# Lector85x CAN I/O

Image-based code reader

**SICK**
Sensor Intelligence.

**Described product**

Lector85x CAN I/O

**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

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

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

These operating instructions do not provide information on the handling and safe operation of the machine or system in which the product is integrated. Information on this can be found in the operating instructions for the machine or system.

## 1.2 Symbols and document conventions

**Warnings and other notes**

⚠ **DANGER**
Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

⚠ **WARNING**
Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

⚠ **CAUTION**
Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

❗ **NOTICE**
Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

ⓘ **NOTE**
Highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

**Instructions to action**

▶ The arrow denotes instructions to action.

1. The sequence of instructions is numbered.
2. Follow the order in which the numbered instructions are given.
✓ The tick denotes the results of an action.

## 1.3 Related applicable documents

**Related applicable documents from SICK**

| Document | Title | Part number | Source |
|---|---|---|---|
| Technical information | VI83I-xxxxxxHx illumination unit | 8027770 | www.sick.com/8027770 |

## 1.4      Further information

More information can be found on the product page.

The call is made 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).

**The following information is available depending on the product:**
* Data sheets
* This document in all available language versions
* CAD files and dimensional drawings
* Certificates (e.g., declaration of conformity)
* Other publications
* Software
* Accessories

# 2 Safety information

## 2.1 Basic safety notes

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.

Danger due to visible radiation is product-specific. See the technical data for more information.

**Laser notes**

**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.
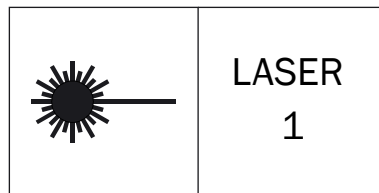


IEC 60825-1: 2014

EN 60825-1:2014+A11:2021

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

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

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

**LED notes**

**CAUTION**

**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.

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

No maintenance is required to ensure compliance with the LED risk group.

**For both radiation types:**

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.

**Mounting and electrical installation**

**CAUTION**
**Risk of injury due to hot device surface.**

The surface of the device can become hot.

- Before performing work on the device (e.g. mounting, cleaning, disassembly), switch off the device and allow it to cool down.
- Ensure good dissipation of excess heat from the device to the surroundings.

**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 require‐ments 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.

**Repairs and modifications**

**WARNING**
**Electric shock!**

Non-insulated electrical conductors are located in the housing. Electrical voltage can cause severe injury or death.

- Do not open the housing.
- Protect the housing from damage.
- If the housing is damaged, disconnect the device from the voltage supply and do not put it into operation.

## 2.2      Intended use

The Lector85x image-based code reader is a SICK 4Dpro sensor. The product is used for automatic, stationary identification and decoding of codes on moving or stationary objects. The product reads 1D codes (barcodes, stacked codes) and 2D codes (matrix codes). In read mode, the product sends the read results via the data interface to a controller for coordinated further processing.

The base model of the product is a camera housing with C-mount thread. The product can be assembled from individual components to suit the particular application. The individual components can be ordered separately as accessories. Only certain lenses and illumination units are compatible depending on the product type. Use only components from SICK intended for this product. Use a compatible variant of the VI83I illumination unit as the integrated illumination.

As a complete device, the product is already equipped with pre-mounted optics (lens, integrated illumination unit, spacer, optics protection hood).

To increase the irradiance in the field of view of the product, an external VI228x illumination unit can also be used. It is recommended to use polarizing filters for applications with high reflection.

The product is designed for use in industrial and logistics areas, and meets the requirements for industrial ruggedness, interfaces and data processing.

The product was developed for use in industrial environments (EN 61000-6-4).

Incorrect use, improper modification, or tampering with the product will invalidate any warranty offered by SICK AG. Furthermore, SICK AG shall not accept any responsibility or liability for any resulting damage and consequential damage.

## 2.3      Improper use

**Impermissible use**
- As a safety component as defined in the relevant applicable safety standards for machines, e.g. Machinery Directive

**Impermissible ambient conditions**
- Explosion-hazardous area
- Corrosive environment

## 2.4      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)

**Further topics**

- Interfaces
- Network services and ports
- Password management

## 2.5 Qualification of personnel

Any work on the product may only be carried out by personnel qualified and authorized to do so.

Qualified personnel are able to perform tasks assigned to them and can independently recognize and avoid any potential hazards. This requires, for example:

- technical training
- experience
- knowledge of the applicable regulations and standards

# 3  Product description

## 3.1  Scope of delivery

| No. of units | Component | Note |
|---|---|---|
| 1 | Device in the version ordered | • Camera housing with C-mount threaded connection<br>• Order individual components separately as accessories and mount them independently.<br>• Light inlet is sealed with a protective cap.<br>• Electrical connections are sealed with protective caps.<br>• Without holders and connecting cables |
| 2 | Sliding nut, 5.5 mm deep, M5 threaded mounting hole | • Alternative mounting option for the device instead of the threaded mounting hole<br>• Use in pairs. |
| 1 | Hexagon key WAF 2 | For mounting the VI83I illumination unit |
| 1 | Commissioning sample | For determining the camera position and adjusting the focus and aperture |
| 1 | Printed safety notes, multilingual | Brief information and general safety notes |

The actual scope of delivery may differ for special designs, additional orders or due to the latest technical changes.

## 3.2  Type label

The type label contains information for identifying the product.

*Figure 1: Lector85x type label (example)*

| | |
|---|---|
| ① | Product and type designation |
| ② | Product characteristics |
| ③ | Product ID |
| ④ | Conformity mark and certification mark |
| ⑤ | Place and date of production |
| ⑥ | Supply voltage and maximum power consumption |
| ⑦ | MAC address P1 / P2 (Ethernet) |
| | MAC address P3 (Ethernet) |
| ⑧ | QR code with a link to the product and more information |

## 3.3 Type code

**Type code structure**

V2D a b c d – e f g h i j k l m n

| Position | Description | Characteristic |
|---|---|---|
| a | Product family | 8: 8xx series |
| b | Platform, housing | 5: Advanced Line |
| c | Resolution of the image sensor | 05: 5 megapixels (2,464 px x 2,048 px)<br>09: 9 megapixels (4,096 px x 2,176 px)<br>12: 12 megapixels (4,096 px x 3,008 px) |
| d | Function | R: Lector - Reading |
| e | Generation | 1: First generation |
| f | Image sensor type/color | M: Monochrome |
| g | Optical/focusing system | C: C-mount |
| h | Illumination unit | X: Without<br>M: Visible red light medium<br>L: Visible red light wide<br>K: Visible white light medium<br>I: Visible white light wide |

| Position | Description | Characteristic |
|---|---|---|
| i | Focal length | X: Without<br>B: 8 mm<br>C: 12 mm<br>D: 16 mm<br>E: 25 mm |
| j | Filter | X: Without |
| k | CPU | A: Advanced |
| l | Connection modules | L: CAN I/O<br>F: Fieldbus |
| m | IP protection class and front screen | 0: Without<br>2: IP65 Glas |
| n | Temperature range | S: 0 °C … 50 °C (standard) |

## 3.4    Product overview

**Product overview**



①     C-mount thread

②     Lens

③     Illumination unit

④     Spacer

⑤     Optics protection hood not mounted

⑥     Optics protection hood mounted

⑦     USB (for temporary use as a service interface)

⑧     Slot for a microSD memory card (accessory)

**Further topics**

- Dimensional drawing

## 3.5 Integrated illumination unit

**Overview**



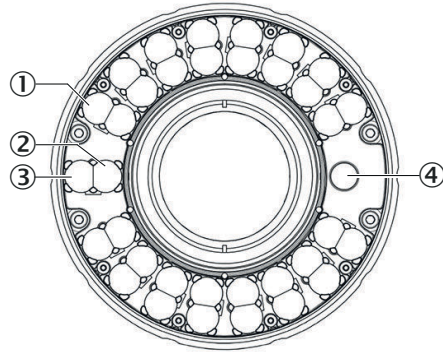*Figure 2: VI83I illumination unit*

①  32 illumination LEDs
②  1 Feedback LED, e.g., for Good Read (not available)
③  1 Feedback LED, e.g., for No Read (not available)
④  Laser alignment aid

**Feedback LED (not available)**
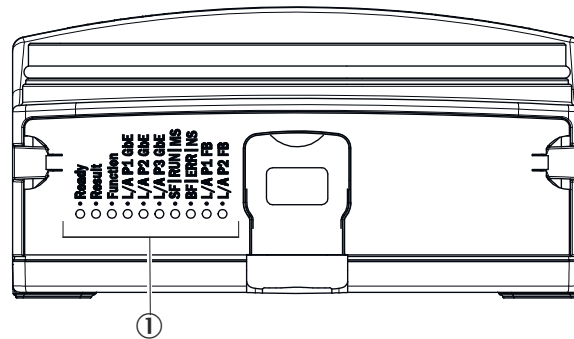
With the default settings, for example, the green feedback LED briefly produces a green feedback spot within the field of view of the product after a successful read.

**Laser alignment aid**

The laser alignment aid produces a red spot (laser spot) in the field of view of the product. The alignment aid can be switched off.

## 3.6 Display and control elements

**Overview**



①  Status LEDs

**Status LEDs**

| Display | LED (color) | Description | Information |
|---------|-------------|-------------|-------------|
| Ready | ● (Green) | Product is switched on and ready for use. | |
| | ● (Red) | Error | |
| | ☀ (Green) | Product is not ready for operation.<br><br>**Reasons**<br>• Firmware update<br>• Parameter change by the user<br>• Parameter change by another device (e.g., PLC) | |
| | ● (Blue) | Product is powering up. | |
| Result | | | Not available for the product variant. |
| Function | | | Not available for the product variant. |
| L/A P1 GbE | ○ | No Ethernet connection | |
| | ● (Green) | Connected to network (10/100 Mbit/s) | |
| | ☀ (Green) | Data transmission over the network (10/100 Mbit/s) | |
| | ● (Blue) | Connected to network (1 Gbit/s) | |
| | ☀ | Data transmission over the network (1 Gbit/s) | |
| L/A P2 GbE | ○ | No Ethernet connection | |
| | ● (Green) | Connected to network (10/100 Mbit/s) | |
| | ☀ (Green) | Data transmission over the network (10/100 Mbit/s) | |
| | ● (Blue) | Connected to network (1 Gbit/s) | |
| | ☀ | Data transmission over the network (1 Gbit/s) | |
| L/A P3 GbE | ○ | No Ethernet connection | |
| | ● (Green) | Connected to network (10/100 Mbit/s) | |
| | ☀ (Green) | Data transmission over the network (10/100 Mbit/s) | |
| | ● (Blue) | Connected to network (1 Gbit/s) | |
| | ☀ | Data transmission over the network (1 Gbit/s) | |

| Display | LED (color) | Description | Information |
|---|---|---|---|
| SF/RUN/MS | **PROFINET**: system failure (SF) | | Not available for the product variant. |
| | ○ Not an error | | |
| | ☀ (Red) | DCP signal service is triggered via the fieldbus. | |
| | ● (Red) | Watchdog timeout: Channel diagnostics, generic diagnostics, advanced diagnostics, system error | |
| | **EtherNet/IP™**: Module status (MS) | | Not available for the product variant. |
| | ● (Green) | Product is in operation. | |
| | ☀ (Green) | Standby: Product is not configured. | |
| | ☀☀☀ (Green, red, green) | Self-test when switching on | |
| | ☀☀○ (Red, green, off) | Flash sequence for visually identifying the product **MS** and **NS** LEDs flash simultaneously. | |
| | ☀ (Red) | Correctable error: e.g. incorrect configuration | |
| | ● (Red) | Error: Device is not operational. | |
| | ○ | No supply voltage or no EtherNet/IP™ app installed | |
| | **EtherCAT**: Run (RUN) | | Not available for the product variant. |

