of the TriSpectorP1000 in the address field. The default IP address is 192.168.0.1.

7.3.1 Views

The ImageAcquisition SensorApp has two views:
- **ImageSetup**, which contains a 3D image viewer and a configuration section.
- **SensorView**, which displays the sensor image.

Switch from one view to the other by clicking the corresponding buttons in the left part of the GUI.

7.3.2 Field of view

Two regions are displayed in the image viewer in the **ImageSetup** view:
- The guaranteed field of view (yellow) is the region where 3D image acquisition is possible for all TriSpectorP1000 cameras with the same field of view size.
- The selected field of view (blue) is the region in which the camera acquires 3D images with the current configuration. Use the **Select** tool or the value boxes in the **Field of view** section to change the position and dimensions of the selected field of view.

7.3.3 Configuration

Configure the camera by editing the parameter values in the **ImageSetup** view. By default, images are acquired continuously and the selected field of view is set to its maximum.
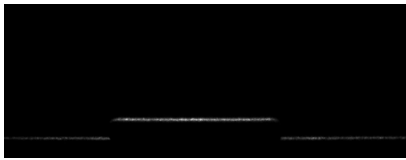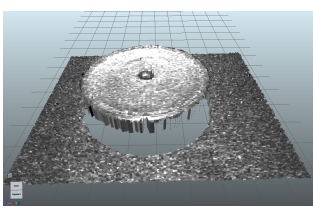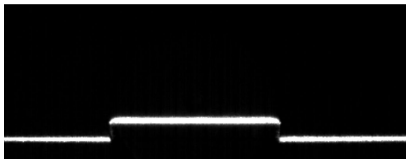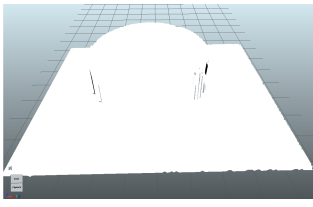
ⓘ NOTE
When a parameter value has been changed, click **Set Configuration** to apply the change.

Configuring the Acquisition settings

1. Go to the **SensorView** and check the laser line. The optimal exposure time yields a gray line. A slightly brighter line is preferable to a slightly darker line. See the figures below for examples of sensor images and corresponding 3D images, including reflectance overlay.

View	Sensor view	3D image
Short exposure time		

View	Sensor view	3D image
Normal expo-sure time		
Long exposure time		

2. To change the exposure time, go to the **ImageSetup** view and adjust the **Exposure** parameter.
3. Repeat steps 1-2 until the laser line is gray and the heightmap looks good.
4. Adjust the **Gain** parameter if needed. A low gain value keeps the noise level down. A high gain value increases the image brightness, but also increases the noise level.
5. Adjust the **LaserThreshold** parameter to determine which sensor intensity values to include when locating laser peaks. A high threshold value gives less noise in the heightmap, while a low threshold value makes it possible to detect weak laser peaks.
6. Select laser line acquisition criteria with the **PeakSelection** parameter:
   o **Strongest** locates the point with the highest intensity in each column.
   o **Top Most** and **Bottom Most** locate the highest or lowest point with an intensity higher than the value set by the **LaserThreshold** parameter.
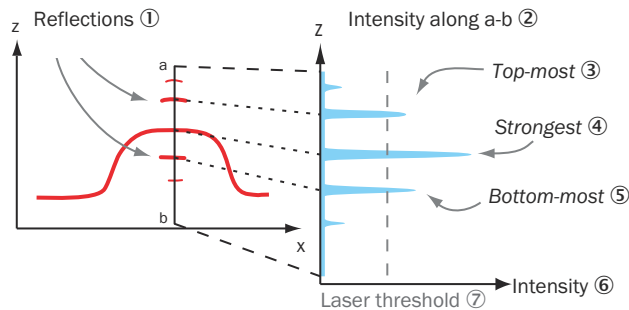
①	Reflections
②	Intensity along a - b
③	Top-most
④	Strongest
⑤	Bottom-most
⑥	Intensity
⑦	Laser threshold

Configuring the Motion settings

- Set the **ProfileTrigger** parameter to **Encoder** to acquire profiles based on encoder input. A profile is triggered each time the sensor has received a specified number of ticks from the encoder.
- • Set the **ProfileTrigger** parameter to **Freerunning** to acquire profiles continuously. In free running mode, the time between two profiles is determined by the **Speed** and **ProfileDistance** parameters. The object traversing speed must be constant to get heightmaps with correct proportions.
- • Set the image resolution by adjusting the **ProfileDistance** and **X-Resolution** parameters. Keep the pixels as square as possible to ensure that all image processing algorithms work smoothly.

Configuring the Field of view settings

Adjust the **Width**, **Height**, and **Length** parameters of the field of view to fit the object. The number of profiles in the acquired heightmap is determined by the **Length** parameter divided by the **ProfileDistance** parameter. The maximum number of height profiles is 2500.

Configuring the Image Trigger settings

- Select **None (continuous)** to acquire profiles continuously. A 3D image is displayed as soon as the specified number of height profiles have been acquired.
- Select **Trigger on I/O 3** to start the image acquisition based on a digital input signal.
- Select **Object Trigger** to start the image acquisition when the object extends above a specified threshold.
- Select **Software** to display a **Force Trigger** button which enables triggering from the user interface.

Using a configuration

- Click **Set Configuration** to apply the parameter changes. A green cog icon in the user interface indicates a valid configuration.
- Click **Save configuration** to save the configuration to the camera's flash memory.
- Click **Load configuration** to load the latest saved configuration.

7.3.4 Image handling controls

Use the image handling controls to scale, move, and rotate the 3D image in the viewer. As an alternative to the buttons, use the mouse shortcuts described below.

Button	Name	Description
	Select	Hover over a region to display the coordinates and corresponding pixel intensities. Click and drag to change the dimensions of the region of interest.
	Move	Click and drag to move the image. Mouse shortcut: Press and hold **Shift**.
	Rotate	Click and drag to rotate the image. Mouse shortcut: Press and hold **Ctrl**.
	Zoom	Click and drag upwards to zoom in and downwards to zoom out. Mouse shortcut: Use the mouse scroll wheel.

3D navigation control

To change between orthographic 2D and 3D viewing angles, use the 3D navigation control in the lower left corner of the image viewer:

- Click an arrowhead (X, Y or Z) to view an orthographic 2D projection of the object.
- Click the same arrowhead twice to flip the 2D projection, e.g. switch between the top and bottom view for the Z-axis.
- Press **Home** to restore the default viewing position.

View		Projection
Home		
Top view		
Right view		

7.3.5 Menus

The **View**, **Color** and **Options** menus in the image viewer contain options for visualization of the heightmap and the reflectance data:

- Select **Reflectance** from the **View** menu to display the heightmap with reflectance overlay. The reflectance image is useful for displaying surface details, such as prints.
- Select **Surface** or **Points** from the Options menu to display the data as a smooth surface or with a point representation.

7.4 Installing SensorApps

7.4.1 Available SensorApps

The available SensorApps for the device can be downloaded from SICK AppPool (http://apppool.cloud.sick.com/). The use of SICK AppPool requires a SICK ID, which can be obtained at the login page at the link above.

The **Apps** tab on each device page on www.sick.com contains a list of available SensorApps for the device.

7.4.2 Installing or updating a SensorApp on the device

A SensorApp must be downloaded to the PC before installing it on the device. There are two different options for downloading a SensorApp:

- Online option: If the PC has Internet access when connected to the device, the SensorApp can be downloaded and installed directly from SICK AppPool as part of the installation procedure described below.
- Offline option: If the PC does not have Internet access when connected to the device, the SensorApp must be downloaded from the SICK AppPool to the PC via a web browser prior to the installation.