| Display | LED (color) | Description | Information |
|---|---|---|---|
| BF/ERR/NS | **PROFINET:** Bus error (BF) | | Not available for the product variant. |
| | ○ | Not an error | |
| | ☀ (Red) | No data exchange | |
| | ● (Red) | No configuration or no Ethernet connection, slow physical connection or no physical connection | |
| | **EtherNet/IP™:** Network status (NS) | | Not available for the product variant. |
| | ● (Green) | IP address is configured. CIP connection is established. | |
| | ☀ (Green) | IP address is configured but no CIP connection present. | |
| | ☀ ☀○ (Green, red, off) | Self-test when switching on | |
| | ☀☀○ (Red, green, off) | Flash sequence for visually identifying the product **MS** and **NS** LEDs flash simultaneously. | |
| | ☀ (Red) | Warning: The connection has timed out. Reset due to reset or establishment of a new connection | |
| | ● (Red) | Error: IP address is already allocated to another product. | |
| | ○ | No supply voltage, no IP address present, or no Ethernet/IP™ app installed. | |
| | **EtherCAT:** Error (ERR) | | Not available for the product variant. |
| L/A P1 FB | ○ | No Ethernet connection/fieldbus | Not available for the product variant. |
| | ● (Green) | Connected to network (10/100 Mbit/s) | |
| | ● (Yellow) | Data transmission via the network (10/100 Mbit/s) | |
| L/A P2 FB | ○ | No Ethernet connection/fieldbus | Not available for the product variant. |
| | ● (Green) | Connected to network (10/100 Mbit/s) | |
| | ● (Yellow) | Data transmission via the network (10/100 Mbit/s) | |

○ = off; ● = illuminated; ☀ = flashing

## 3.7 Working distance and field of view size
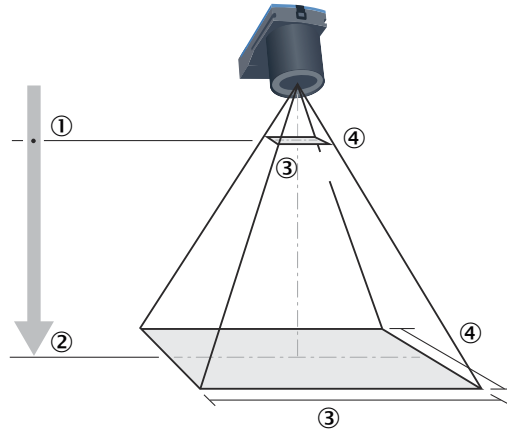


*Figure 3: Working distance and field of view size*

① Min. working distance in mm
② Max. working distance in mm
③ Min. perceived field of view area: horizontal (mm)
④ Min. perceived field of view area: vertical (mm)
⑤ Max. perceived field of view area: horizontal (mm)
⑥ Max. perceived field of view area: vertical (mm)

The perceived field of view area is determined by the focus position, the focal length of the lens, and the working distance. The necessary working distance can be determined from the field of view diagram.

## 3.8 Focus setting

The focus position can be adjusted manually on the lens.

The focus position is valid for one working distance. The device does not perform automatic tracking (auto focus) if, for example, the working distance changes significantly.

## 3.9    Code object assignment

**Overview**
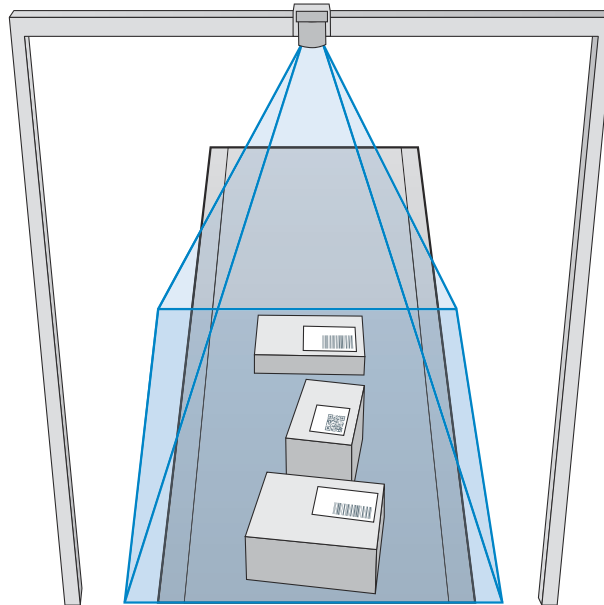


*Figure 4: Code object assignment*

**Code object assignment**

A trigger (e.g. photoelectric sensor) controls the start and end of the reading process. Several objects with codes may be present in the field of view of the product during the reading process. The product reads multiple codes simultaneously. The product uses the code object assignment function to correctly assign the codes it reads to the objects. An object separation of at least 50 mm is necessary for clear differentiation of successive objects.

If the speed of the conveying equipment is variable, an external encoder is required for the code object assignment.

# 4 Mounting

## 4.1 Planning for mounting

### Installation site

- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- The mounting site is suitable for the weight of the device.
- Mount the device in a shock and vibration insulated manner.
- Make sure the product has a clear view of the codes of the objects to be scanned.

### Heat regulation

- If the ambient operating temperature will be ≥ 45 °C, ensure adequate heat dissipation when mounting the device. For example, mount the product using a mounting bracket on a suitable heat sink. A suitable heat sink is an aluminum profile with minimum dimensions 40 mm x 80 mm x 665 mm. To ensure air circulation, mount the product, for example, at an adequate distance from walls, ceilings and other devices.

### Strong light sources, lasers and retro-reflectors

- In order to avoid reflections from the surfaces to be scanned, mount the product so that it is tilted from the perpendicular to the surface. An angle of 0° up to 45° is appropriate depending on the application.
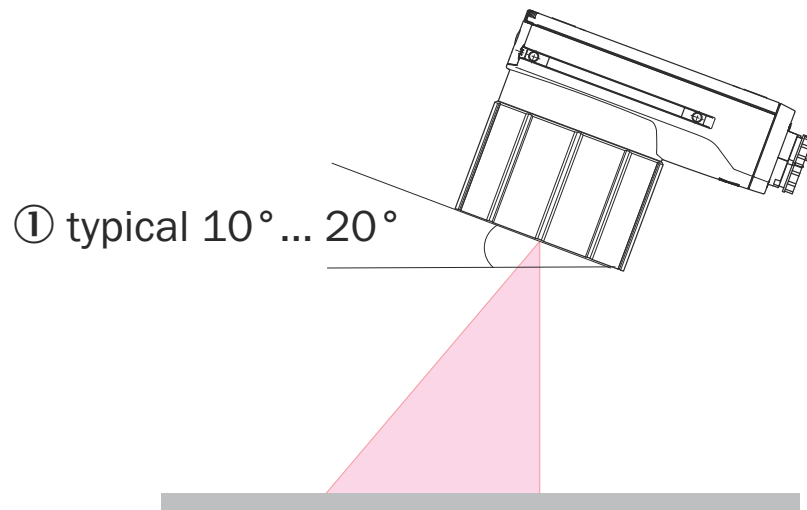


① typical 10°... 20°

*Figure 5: Mounting angle to use, depending on the application*

① Typical angle 10° ... 20°

## 4.2 Mounting the lens and illumination unit

### Overview

This mounting step is only required for the product type V2D85xxx-xx**C**xxxxxxx.
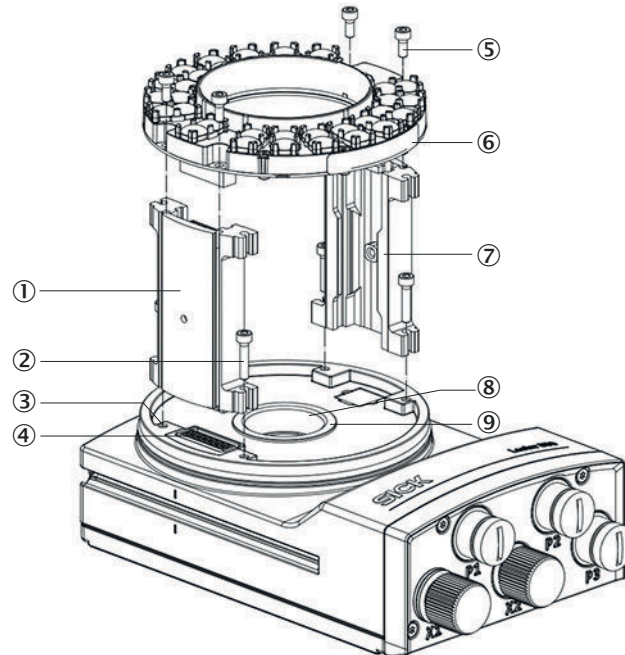
①      Spacer, left with electrical connection

②      4 long screws: M2.5; length: 12 mm (ISO 4762, hexagon socket head screw)

③      4 tapped blind holes, M2.5; depth: 5.5 mm, for mounting the spacer

④      Electrical connection for the integrated illumination unit

⑤      4 short screws: M2.5; length: 6 mm (ISO 4762, hexagon socket head screw)

⑥      Integrated illumination unit

⑦      Spacer, right

⑧      Light inlet with threaded connection for the lens

⑨      C-mount thread

**Important information**

---

**! NOTICE**

**Risk of damage due to electrostatic discharge**

Electrostatic discharge from the human body may damage parts of the illumination unit or the camera housing.

- Take the necessary ESD precautions when assembling the device.
- Do not touch the open contacts of the electrical connection on the camera housing and the illumination unit.

---

**i NOTE**

**Possible impairment of image quality**

Contamination (e.g. dust, fingerprints) on the image sensor can impair the image quality and decoding performance of the product.

▶ Ensure a dust-free and dry environment when mounting components.

▶ Do not touch the image sensor in the light inlet opening of the product with your fingers.

▶ Do not touch the glass lenses at either end of the lens unit with your fingers.

---

**Prerequisites**

- There is a risk of burns at ambient temperatures above 32 °C. If the ambient temperature is above 32 °C, remove the optics protection hood and perform the fine adjustments on the mounted lens within 20 minutes of switching on the cooled down device.
- Lens and illumination unit are compatible with the product. You can find compatible accessories on the product page on the Internet.
- SW 2 hex key (included with delivery)
- SW 5 socket wrench, recommendation: as a torque wrench for 65 Ncm

**Approach**

1. Switch off the supply voltage to the device.
2. Peel off the white protective sticker on the camera housing that covers the electrical connection for the illumination unit.
3. Place the camera housing on a nonslip base.
4. Remove the protective cap from the round light inlet.
5. Screw the lens unit into the C-mount thread until it engages.
6. Take 2 pairs of long screws and screw them into the tapped blind holes to mount each spacer on the camera housing.
7. Use the 4 short screws to fasten the illumination unit to the two spacers.
8. In systems subjected to heavy vibrations, secure the C-mount threaded connection of the lens using threadlocking adhesive.
9. Manually preset the sharpness and aperture of the lens unit.
10. Check the adjustment using SOPASair.
11. If the required adjustments to the lens are not carried out immediately, mount the optics protection hood for the lens.

## 4.3  Mounting the external illumination

**Overview**
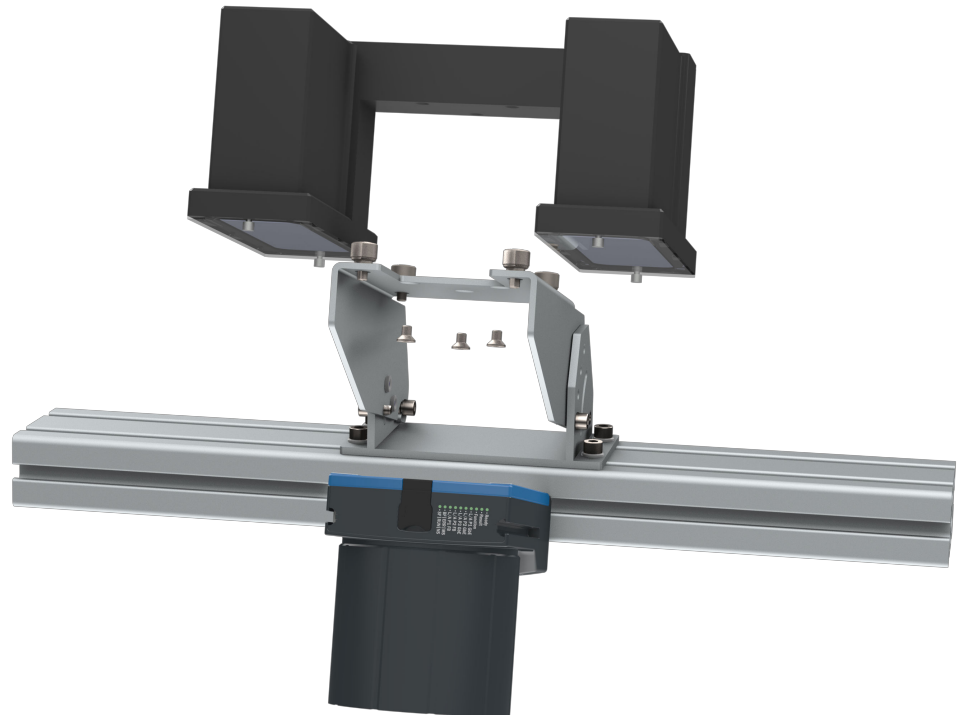


*Figure 6: Mounting the external illumination*
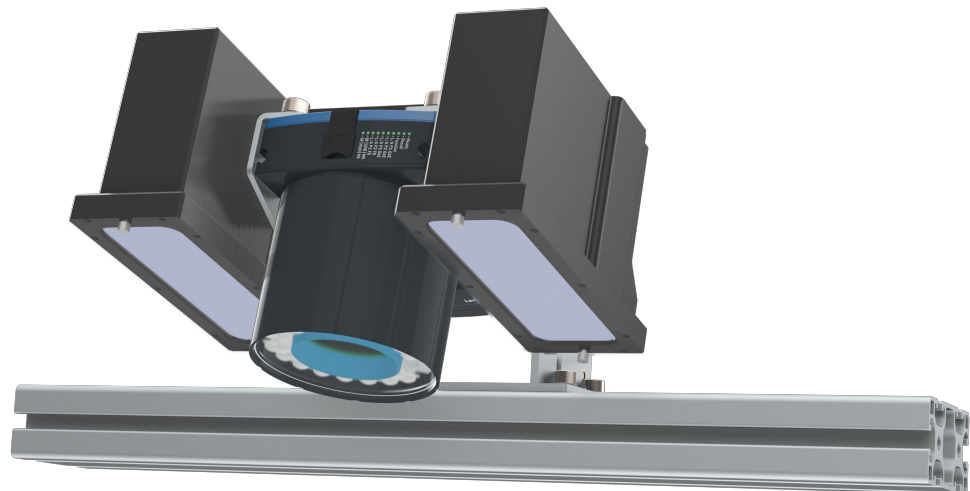


*Figure 7: Product and external illumination assembled*

**Prerequisites**

- The camera is not mounted on the mounting bracket.
- Connecting cables have been removed.

**Procedure**

1. Mount the external illumination on the mounting bracket using three M5 screws (tightening torque: 5 Nm ± 0.5 Nm).
2. Mount the device on the mounting bracket using four M5 knurled screws. Tighten the knurled screws by hand without tools.

## 4.4 Assembling the product

**Approach**

1. Mount the product on suitably prepared mounting equipment using M5 screws and by means of the threaded mounting holes or sliding nuts. Mounting equipment is available as an accessory.
   - Screw the screws no more than 5 mm into the threaded mounting holes or sliding nuts.
   - To do so, either use all 4 threaded mounting holes on the rear of the product or the two sliding nuts on the side of the product.
   - Attach the optional SICK mounting equipment ordered separately using the sliding nuts on the product.
2. 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), mount the product with vibration dampers. Mount the product in a freely suspended manner.
3. Align the product taking into consideration the field of view and the application circumstances.
4. Connect the product to interfaces and supply voltage when disconnected from voltage.
5. Start the product.
✓ The **Ready** status LED lights up green.
6. Perform fine tuning.

# 5 Electrical installation

## 5.1 Prerequisites for safe operation of the device

**Important information**

> ⚠️ **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. For example, ensure low-impedance and current-carrying equipotential bonding.

**Prerequisites for safe operation of the device**

The device is connected to the peripheral devices (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
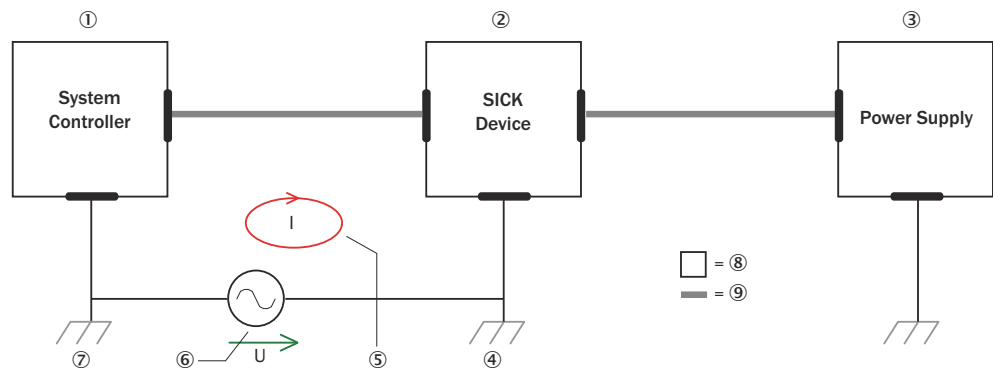
*Figure 8: Example: Occurrence of equipotential bonding currents in the system configuration*

① System controller
② Device
③ Voltage supply
④ Grounding point 2
⑤ Closed current loop with equalizing currents via cable shield
⑥ Ground potential difference
⑦ Grounding point 1
⑧ Metal housing
⑨ Shielded electrical cable

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

**Remedial measures**

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

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

**Measures for widely distributed system installations**

On widely distributed system installations with correspondingly large potential differences, the setting up of local islands and connecting them using commercially available **electro-optical signal isolators** is recommended. This measure achieves a high degree of resistance to electromagnetic interference.
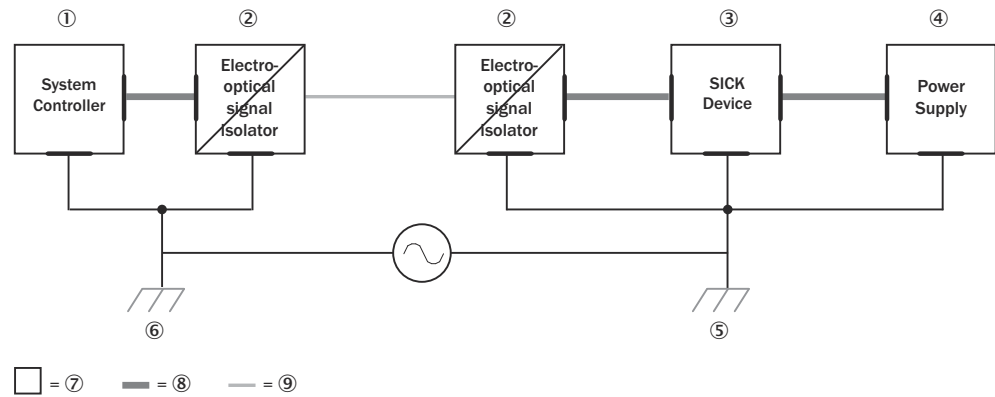
*Figure 9: Example: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators*

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

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

**Measures for small system installations**

For smaller installations with only slight potential differences, insulated mounting of the device and peripheral devices may be an adequate solution.
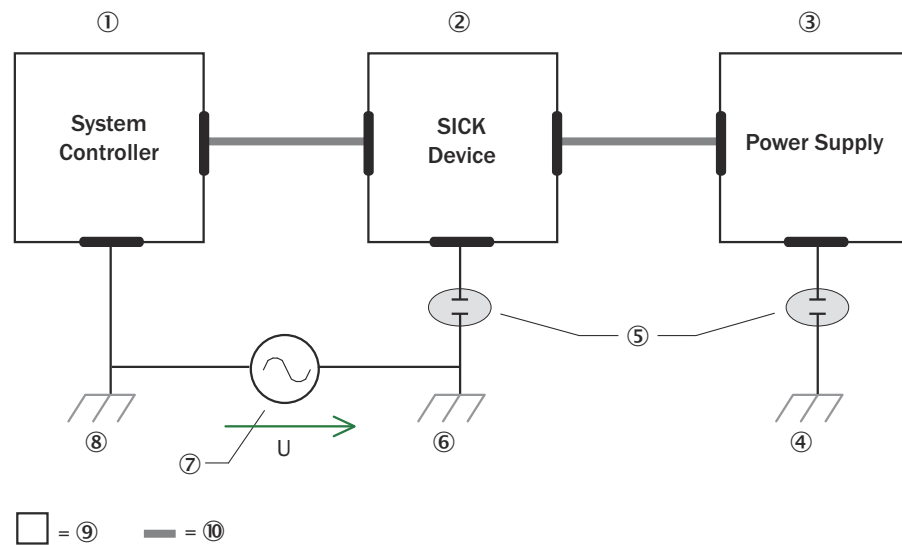
*Figure 10: Example: Prevention of equipotential bonding currents in the system configuration by the insulated mounting of the device*

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.

## 5.2 Pin assignment

**Overview**
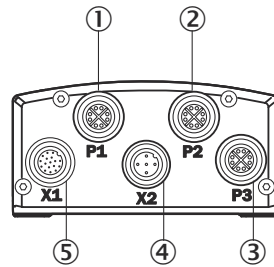


①　P1: Gigabit Ethernet 1
②　P2: Gigabit Ethernet 2
③　P3: Gigabit Ethernet 3
④　X2: Power/CAN
⑤　X1: Power/CAN/serial interface/IO

**Prerequisites**

**General**
- Connect the connecting cables in a de-energized state. Do not switch on the supply voltage until installation is complete and all connecting cables are connected to the device and control.
- Wire cross-sections in the supply cable from the user'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 properly insulated from each other.
- The maximum current consumption depends on how the product is used. If outputs are used, the current consumption will be higher. Ensure that the sum of the output currents at the outputs does not exceed 400 mA.

**Data cables**
- Use shielded data cables with twisted-pair wires.
- Implement proper and complete shielding concept.
- To avoid interference, always use EMC-compliant cables and layouts. This applies, for example, to cables for switched-mode power supplies, motors, clocked drives, and contactors.
- Do not lay cables over long distances in parallel with voltage supply cables and motor cables in cable ducts.