To install or update a SensorApp using SICK AppManager:

1. Connect the device to the PC via Ethernet.
2. On the PC, open SICK AppManager.
3. Under the **Device Search** tab in SICK AppManager, click **Scan** to search for available devices on the network.
4. In the list of available devices, select the device where you want to install the SensorApp.
5. If the device tab (lower left pane) contains any active applications, right-click the applications and delete them.
6. Online option: To download and install the SensorApp directly from the AppPool:
   a) Click **Login to SICK ID** (below the **Utils** menu in SICK AppManager) to log in to SICK AppPool.
   b) Click the **AppPool** tab.
   c) Select a SensorApp in the list of available SensorApps.
   d) Click **Download and install** to download the selected SensorApp to the PC and install it on the device.

   Or:

   Offline option: To install a downloaded SensorApp from the PC to the device:
   a) Click the **Local Packages** tab in SICK AppManager.
   b) Drag and drop the **SensorApp** into the file list.
   c) Click **Install** to install the SensorApp on the device.
   ✓ The SensorApp is now installed and running on the device.

7.4.3 Opening the web user interface

To access the user interface for an installed SensorApp:

1. Open a Google Chrome web browser window.
2. Type the IP address of the device. The default IP address is 192.168.0.1.

7.5 Programming the device

7.5.1 Starting SICK AppStudio

Before starting SICK AppStudio:

- Make sure that the network communication settings are correct (see "Network communication settings", page 34).
- When starting SICK AppStudio for the first time, a license dialog opens. To be able to use the software, make sure to have a valid license available (see "PC Software", page 34).

7.5.2 Lua scripting

The embeddable scripting language Lua is used to create scripts in SICK AppStudio. See www.lua.org for more information about Lua.

7.5.3 Programming API

SICK AppSpace has a large application programming interface (API) which includes algorithms and functionality for hardware configuration, result processing, and result communication. The API consists of functional groups called crowns, where each crown contains functions and events related to a specific topic.

The complete API documentation for each firmware release is available on the TriSpectorP1000 pages in the SICK Support Portal, **supportportal.sick.com**.

NOTE

The API is directly accessible from SICK AppStudio. To access it, click a free place in a lua file and press Ctrl+Space to display a list of all accessible functions and commands for the device.

7.5.4 Tutorials and code samples

Tutorials and code samples for general and device-specific topics are available to help the user get started with the programming of the device:

- Tutorials are available from the SICK Support Portal: **supportportal.sick.com/pages/appspace/documentation-and-more**.
- Code samples are available from Gitlab: **gitlab.com/sick-appspace/samples**.

The above pages can be accessed directly from the **Help** menu in SICK AppStudio.

8 Maintenance

8.1 Maintenance plan

During operation, the device works maintenance-free.

> **NOTE**
> No maintenance is required to ensure compliance with the laser class.

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

Table 7: 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.	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

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.

▶ Keep the windows clean to maintain the read performance of the device. Regularly check the windows for contamination such as dust or humidity. If there is contamination, gently clean the window with a soft, damp cloth. Use a mild cleaning agent if needed.

▶ The windows in the PMMA variants can attract dust particles due to static charging. To minimize this effect, use the anti-static plastic cleaner from SICK (no. 560000006) together with the SICK lens cloth (no. 4003353).

> **WARNING**
> **Optical radiation: LED risk group 1, visible radiation, 400 nm to 780 nm**
> The LEDs may pose a danger to the eyes in the event of incorrect use.
>
> - Do not look into the light source intentionally.
> - Do not open the housing. Opening the housing will not switch off the light source. Opening the housing may increase the level of risk.
> - Comply with the current national regulations on photobiological security of lamps and lamp systems.

⚠️ **CAUTION**
Optical radiation: Laser class 2

The human eye is not at risk when briefly exposed to the radiation for up to 0.25 seconds. Exposure to the laser beam for longer periods of time may cause damage to the retina. The laser radiation is harmless to human skin.

- Do not look into the laser beam intentionally.
- Never point the laser beam at people's eyes.
- If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.
- Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.
- Do not open the housing. Opening the housing may increase the level of risk.
- Current national regulations regarding laser protection must be observed.

8.3 Upgrading the firmware

The latest firmware for the device can be downloaded from the SICK Support Portal, supportportal.sick.com.