**Voltage supply**
- Configure the circuits connected to the device as ES1 circuits or as SELV circuits (SELV = Safety Extra Low Voltage). The voltage source meets the requirements of ES1 (EN 62368-1) or SELV (EN 60950-1).
- The device must be supplied with an energy-limited source as per UL61010-1, 3rd ed. cl. 9.4 or a limited current source as per UL62368-1 or Class 2 as per NEC.
- Required power output of the voltage source: at least 48 W
- For a supply voltage of DC 24 V ± 20%, protect the cables with a separate fuse. The required fuse depends on the cable used. Typical examples: 2 A fuse for 17-pin M12 cable, or 4 A fuse for 5-pin M12 cable. Install the fuse in the supply circuit at the start of the supply cable.
- To ensure protection against short-circuits/overload in the customer's supply cables, choose and implement wire cross-sections in accordance with the applicable standards.

**Power/CAN/serial interface/IO**
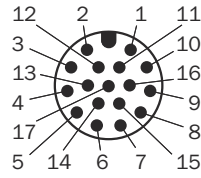


*Figure 11: M12 male connector, 17-pin, A-coded*

| Contact | Signal | Description | Information |
|---|---|---|---|
| 1 | GND | Supply voltage: 0 V | |
| 2 | $V_S$ | Supply voltage: DC 24 V ± 20% | |
| 3 | CAN L | CAN-Bus LOW (IN/OUT) | |
| 4 | CAN H | CAN-Bus HIGH (IN/OUT) | |
| 5 | TD+ (RS-422) | Serial data interface (Sender+) | |
| 6 | TD- (RS-422) TxD (RS-232) | Serial data interface (Sender–) | |
| 7 | TxD (RS-232) | Serial service interface (Sender) | Do not connect. |
| 8 | RxD (RS-232) | Serial service interface (Receiver) | Do not connect. |
| 9 | SensGND | Digital input ground | |
| 10 | Sensor 1 | Digital input 1 | |
| 11 | RD+ (RS-422) | Serial data interface (Receiver+) | |
| 12 | RD- (RS-422) RxD (RS-232) | Serial data interface (Receiver–) | |
| 13 | DIO 3 | Configurable digital input and output 3 | Do not connect. |
| 14 | DIO 4 | Configurable digital input and output 4 | |
| 15 | Sensor 2 | Digital input 2 | |
| 16 | DIO 5 | Configurable digital input and output 5 | |
| 17 | DIO 6 | Configurable digital input and output 6 | |

**Power/CAN**
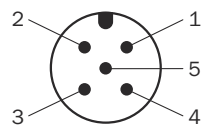


*Figure 12: M12 male connector, 5-pin, A-coded*

| Contact | Signal | Description |
|---|---|---|
| 1 | – | Shielding |
| 2 | Vs | Supply voltage |
| 3 | GND | Supply voltage: 0 V |
| 4 | CAN H | CAN-Bus HIGH (IN/OUT) |
| 5 | CAN L | CAN-Bus LOW (IN/OUT) |

**Gigabit Ethernet**
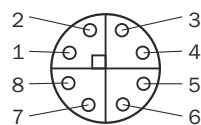


*Figure 13: Female connector, M12, 8-pin, X-coded*

*Table 1: Pin assignment for Gigabit Ethernet*

| Contact | Signal | Description |
|---|---|---|
| 1 | TRD0_P | Sender+/receiver+ 0 |
| 2 | TRD0_N | Sender–/receiver– 0 |
| 3 | TRD1_P | Sender+/Receiver+ 1 |
| 4 | TRD1_N | Sender–/Receiver– 1 |
| 5 | TRD3_P | Sender+/Receiver+ 3 |
| 6 | TRD3_N | Sender–/Receiver– 3 |
| 7 | TRD2_N | Sender–/Receiver– 2 |
| 8 | TRD2_P | Sender+/Receiver+ 2 |

### Complementary information

Pre-assembled cables can be found on the product page.

The call is made 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).

### Further topics

- Information on interfaces: Technical data

## 5.3 Pin assignment for external illumination

### Prerequisites

General

- Connect the connecting cables in a de-energized state. Do not switch on the supply voltage until installation is complete and all connecting cables are connected to the device and control.

Data cables

- Use shielded data cables with twisted-pair wires.
- Implement proper and complete shielding concept.
- Length of cable for trigger signal: max. 20 m

Voltage supply

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

### I1 TRIG: Synchronization
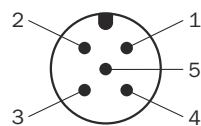


*Figure 14: M12 male connector, 5-pin, A-coded*

| Contact | Signal | Description |
|---|---|---|
| 1 | – | – |
| 2 | Sensor 1 | Digital input for external trigger |
| 3 | GND | Supply voltage: 0 V |
| 4 | – | – |
| 5 | – | – |

**I2 PWR / TRIG: Power / Synchronization**
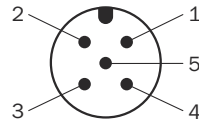


*Figure 15: M12 male connector, 5-pin, A-coded*

| Contact | Signal | Description |
|---|---|---|
| 1 | – | – |
| 2 | Vs | Supply voltage |
| 3 | GND | Supply voltage: 0 V |
| 4 | Sensor 1 | Digital input for external trigger |
| 5 | – | – |

**Complementary information**

Pre-assembled cables can be found on the product page.

The call is made 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).

**Further topics**

- Information on external illumination: Data sheet for external illumination

## 5.4 Network services and ports

Available network services and ports can be viewed in SOPASair under Diagnostics > Cybersecurity.

## 5.5 CAN interface

**Configuration of the CAN interface**

Configure the CAN data interface using SOPASair.

**Series connection**

The devices communicate with each other and are supplied with voltage via the CAN interface. A maximum of 3 devices can be connected in series (line topology). The devices are connected via a Y-cable.

For a CAN network with more than 3 devices, a separate voltage supply must be used for every 3 devices. Communication between all devices in the network is done via CAN.

**Complementary information**

Information on using the device in conjunction with a modular system controller or a Sensor Integration Machine can be found in the associated publications. The publications can be found at sick.com/{part number}.

Publications
- MSC800 Modular System Controller operating instructions, part number 8011539
- SIM2000ST Sensor Integration Machine operating instructions, part number 8020763
- SIM2000ST-E Sensor Integration Machine operating instructions, part number 8025453

## 5.6 CAN connection principle

**Connection to 3 devices**
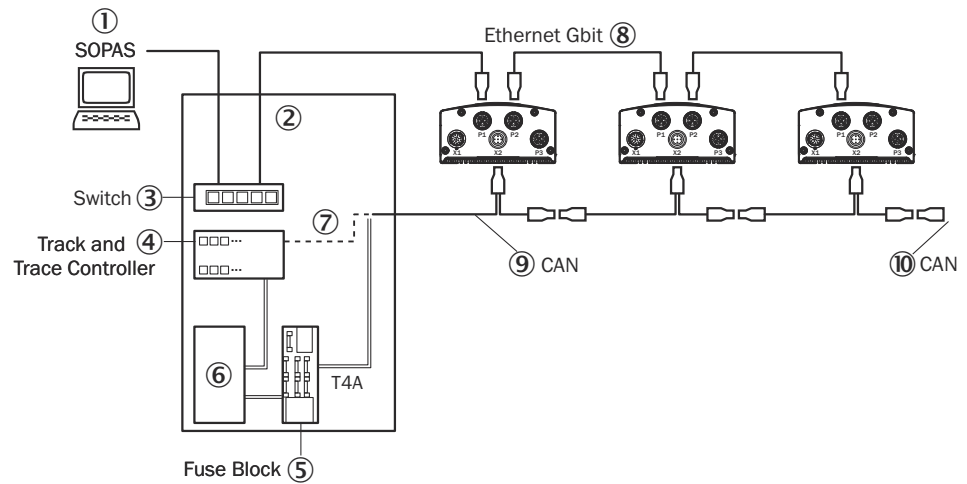


*Figure 16: Connection principle for CAN with track and trace controller, 3 devices*

①      Software for Integration Package Analytics, image output
②      Control cabinet
③      Switch
④      Track and trace controller (e.g., MSC800, SIM2000)
⑤      Fuse box
⑥      26 V supply voltage
⑦      CAN connection A
⑧      Gbit P1 and P2 Ethernet: image output, parameterization
⑨      CAN: power, increment, trigger, focus, code
⑩      CAN male connector with terminating resistor

**Connection to 6 devices**
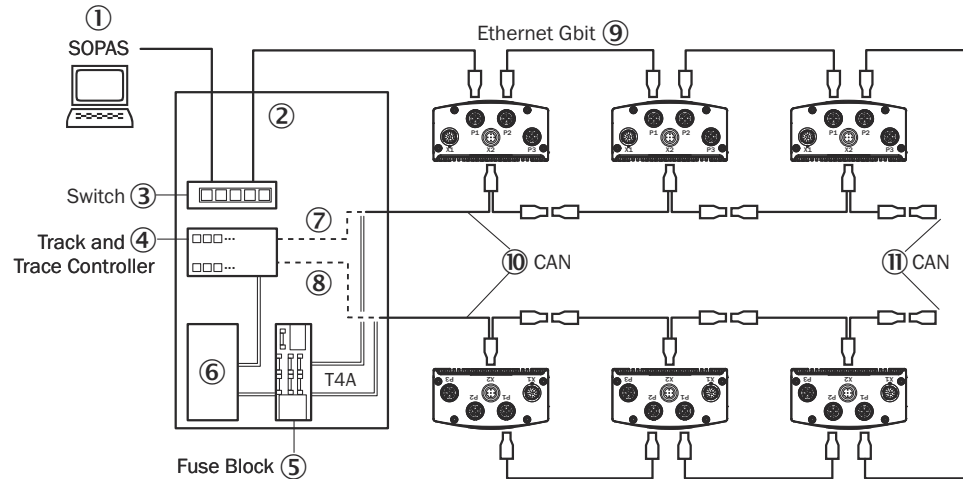


*Figure 17: Connection principle for CAN with track and trace controller, 6 products*

① Software for Integration Package Analytics, image output

② Control cabinet

③ Switch

④ Track and trace controller (e.g., MSC800, SIM2000)

⑤ Fuse box

⑥ 26 V supply voltage

⑦ CAN connection A

⑧ CAN connection B

⑨ Gbit P1 and P2 Ethernet: image output, parameterization

⑩ CAN: power, increment, trigger, focus, code

⑪ CAN male connector with terminating resistor

## 5.7 Connection principle for external illumination

### Connection with track and trace controller
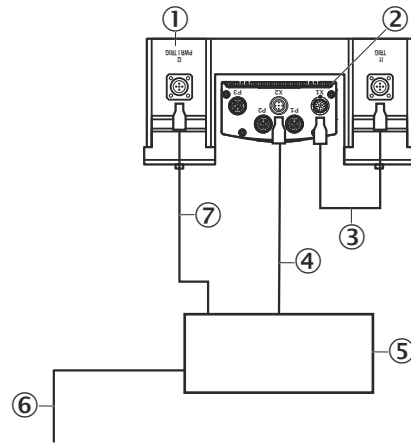


*Figure 18: Connection of external illumination with track and trace controller*

①    External illumination

②    Device

③    Synchronization between the device and external illumination

④    Supply voltage for the device, protected with a 4 A fuse (typ. in the control cabinet)

     SICK CAN sensor network

⑤    Control cabinet with track and trace controller (e.g. MSC800, SIM2000)

⑥    Supply voltage for the control cabinet

⑦    Supply voltage for the external illumination, protected by a 4A fuse (typ. in the control cabinet)

### Connection using a connection module
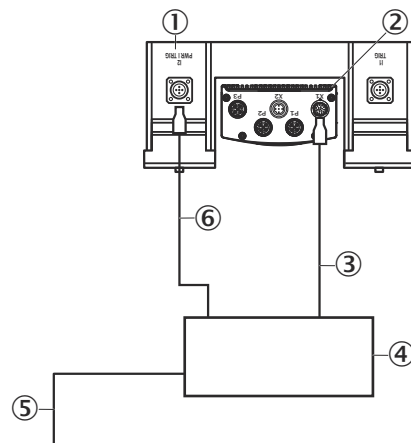


*Figure 19: Connection of the external illumination using a connection module*

①    External illumination

②    Device

③    Supply voltage and trigger for the device

④    Connection module (e.g. CDM, CDB)

⑤    Supply voltage for the 24 V connection module, 4 A fuse additionally required

⑥    Supply voltage for the external illumination, synchronization between the device and external illumination

## 5.8 Connection modules

**Prerequisites**

- Compatible connection module, to be ordered separately as an accessory.
- Only use the CDM connection module with integrated 40 W power supply with the product type V2D85xxx-xx**C**xxxxxxx. Note the additional current consumption in the connection module of max. 200 mA incl. output currents of the device.

**Connection modules**

Connection modules can be added as accessories in SOPASair when configuring the device. The wiring of the connection modules is described during configuration in SOPASair.

# 6 Commissioning

## 6.1 Starting SOPASair

### Overview

SOPASair is used for operation, parameterization, and servicing purposes (e.g., diagnostics, data logger).

### Prerequisites

- Device is connected to the computer via Ethernet (P1, P2 or P3) or USB.
- Voltage supply is connected.
- Computer and device are located on the same network.
- Computer and device have different IP addresses.
- Access data

| Rights | Password |
|---|---|
| Read | Can be accessed without a password |
| Read and write | Default password: servicelevel |

### Approach

1. Open web browser (recommendation: Google Chrome).
2. Enter the device IP address into the address line.
   Default IP addresses:
   - P1 and P2: 192.168.1.1
   - P3: 192.168.0.1
   - USB: 169.254.0.1
✓ The user interface is displayed.
3. To make changes, log in to the device.

## 6.2 Password management

### 6.2.1 Password assignment

#### Overview

Reading the parameter settings is possible without a password. A password can be assigned to protect the product against unauthorized changes to the settings.

#### Prerequisites

- When assigning a password for the first time, ensure the connection is secure, e.g. by using a point-to-point connection to the device.

#### Procedure

1. Establish a connection to the product in the web browser.
2. Select:
3. Log in with the default password **servicelevel**.
✓ You will be prompted to assign a new password.
4. Assign a new password.
✓ The new password is valid immediately.
5. Log in again with the newly assigned password.

### 6.2.2 Changing password

**Procedure**

1. Establish a connection to the product in the web browser.
2. 👤 Select:
3. Log in with the last assigned password.
4. Select **Change password**.
5. Assign a new password.
✓ The new password is valid immediately.

### 6.2.3 Resetting the password

**Procedure**

1. Establish a connection to the product in the web browser.
2. 👤 Select:
3. Select **Password forgotten?**.
4. Send **Device key**, **Serial number** and **Part number** in an e-mail to the responsible SICK sales company or the responsible SICK service partner, see **www.sick.com/ worldwide**.
5. Click **Next** to confirm.
✓ The window for entering a code appears.
   You can get the code from the responsible SICK sales company or the responsible SICK service partner. The code is only valid once for the reset process. You can close the window by clicking on the **x** without interrupting the reset process. If you select **Cancel** or enter an incorrect code several times, the current reset process is terminated. The requested code is no longer valid. The process must be restarted.
6. Optional: close the window by clicking on **x**. At a later time, open the window for

   entering the code via 👤 and **Password forgotten?**.
7. Enter the code.
8. Click **Reset** to confirm.
✓ The password is reset to the default password **servicelevel**. Parameters are not changed.

## 6.3 Starting SOPAS ET

**Overview**

The saved parameters can be manually saved, imported, and exported as a project file on the computer in the SOPAS ET configuration software.

**Prerequisites**

- Device is connected to the computer via Ethernet (P1, P2 or P3) or USB.
- Voltage supply is connected.
- Computer and device are located on the same network.
- Computer and device have different IP addresses.
- Computer with the SOPAS ET software installed
  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.
- SDD file (device description file)
  You can install the SDD file using the device catalog in SOPAS ET. Use the wizard in SOPAS ET to do this. The SDD file can be installed from the device or the SICK website. To install it from the SICK website, you need an Internet connection.
- Access data

| User levels | Password |
|---|---|
| Maintenance personnel | Main |
| Authorized client | Client |
| Service | Service level |

**Approach**

1. Install the latest version of the SOPAS ET configuration software. In this case, select the "Complete" option as suggested by the installation wizard. Administrator rights may be required on the computer to perform the installation.
2. Start "SOPAS ET" after completing the installation.
✓ SOPAS ET automatically starts the search for connected devices. Connected devices are displayed in the **Device Search** window.
3. Select the desired device in the list of available devices.
    **Default IP addresses:**
    o   P1 and P2: 192.168.1.1
    o   P3: 192.168.0.1
    o   Subnet mask: 255.255.255.0
    If necessary, install an updated device description file for the device.
4. Click on ⊞ **Add** to establish communication.
✓ SOPAS ET establishes communication with the device, loads its current device description (parameters), and displays the device in the **New Project** window.
5. Log into the device.

## 6.4 External data back-up

**Manual data backup using project file**

The parameter set can be manually saved on the computer as a project file (*.sopas). This is the generally recommended procedure. Using the project file, the parameter set can be transferred to a replacement device via download.

**Automatic data backup**

An additional storage medium is required to automatically save the parameter set to an external location. The device is permanently connected to the external storage medium. The externally stored parameter set is also updated automatically each time the parameterization is permanently saved.

External storage medium
▪ MicroSD memory card (cloning function)

Once it is switched on, the device automatically detects an external storage medium. The subsequent device behavior depends on the content of the storage medium. The goal is for the internal parameter set and the parameter set saved externally to always be identical.

| Content of the storage medium | Device behavior |
|---|---|
| Empty | Once the parameter set is permanently saved, the device also saves the internal parameter set on the storage medium. The prerequisite is that there is enough storage space. |
| No parameter set possible to interpret | |
| Parameter set possible to interpret | After being switched on, the device automatically loads the compatible parameter set from the external storage medium into the working memory and internal, permanent parameter memory. The device then starts with its new valid parameter set. |

## 6.5 Inserting and removing memory card

**Important information**

| ! | NOTICE |
|---|---|

**Loss of configuration data**

Do not remove the memory card or switch off the supply voltage while the parameter set is being saved. Otherwise all parameters not yet saved permanently will be lost.

**Prerequisites**

- The supply voltage for the product is switched off.
- To remove the memory card during operation, select the **Remove SD card** option under **Analysis/SD card** in SOPAS ET.
- If the cover is open, the product does not fulfill any specified enclosure rating. Only briefly open the cover. Protect the product against moisture and dust during this time.

**Approach**

Inserting the memory card
1. Open the rubber cover.
2. Making sure it is in the correct position, insert the memory card into the slot until it locks into place. To do so, align the product as per the card icon.
3. Close the cover again. Make sure that the cover is completely flush with the product when closed.
4. Switch on the supply voltage for the product.

Removing memory card
1. Push the memory card into the slot until it is released.
2. Remove the memory card.
3. Close the cover again. Make sure that the cover is completely flush with the product when closed.
4. Switch on the supply voltage for the product.

## 6.6 Saving the parameter set

**Overview**

The device is configured for the application using SOPASair. The parameter set can be permanently saved in SOPASair. To be able to restore the parameter set to a replacement device, for example in the event of a device failure, you should also save the parameter set externally.

**Approach**

1. Permanently saving the parameters in SOPASair:

    

   ✓ The device stores the parameter set internally in the permanent parameter memory.
   ✓ If a memory card is installed in the device, the device also saves the parameter set externally on the memory card.
2. Open SOPAS ET.
3. In SOPAS ET, manually save the parameter set as a project file on the computer.
   ✓ The parameter set is also saved externally. The parameter set in the project file can be transferred to a replacement device via download.

## 6.7 Installing firmware updates

**Prerequisites**

- Computer with the SICK AppManager software installed
  The current version of SICK AppManager can be downloaded from **www.sick.com/
  SICK_AppManager**. To install SICK AppManager, open the installation file (*.exe)
  and follow the instructions on the screen.
- Ethernet port P1, P2 or P3

**Procedure**

1. Open SICK AppManager.
2. Drag and drop the file into the **Firmware** window.
3. In the **Firmware** window, select the file to be installed.
4. In the bottom right window, click the **Install** button.
✓ The firmware update is installed.

# 7   Maintenance

## 7.1   Maintenance

*Table 2: Maintenance schedule*

| Maintenance work | Interval |
| --- | --- |
| Check device and connecting cables for damage at regular intervals. | Depends on ambient conditions and climate. |
| Check the housing and viewing window for contamination and clean if necessary. | Depends on ambient conditions and climate. |
| Check the screw connections and plug connections. | Depends on the place of use, ambient conditions or operating requirements. Recommended: At least every 6 months. |
| Check that all unused connections are sealed with protective caps. | Depends on ambient conditions and climate. Recommended: At least every 6 months. |

## 7.2   Cleaning the product

**Important information**

> **!**   **NOTICE**
> ▶   Never use sharp objects for cleaning.
> ▶   Recommendation: Use anti-static cleaning agents.
> ▶   Recommendation: Use anti-static plastic cleaners and lens cloths from SICK.

> **!**   **NOTICE**
> If the viewing window is scratched or damaged, take the product out of operation and have it repaired by SICK.

**Approach**

1.   If possible, switch off the voltage supply to the product. If this is not possible, wear suitable laser safety goggles. These must effectively absorb the radiation of the wavelength used by the product.
2.   Clean the viewing window according to the material:
     o   Glass window: remove dust from the viewing window using a soft, clean brush. If necessary, also clean the viewing window with a clean, damp, lint-free cloth, and a mild anti-static lens cleaning fluid.
     o   Plastic window: clean the viewing window only with a clean, damp, lint-free cloth, and a mild anti-static lens cleaning fluid.
3.   Remove any dust from the housing using a soft brush.

# 8 Troubleshooting

## 8.1 Troubleshooting

**Faults, warnings and errors**

| Situation | Error or fault |
|---|---|
| Mounting | ■ Device poorly aligned to objects with codes (e.g. glare)<br>■ Trigger sensor for reading cycle incorrectly positioned (e.g. internal reading interval is opened too late or closed too early)<br>■ Incremental encoder (optional) incorrectly positioned |
| Electrical installation | ■ Interfaces of the device incorrectly wired |
| Configuration | ■ Functions not adapted to local conditions, e.g., parameters for the data interface not set correctly<br>■ Device limits not observed, e.g., working range, aperture angle<br>■ Trigger source for read cycle not selected correctly |
| Operation | ■ Start/stop operation: external read cycle missing, more than one object is in the reading field<br>■ Device faults (hardware, software) |

**Diagnostics using SOPASair**

The error log contains current error messages.

You can create and download a diagnostic file in the configuration software for service purposes. The diagnostic file contains data required for fault analysis.

**Complementary information**

For faults that cannot be rectified based on the error description, please contact SICK Service. To help us to resolve the matter quickly, please note down the details on the type label.