To upgrade the firmware:

1. Log in to the SICK Support Portal and navigate to the **TriSpectorP1000** page.
2. Click the latest firmware release.
3. Download the firmware package file (FWP file format) and the firmware key file (KEY file format).
4. Follow the instructions on the page to install the firmware.

! **NOTICE**

Old firmware for the TriSpectorP1000 is available on the SICK Support Portal and can be used to downgrade the device:

1. Click a firmware version on the TriSpectorP1000 page.
2. Follow the downgrading instructions on the page.

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9 Troubleshooting

9.1 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.

9.2 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

9.3 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 valid 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/TriSpectorP1000
>
> Please note: This documentation may contain further technical data.

10.1 Features

Type	Value
Tasks	Positioning, inspection, measuring, reading
Technology	3D, line scan, image analysis
Working distance (measured from front window)	1008: 56…116 mm range 1030: 141…541 mm range 1060: 291…1091 mm range
Example field of view	1008: 65 mm x 15 mm 1030: 270 mm x 100 mm 1060: 540 mm x 200 mm
Width at minimum working distance	1008: 40 mm 1030: 90 mm 1060: 180 mm
Width at maximum working distance	1008: 75 mm 1030: 330 mm 1060: 660 mm
Maximum height range	1008: 60 mm 1030: 400 mm 1060: 800 mm
Factory calibrated	Yes
Light source	Visible red light (laser, 660 nm)
Laser class	2 (EN/IEC 60825-1:2014) 2M (EN/IEC 60825-1:2007) Complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007
Laser fan angle	45°±2°
Imaging angle	1008/1030: 65° 1060: 67°
Offline support	Emulator

10.2 Ambient data

Type	Value
EMC	Immunity: EN 61000-6-2:2005 Emission: EN 61000-6-3:2007
Shock load	15 g / 6 ms (EN 60068-2-27)
Vibration load	5 g, 10 Hz…150 Hz (EN 60068-2-6)
Ambient operating temperature	0 °C … +40 °C (adequate heat dissipation is required, see "Mounting the device", page 22)

Type	Value
Ambient storage temperature	–20 °C … +70 °C
Permissible relative air humidity	0% … 90%, non-condensing

10.3 Interfaces

Type	Value
Operator interface	Web server
Configuration software	SICK AppStudio
Communication interfaces	Gigabit Ethernet (TCP/IP), EtherNet/IP, serial (RS-422, RS-232), programmable digital I/O
Digital inputs	3 x, non-isolated
Digital in-/ outputs	4 x, non-isolated, configurable
Encoder interface	RS-422/TTL
Maximum encoder frequency	300 kHz

10.4 Mechanics and electronics

Type	Value
Connections	M12 male connector, 12-pin A-coded (Power I/O) M12 female connector, 8-pin X-coded (Gigabit Ethernet) M12 female connector, 8-pin A-coded (Encoder)
Connector material	Brass, nickel-plated
Supply voltage	24 V DC, ± 20 % SELV + LPS (EN 60950-1) or ES1 + PS2 (EN 62368-1) or Class II (UL1310)
Supply current	1.5 A maximum; external fuse required
Power consumption	11 W maximum
Ripple	< 5 Vpp
Current consumption	400 mA with no output loads
Enclosure rating	IP 67
Safety	EN 62368-1
Protection class	III
EMC	Immunity: EN 61000-6-2:2005 Emission: EN 61000-6-3:2007
Weight (not including cables)	1008: 900 g 1030: 1300 g 1060: 1700 g
Dimensions (L x W x H)	1008: 136 mm x 62 mm x 84 mm 1030: 217 mm x 62 mm x 84 mm 1060: 307 mm x 62 mm x 84 mm
Optics	Fixed

10.5 Input switching levels

Type	Value
Input levels	Up to 30 V Stresses beyond this over-voltage level can cause permanent damage to the device.
Input threshold levels	High: > 15.0 V Low: < 5.0 V
Hysteresis	> 1.0 V
Input current	High: < 3.0 mA Low: < 0.1 mA