## 8.2 Repair

Repairs on the device may only be performed by qualified and authorized personnel from SICK AG. Interference with or modifications to the device on the part of the customer will invalidate any warranty claims against SICK AG.

## 8.3 Removing the product

**Approach**

1. Switch off the supply voltage.
2. Mark the position and alignment of the device on the bracket or surroundings.
3. Disconnect and remove the connecting cables of the device.
4. Remove the device from the bracket.

**Complementary information**

If you replace the product, you can transfer the parameter values to the replacement product by downloading them. If only the camera housing and not the lens is replaced, readjust the focus position on the lens.

# 9 Decommissioning

## 9.1 Disposal of the product

**Procedure**

► Always dispose of unusable products in accordance with national waste disposal regulations.

**Complementary information**

SICK will be glad to help you dispose of these products on request.

# 10 Technical data

> **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

| | |
|---|---|
| **Typical application** | indoor area |
| **Variant** | Base device<br>Complete device |
| **Optical focus** | Adjustable focus<br>Manual sharpness and aperture setting on optional lens |
| **Sensor** | CMOS matrix sensor, grayscale values |
| **Sensor resolution** | V2D85**05**x–xxxxxxxxxx: 5 megapixel (2,464 px x 2,048 px)<br>V2D85**09**x–xxxxxxxxxx: 9 megapixel (4,096 px x 2,176 px)<br>V2D85**12**x–xxxxxxxxxx: 12 megapixel (4,096 px x 3,008 px) |
| **Integrated illumination unit** | Order separately as an accessory, e.g. variant of the VI83I illumination unit<br><br>**Variants of the VI83I illumination with 32 LEDs:**<br>• Visible white light medium, aperture angle: 31°<br>• Visible white light wide, aperture angle: 47°<br>• Visible red light medium, peak wavelength: $\lambda$ = 660 nm ± 20 nm, aperture angle: 31°<br>• Visible red light wide, peak wavelength: $\lambda$ = 660 nm ± 20 nm, aperture angle: 47° |
| **Feedback LED** | Not available due to the variant of the VI83I illumination unit |
| **LED risk group of the illumination unit (visible white light variant + feedback LED)** | Risk group 1 (low risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09<br><br>**Radiance:**<br>• $L_B$ [1]: < 10 x $10^3$ W/(m²sr) within 100 seconds; at a distance ≥ 200 mm<br>• $L_R$ [2]: < 2.5 x $10^6$ W/(m²sr) within 10 seconds; at a distance ≥ 200 mm<br><br>Risk RG 0 (no risk group) corresponding to $L_B$ < 100 W/(m²sr) within 10 x $10^3$ seconds for distances > 0.8 m. |
| **LED risk group of the illumination unit (visible red light variant + feedback LED)** | Risk group 1 (low risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09<br><br>**Radiance:**<br>• $L_B$ [1]: < 10 x $10^3$ W/(m²sr) within 100 seconds; at a distance ≥ 200 mm<br>• $L_R$ [2]: < 2.5 x $10^6$ W/(m²sr) within 10 seconds; at a distance ≥ 200 mm<br><br>Risk RG 0 (no risk group) corresponding to $L_B$ < 100 W/(m²sr) within 10 x $10^3$ seconds for distances > 0.3 m. |
| **Laser alignment aid [3]** | 1 laser, can be switched off<br>Visible red light ($\lambda$ = 630 nm … 680 nm) |

| Laser class of the alignment aid | Class 1 Laser Product according to IEC 60825-1: 2014 and EN 60825-1:2014+A11:2021. Complies with 21 CFR 1040.10/11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56 dated 8 May 2019. P < 0.39 mW |
|---|---|
| Scanning frequency | 30 Hz, at 5 megapixels resolution<br>20 Hz, at 9 megapixels resolution<br>15 Hz, at 12 megapixels resolution |
| Code resolution | ≥ 0.1 mm (depending on the lens) |
| Working distance | 500 mm ... 3,000 mm |
| Lens | C-mount |
| Sensor format | V2D85**05**x–xxxxxxxxxx: 1/1.8"<br>V2D85**09**x–xxxxxxxxxx: 1/1.2"<br>V2D85**12**x–xxxxxxxxxx: 1/1.1" |

[1]    $L_B$= Hazard from blue light.
[2]    $L_R$= Hazard to the retina of the eye due to heating.
[3]    Not available.

## 10.2    Mechanics and electronics

| Connection type | • 1 M12 male connector, 17-pin, A-coded (Power, CAN, serial interface, I/O) [1]<br>• 1 M12 male connector, 5-pin, A-coded (Power, CAN)<br>• 3 M12 female connectors, 8-pin, X-coded (Gigabit Ethernet) |
|---|---|
| Supply voltage Vs | DC 24 V ± 20%<br>Voltage source in accordance with ES1 (EN62368-1) or SELV (EN60950-1) |
| Power consumption | Operation: Typically 24 W [2] |
| Current consumption | Max. 2.0 A |
| Output current | • Output current per output: max. 200 mA<br>• Sum of output currents: max. permissible 400 mA |
| Housing material | Aluminum die cast |
| Housing color | Anthracite gray (RAL 7016) |
| Viewing window material | Glass, 2 mm thick, scratch-proof coating |
| Cover (top of device) | Material: Plastic<br>**Function**<br>• Insert or remove optional memory card<br>• Temporary use of the USB interface as a service interface<br>Function: For temporary access to the microSD memory card slot and the USB connection<br>Foldable [3] |
| Enclosure rating | IP 65 (IEC 60529:2013 +C1:2013 +C2:2015 +AMD2 C1:2019, EN 60529:1991 +A1:2010 +A2:2013 +AC:2019-02) [4] |
| Electrical safety | EN 61010-1:2010<br>EN 61010-1:2010/A1:2019<br>EN 61010-1:2010/A1:2019/AC:2019-04 |
| Regulatory notes | NFPA79 applications only. Adapters including connecting cables are available. |
| Weight | Max. 640 g, without lens and connecting cables |

| Dimensions (L x W x H) | 143.4 mm x 90 mm x 46 mm [5] |
|---|---|
| MTBF | 100,000 h [6] |

[1] Maximum length of cable: 10 m
[2] The typical power consumption depends on the product configuration. The specified value applies to digital outputs without load.
[3] When the cover is open, the device no longer conforms with the specified protection class. Protect the device against moisture and dust when the cover is open temporarily.
[4] **Prerequisites:**
   - The optics protection hood must be screwed tightly onto the device.
   - The cover on the top of the device is closed.
   - The cables plugged into the electrical connections must be screwed tight. Unused electrical connections are sealed off with a protective cap.
[5] Housing only, without lens and optics protection hood.
[6] At 25 °C ambient operating temperature.

## 10.3 Dimensional drawing

**Base device**
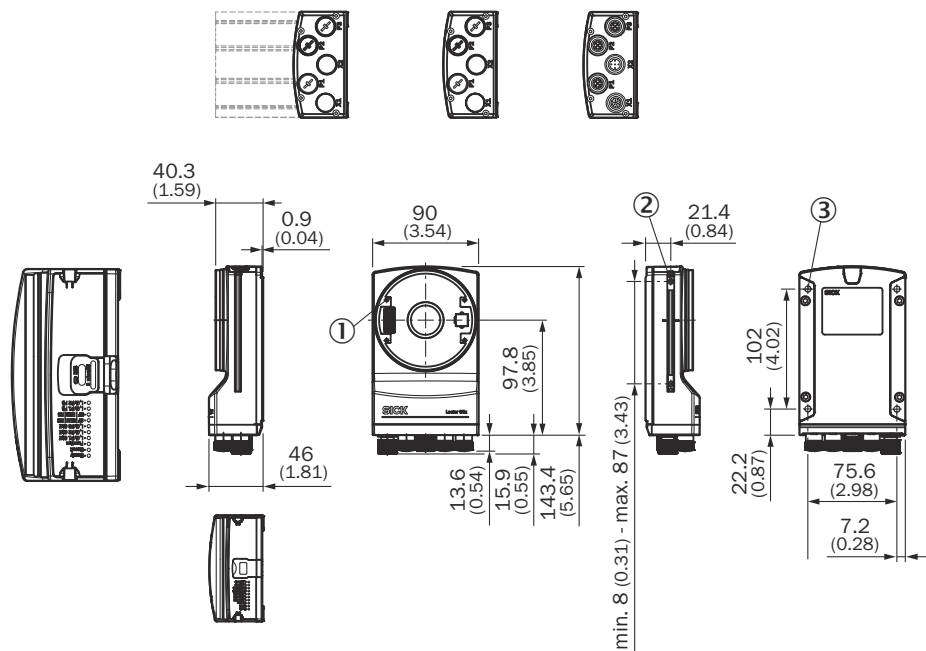


*Figure 20: Structure and device dimensions, unit: mm (inch), decimal separator: period*

① 4 tapped blind holes, M2.5, 5.5 mm deep, for mounting the spacer

② 2 M5 sliding nuts; 5.5 mm deep; pivoting; as an alternative method of mounting the device

③ 4 M5 tapped blind holes, 5.5 mm deep; for mounting the device

**Complete device**

Product type: V2D85**05**x–xxxxxxxxxx
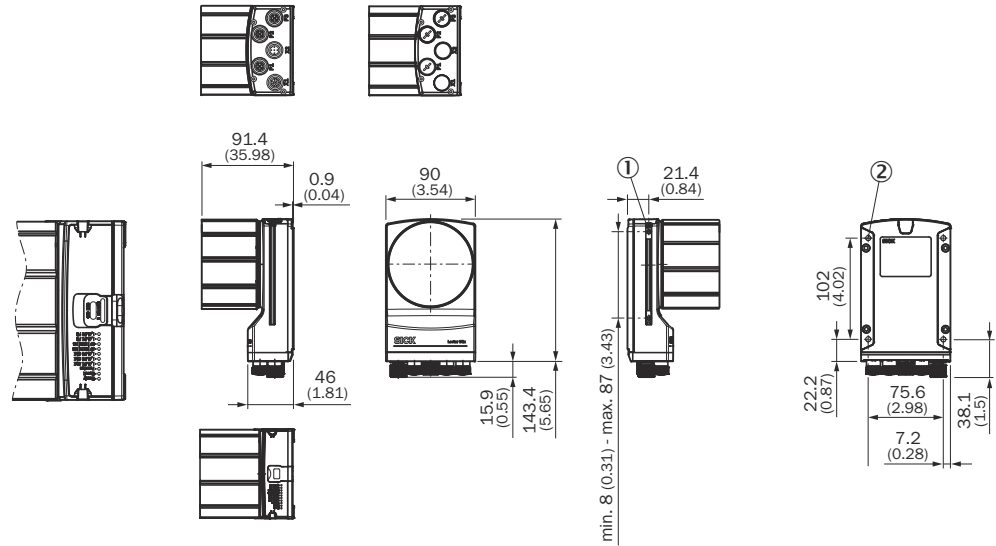
*Figure 21: Structure and device dimensions, unit: mm (inch), decimal separator: period*

① 2 M5 sliding nuts; 5.5 mm deep; pivoting; as an alternative method of mounting the device