10.6 Output switching levels

Type	Value
Voltage level high	High: > Voltage Supply - 3.0 V (Voltage Supply = 19.2 V...28.8 V) Low: < 2.0 V
Source/sink output current	≤ 100 mA at 24 °C
Overcurrent protection	< 200 mA
Capacitive load	≤ 100 nF
Inductive load	≤ 1H (with use of external free-wheeling diode, otherwise permanent damage to the device can occur)

10.7 Performance

Type	Value
Height resolution	1008: 20 ... 50 µm 1030: 40 ... 280 µm 1060: 80 ... 670 µm
Scan/frame rate	5000 3D profiles/s
Maximum number of profiles	2500 per image
3D profile resolution	1008: 0.049 mm/px 1030: 0.215 mm/px 1060: 0.43 mm/px

11 Accessories

> **NOTE**
> Accessories and where applicable mounting information can be found online at:
>
> • **www.sick.com/TriSpectorP1000**

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/TriSpectorP1000

12.2 Licenses

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12.3 Connecting the TriSpectorP1000 to CDF600-22xx

This is an instruction for connecting the TriSpectorP1000 to the SICK fieldbus module CDF600-22xx.

Setting up the connection

Use either pre-assembled cables or open-ended cables and connection terminals to connect the TriSpectorP1000 to the CDF600-22xx.

> **!** **NOTICE**
> If pre-assembled cables are used for the connection, the CDF600-22xx cannot access the digital I/Os on the TriSpectorP1000.

To connect using pre-assembled cables:
1. Connect the TriSpectorP1000 to the CDF600-22xx by a connection cable (e.g. part no 2055419) and a cable adapter (part no 2086398) according to figure 20.
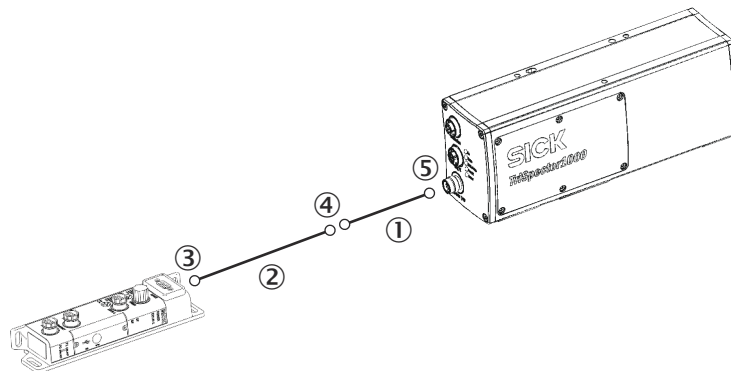

Figure 20: Connecting the device to the CDF600-22xx by pre-assembled cables

① Adapter cable (2086398)

② Connection cable (e.g. 2055419)

③ D-Sub HD, 15-pin

④ M12, 17-pin

⑤ M12, 12-pin

2. Connect the CDF600-22xx to a 24 V power supply.

3. Set the rotary encoding switch found on the side of the CDF600-22xx to "2".

To connect using open-ended cables and connection terminals:

1. Connect the pins according to the table below.

Pin on TriSpectorP1000 (Power I/O connector)	Pin on CDF600-2200 (DEVICE connector)	Connection type
Pin 11	Pin 2	Serial (RX to TX)
Pin 12	Pin 3	Serial (TX to RX)
Pin 2	Pin 5	GND to GND
Pin 1	Pin 1	24 V to 24 V (optional)[1]

[1]   The 24 V to 24 V connection allows the TriSpectorP1000 to be powered by the CDF600-22xx.

2. Set the rotary encoding switch found on the side of the CDF600-22xx to "2".

Further information

For information about configuration and operation of the CDF600-22xx, see the CDF600-2xxx product page, **www.sick.com/CDF600-2**. The following information is available there:

- Technical information
- Function blocks (including documentation) for sending strings to and from the CDF600-22xx using Profinet and Profibus

12.4 TriSpectorP1000 Result Output function block for Siemens Simatic S7 PLC

12.4.1 About this document

Please read this chapter carefully before working with this documentation and the TriSpectorP1000 Result Output function block.

12.4.1.1 Target group

This instruction addresses planning engineers, developers and operators of machines and systems who use a TriSpectorP1000 vision sensor and who are familiar with Simatic S7 PLC programming using the TIA Portal.

12.4.1.2 Scope

This document applies to the following variants of TriSpectorP1000:

- TriSpectorP1008
- TriSpectorP1030
- TriSpectorP1060

12.4.1.3 Supported PLCs

Download the function blocks from the **SICK Support Portal**:

1. Log on to the SICK Support Portal.
2. From the **TriSpectorP1000** page, navigate to the **TriSpectorP PLC function blocks for Siemens S7** page.
3. Download the .zip file with the function blocks.

The zip file contains function blocks for the following controllers:

- S7-300
- S7-400
- S7-1200
- S7-1500

The table below tells you what function block to choose depending on your PLC version. The function blocks are different and not compatible with each other.

Folder name	Compatible with Siemens S7 version
Siemens S7-1500,1200	S7-1500 and S7-1200 firmware version[1] 4.x
Siemens S7-1200	S7-1200 firmware version[1] > 2 and < 4
Siemens S7-300,400,1200	S7-300, S7-400 and S7-1200 firmware version[1] 1.x

[1]   "Firmware version" here refers to the firmware for the TRCV function block, not for the PLC.

ⓘ **NOTE**
You must use the TIA Portal software to be able to use the function blocks. If you use the Simatic STEP7 version 5.5 software, it is not possible to use the function blocks.

12.4.2 PLC Configuration

12.4.2.1 Establishing a TCP connection

The TriSpectorP1000 Result Output function block uses a TCP connection between the sensor and the S7 PLC to get the result output data. The TCP communication must be established by using the Siemens function block **TCON**.

Use the Siemens TCON function block

To establish an open TCP connection, the following communication blocks are available in the Siemens standard library (see figure 21):

- **TCON** for establishing the connection
- **TDISCON** for terminating the connection
- **T_CONFIG** for configuring the interface

Figure 21: Siemens standard library

In this example, the **TCON** function block (see figure 22) is called in OB1 with the instance data block **TCON_DB**. In the case of a reboot, the "**#Initial_Call**" flag triggers the the **TCON** function block to open the TCP communication. The **ID** parameter of the TriSpector1000 function block input must have the same value as the **ID** input of the **TCON** function block (will be set up in next step).
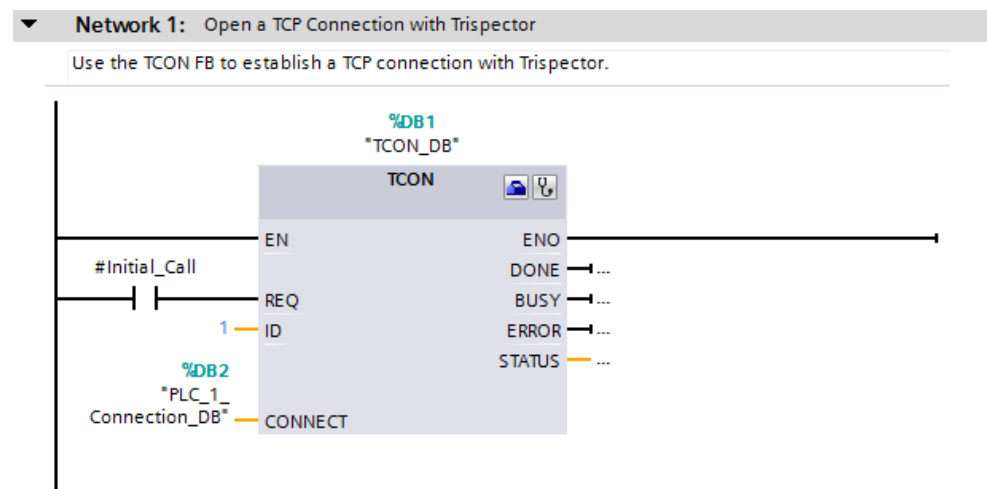