② 4 M5 tapped blind holes, 5.5 mm deep; for mounting the device

**Complete device**

Product type: V2D85**09**x–xxxxxxxxxx, V2D85**12**x–xxxxxxxxxx
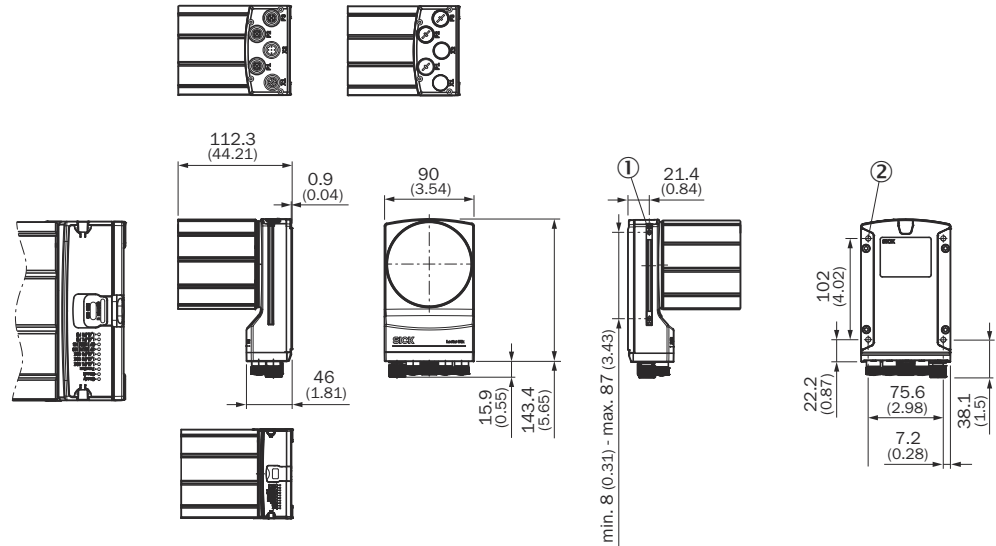
*Figure 22: Structure and device dimensions, unit: mm (inch), decimal separator: period*

① 2 M5 sliding nuts; 5.5 mm deep; pivoting; as an alternative method of mounting the device

② 4 M5 tapped blind holes, 5.5 mm deep; for mounting the device

## 10.4 Performance

| Readable code structures | 1D codes, Stacked, 2D codes |
|---|---|
| **1D code types (bar code types)** | GS1-128 / EAN 128, UPC/GTIN/EAN, 2/5 Interleaved, Code 39, Code 128, Codabar, Code 93 |
| **2D code types** | Data-Matrix ECC200, MaxiCode, QR code |

| | |
|---|---|
| **Stacked code types** | PDF417 |
| **Code qualifica-tion** | On the basis of ISO/IEC 16022, ISO/IEC 15415, ISO/IEC 18004 |
| **Internal image memory** | Not available |

## 10.5  Interfaces

| | |
|---|---|
| **Communication interfaces** | • Gigabit Ethernet: P1/P2<br>• Ethernet P3<br>• Ethernet via USB (RNDIS) [1]<br>• CAN 1 (male connector, M12, 17-pin, A-coded)<br>• CAN 2 (male connector, M12, 5-pin, A-coded)<br>• Serial data interface<br>• Serial service interface |
| **Ethernet** | Protocol: TCP/IP<br>Function: Data interface (read result output), service interface, FTP (image transfer)<br>Data transmission rate: 10/100/1,000 Mbit/s<br>MAC address P1 / P2 / P3, see type label |
| **Serial** | RS-232, RS-422<br>Data transmission rate: 1.2 kBaud … 115.2 kBaud |
| **Digital inputs** | 2 ("Sensor 1", "Sensor 2"), isolated<br>Function: Encoder input, external trigger |
| **Configurable digi-tal inputs and digital outputs** | **X1**: 4 (DIO 3 [2], DIO 4, DIO 5, DIO 6) |
| **CAN** | Protocol: SICK CAN sensor network CSN (CAN Device)<br>Function: Data interface (read result output), trigger interface<br>Data transmission rate: 500 kbit/s |
| **USB** | USB 2.0<br>Function: Service interface, Ethernet via USB (RNDIS) [1] [3] |
| **Reading pulse** | Digital inputs, CAN, PROFINET via trigger bit, EtherNet/IP™ via trigger bit |
| **Optical displays** | 10 status LEDs |
| **Operator interfa-ces** | Web server |
| **Configuration software (param-eterization)** | SOPASair (web interface) |
| **microSD memory card [4]** | Function: Cloning (external storage medium) |
| **Data storage and retrieval** | Image and data storage via external FTP |
| **External illumina-tion control** | Via digital output (max. 24 V trigger) |
| **EncoderFre-quency** | Max. 50 kHz |

| | |
|---|---|
| **Encoder resolution** | 0.2 mm/pulse ... 10 mm/pulse |

[1] For temporary use as a service interface only.
[2] Not available.
[3] If the cover is open, the device does not fulfill any specified enclosure rating. Only briefly open the cover. Protect the device against moisture and dust during this time.
[4] Memory card is available as an optional accessory. To ensure that the memory card functions reliably, only use card types (industrial standard) approved by SICK. Other functions are available upon request.

## 10.6 Ambient data

| | |
|---|---|
| **Electromagnetic compatibility (EMC)** | Immunity: IEC 61000-6-2:2016, EN IEC 61000-6-2:2019<br>Emission: IEC 61000-6-4:2018, EN IEC 61000-6-4:2019 |
| **Vibration resistance** | EN 60068-2-6:2007, EN 60068-2-64:2019 |
| **Shock resistance** | EN 60068-2-27:2008 |
| **Ambient operating temperature** | 0 °C ... +50 °C [1] |
| **Storage temperature** | –20 °C ... +70 °C [2] |
| **Permissible relative humidity** | 0% ... 90%, non-condensing |
| **Ambient light immunity** | 2,000 lx on code |
| **Ambient conditions** | Degree of contamination 2 (according to EN 61010-1) |
| **Altitude** | < 5,000 m above sea level |

[1] If the ambient operating temperature will be ≥ 45 °C, ensure adequate heat dissipation when mounting the device, see "Assembling the product", page 24.
To prevent condensation, avoid exposing the device to rapid changes in temperature.
[2] Store in a place protected from moisture and dust.

## 10.7 Field of view

**V2D8505R-xxxxxxxxxx, focal length: 8 mm**



*Figure 23: Field of view V2D8505R-xxxxxxxxxx, focal length: 8 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Perceived field of view area: vertical (mm)

*Table 3: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 453 | 376 |
| 1000 | 875 | 727 |
| 1500 | 1297 | 1078 |
| 2000 | 1719 | 1429 |
| 2500 | 2141 | 1779 |
| 3000 | 2563 | 2130 |

*Table 4: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.22 | 0.36 |
| 1000 | 0.43 | 0.72 |
| 1500 | 0.63 | 1.06 |
| 2000 | 0.84 | 1.4 |
| 2500 | 1.04 | 1.74 |
| 3000 | 1.25 | 2.08 |

**V2D8505R-xxxxxxxxxx, focal length: 12 mm**



*Figure 24: Field of view V2D8505R-xxxxxxxxxx, focal length: 12 mm*

① Working distance in mm
② Perceived field of view area: horizontal (mm)
③ Perceived field of view area: vertical (mm)

*Table 5: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 301 | 251 |
| 1000 | 583 | 484 |
| 1500 | 864 | 718 |
| 2000 | 1145 | 952 |
| 2500 | 1427 | 1186 |
| 3000 | 1708 | 1420 |

*Table 6: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.15 | 0.24 |
| 1000 | 0.28 | 0.48 |
| 1500 | 0.42 | 0.70 |
| 2000 | 0.56 | 0.92 |
| 2500 | 0.69 | 1.16 |
| 3000 | 0.83 | 1.38 |

**V2D8505R-xxxxxxxxxx, focal length: 16 mm**
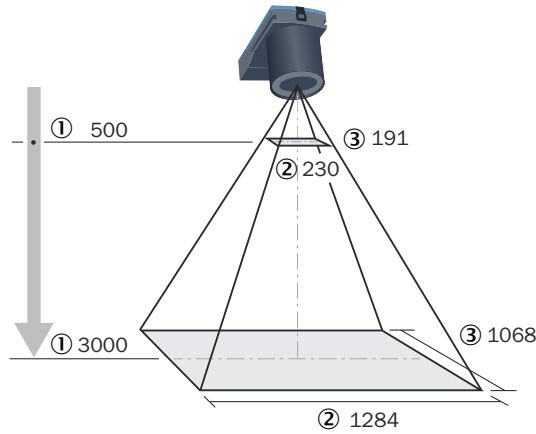


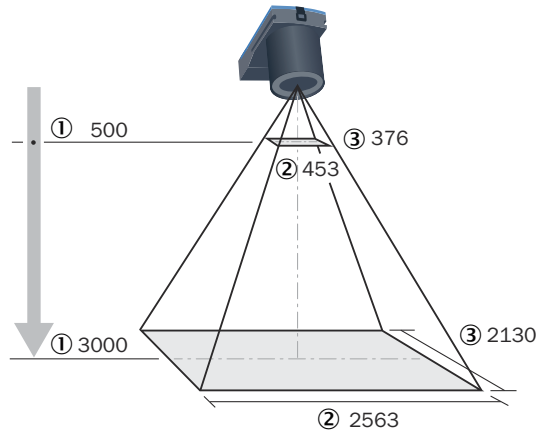*Figure 25: Field of view V2D8505R-xxxxxxxxxx, focal length: 16 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Min. perceived field of view area: horizontal (mm)

*Table 7: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 230 | 191 |
| 1000 | 441 | 366 |
| 1500 | 652 | 542 |
| 2000 | 863 | 717 |
| 2500 | 1073 | 892 |
| 3000 | 1284 | 1068 |

*Table 8: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.11 | 0.18 |
| 1000 | 0.21 | 0.36 |
| 1500 | 0.32 | 0.52 |
| 2000 | 0.42 | 0.7 |
| 2500 | 0.52 | 0.88 |
| 3000 | 0.63 | 1.04 |

**V2D8505R-xxxxxxxxxx, focal length: 25 mm**
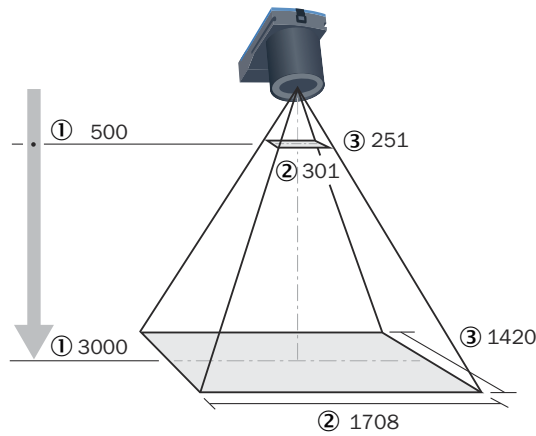


*Figure 26: Field of view of V2D8505R-xxxxxxxxxx, focal length: 25 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Perceived field of view area: vertical (mm)

*Table 9: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 144 | 120 |
| 1000 | 279 | 232 |
| 1500 | 414 | 344 |
| 2000 | 549 | 456 |
| 2500 | 684 | 569 |
| 3000 | 819 | 681 |

*Table 10: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.07 | 0.12 |
| 1000 | 0.14 | 0.22 |
| 1500 | 0.20 | 0.34 |
| 2000 | 0.27 | 0.44 |
| 2500 | 0.33 | 0.56 |
| 3000 | 0.40 | 0.66 |

**V2D8509R-xxxxxxxxxx, focal length: 12 mm**



*Figure 27: Field of view V2D8509R-xxxxxxxxxx, focal length: 12 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Perceived field of view area: vertical (mm)