Figure 22: Establish TCP connection

The connection parameters for setting up the TCP connection are stored in an automatically generated data block. Open the **Properties** tab for the **TCON** function block to make the settings and generate the data block, see figure 23.
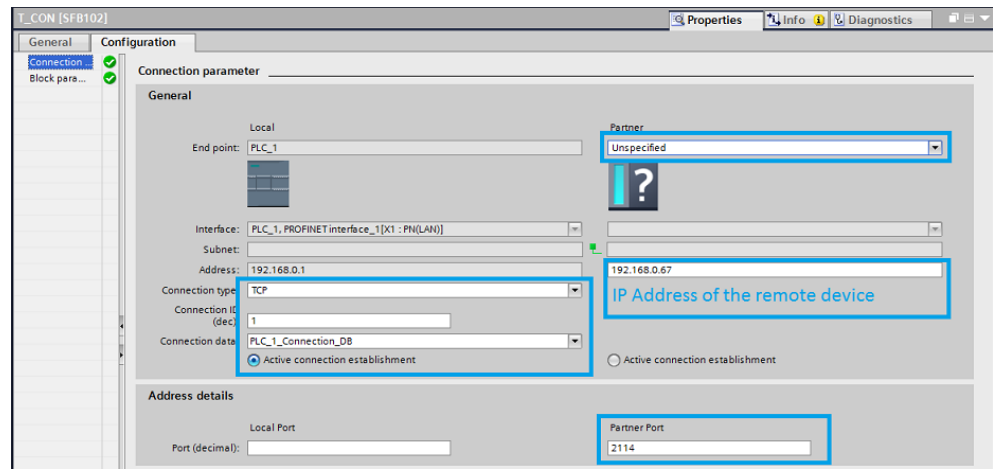
Figure 23: Connection parameters

For more information, see the TIA Portal help system.

Australia
Phone +61 (3) 9457 0600
　　　　1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 (0) 2236 62288-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 (0) 2 466 55 66
E-Mail info@sick.be

Brazil
Phone +55 11 3215-4900
E-Mail comercial@sick.com.br

Canada
Phone +1 905.771.1444
E-Mail cs.canada@sick.com

Czech Republic
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile
Phone +56 (2) 2274 7430
E-Mail chile@sick.com

China
Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland
Phone +358-9-25 15 800
E-Mail sick@sick.fi

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany
Phone +49 (0) 2 11 53 01
E-Mail info@sick.de

Hong Kong
Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary
Phone +36 1 371 2680
E-Mail ertekesites@sick.hu

India
Phone +91-22-6119 8900
E-Mail info@sick-india.com

Israel
Phone +972-4-6881000
E-Mail info@sick-sensors.com

Italy
Phone +39 02 27 43 41
E-Mail info@sick.it

Japan
Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia
Phone +603-8080 7425
E-Mail enquiry.my@sick.com

Mexico
Phone +52 (472) 748 9451
E-Mail mario.garcia@sick.com

Netherlands
Phone +31 (0) 30 229 25 44
E-Mail info@sick.nl

New Zealand
Phone +64 9 415 0459
　　　　0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway
Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland
Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania
Phone +40 356-17 11 20
E-Mail office@sick.ro

Russia
Phone +7 495 283 09 90
E-Mail info@sick.ru

Singapore
Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia
Phone +421 482 901 201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 78849
E-Mail office@sick.si

South Africa
Phone +27 (0)11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain
Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden
Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan
Phone +886-2-2375-6288
E-Mail sales@sick.com.tw

Thailand
Phone +66 2 645 0009
E-Mail marcom.th@sick.com

Turkey
Phone +90 (216) 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates
Phone +971 (0) 4 88 65 878
E-Mail info@sick.ae

United Kingdom
Phone +44 (0)17278 31121
E-Mail info@sick.co.uk

USA
Phone +1 800.325.7425
E-Mail info@sick.com

Vietnam
Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Further locations at **www.sick.com**

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SICK AG | Waldkirch | Germany | www.sick.com