*Table 11: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 497 | 264 |
| 1000 | 965 | 513 |
| 1500 | 1433 | 761 |
| 2000 | 1900 | 1010 |
| 2500 | 2368 | 1258 |
| 3000 | 2836 | 1506 |

*Table 12: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.15 | 0.24 |
| 1000 | 0.28 | 0.48 |
| 1500 | 0.42 | 0.70 |
| 2000 | 0.56 | 0.92 |
| 2500 | 0.69 | 1.16 |
| 3000 | 0.83 | 1.38 |

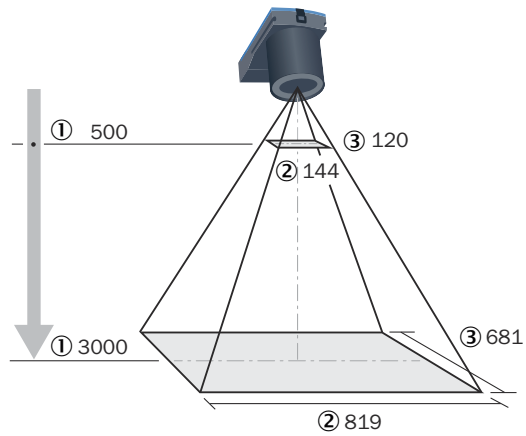**V2D8509R-xxxxxxxxxx, focal length: 16 mm**



*Figure 28: Field of view V2D8509R-xxxxxxxxxx, focal length: 16 mm*

①        Working distance in mm

②        Perceived field of view area: horizontal (mm)

③        Perceived field of view area: vertical (mm)

*Table 13: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 380 | 202 |
| 1000 | 731 | 388 |
| 1500 | 1081 | 574 |
| 2000 | 1432 | 761 |
| 2500 | 1783 | 947 |
| 3000 | 2133 | 1133 |

*Table 14: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.11 | 0.18 |
| 1000 | 0.21 | 0.36 |
| 1500 | 0.32 | 0.52 |
| 2000 | 0.42 | 0.70 |
| 2500 | 0.52 | 0.88 |
| 3000 | 0.62 | 1.04 |

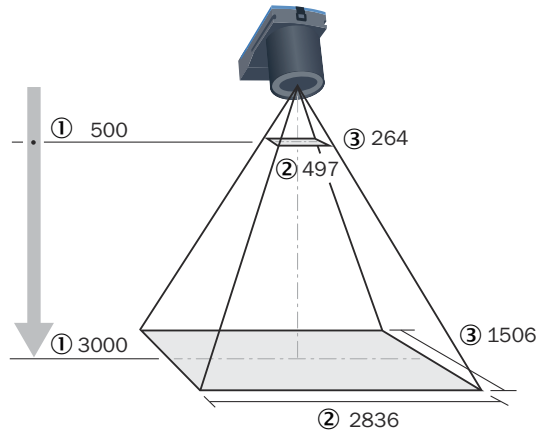**V2D8509R-xxxxxxxxxx, focal length: 25 mm**



*Figure 29: Field of view V2D8509R-xxxxxxxxxx, focal length: 25 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Perceived field of view area: vertical (mm)

*Table 15: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 245 | 130 |
| 1000 | 470 | 250 |
| 1500 | 694 | 369 |
| 2000 | 919 | 488 |
| 2500 | 1143 | 607 |
| 3000 | 1368 | 727 |

*Table 16: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.07 | 0.12 |
| 1000 | 0.14 | 0.22 |
| 1500 | 0.20 | 0.34 |
| 2000 | 0.27 | 0.44 |
| 2500 | 0.33 | 0.56 |
| 3000 | 0.40 | 0.66 |

**V2D8512R-xxxxxxxxxx, focal length: 12 mm**



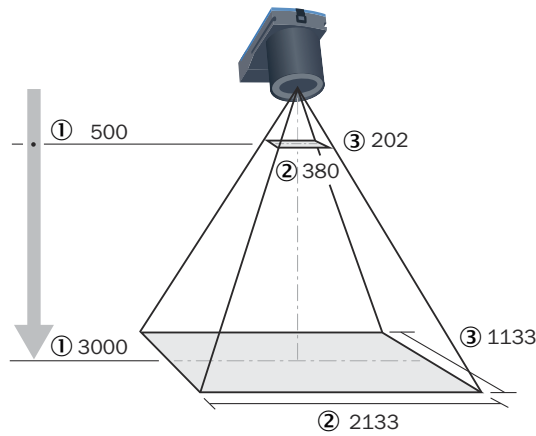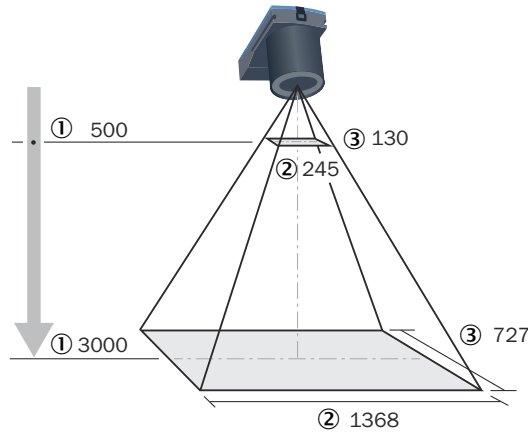*Figure 30: Field of view V2D8512R-xxxxxxxxxx, focal length: 12 mm*

①      Working distance in mm
②      Perceived field of view area: horizontal (mm)
③      Min. perceived field of view area: horizontal (mm)

*Table 17: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 497 | 365 |
| 1000 | 965 | 709 |
| 1500 | 1433 | 1052 |
| 2000 | 1900 | 1396 |
| 2500 | 2368 | 1739 |
| 3000 | 2836 | 2082 |

*Table 18: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.15 | 0.24 |
| 1000 | 0.28 | 0.48 |
| 1500 | 0.42 | 0.70 |
| 2000 | 0.56 | 0.92 |
| 2500 | 0.69 | 1.16 |
| 3000 | 0.83 | 1.38 |

**V2D8512R-xxxxxxxxxx, focal length: 16 mm**



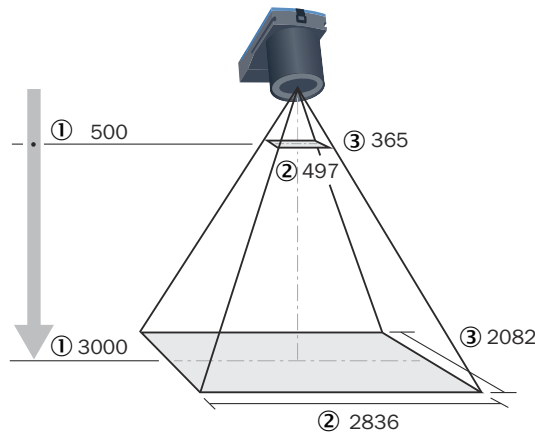*Figure 31: Field of view V2D8512R-xxxxxxxxxx, focal length: 16 mm*

①        Working distance in mm
②        Perceived field of view area: horizontal (mm)
③        Perceived field of view area: vertical (mm)

*Table 19: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 380 | 279 |
| 1000 | 731 | 537 |
| 1500 | 1081 | 794 |
| 2000 | 1432 | 1052 |
| 2500 | 1783 | 1309 |
| 3000 | 2133 | 1567 |

*Table 20: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.11 | 0.18 |
| 1000 | 0.21 | 0.36 |
| 1500 | 0.32 | 0.52 |
| 2000 | 0.42 | 0.70 |
| 2500 | 0.52 | 0.88 |
| 3000 | 0.62 | 1.04 |

**V2D8512R-xxxxxxxxxx, focal length: 25 mm**



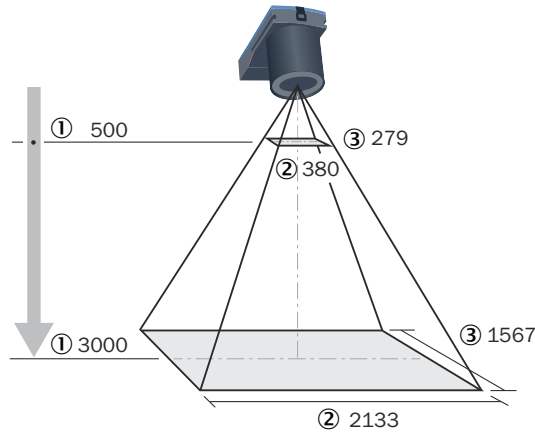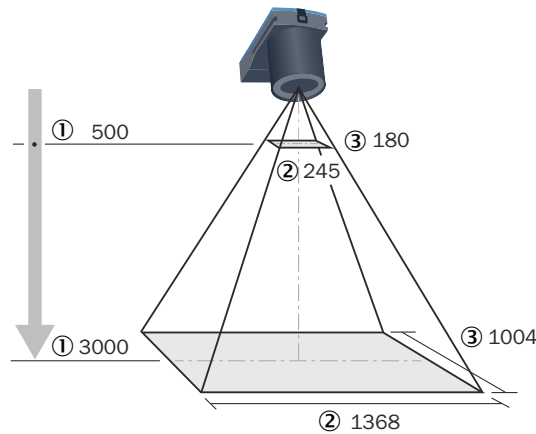*Figure 32: Field of view V2D8512R-xxxxxxxxxx, focal length: 25 mm*

① Working distance in mm
② Perceived field of view area: horizontal (mm)
③ Perceived field of view area: vertical (mm)

*Table 21: Perceived field of view area*

| Working distance (mm) | Horizontal (mm) | Vertical (mm) |
|---|---|---|
| 500 | 245 | 180 |
| 1000 | 470 | 345 |
| 1500 | 694 | 510 |
| 2000 | 919 | 675 |
| 2500 | 1143 | 840 |
| 3000 | 1368 | 1004 |

*Table 22: Minimum resolution*

| Working distance (mm) | 1D code (mm) | 2D code (mm) |
|---|---|---|
| 500 | 0.07 | 0.12 |
| 1000 | 0.14 | 0.22 |
| 1500 | 0.20 | 0.34 |
| 2000 | 0.27 | 0.44 |
| 2500 | 0.33 | 0.56 |
| 3000 | 0.40 | 0.66 |

## 10.8 Data sheet for external illumination

| | |
|---|---|
| **Operating mode** | Pulsed |
| **Field of view, illumination** | 32 LEDs, visible light |
| **Color** | VI228U-WH50**31**F3: Visible white light medium, aperture angle: 31° <br> VI228U-WH50**47**F3: Visible white light wide, aperture angle: 47° |
| **LED class** | Risk group 0 (free group) according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09 |

| | |
|---|---|
| **Supply voltage Vs** | DC 24 V ± 20% |
| **Current consumption** | Max. average current: 2 A<br>Max. peak current 2.5 A |
| **Frequency** | 1 ... 120 Hz |
| **Pulse duration** | 50 ... 350 µs |
| **Enclosure rating** | IP 65 (IEC 60529:2013 +C1:2013 +C2:2015 +AMD2 C1:2019,<br>EN 60529:1991 +A1:2010 +A2:2013 +AC:2019-02) [1] |
| **Ambient operating temperature** | 0 °C ... +40 °C [2] |
| **Storage temperature** | –20 °C ... +70 °C [3] |
| **Permissible relative humidity** | 0% ... 90%, non-condensing |

[1]   Prerequisites:
- The cables plugged into the electrical connections must be screwed tight. Unused electrical connections are sealed off with a protective cap.

[2]   Ensure adequate heat dissipation when mounting the device.

[3]   Store in a place protected from moisture and dust.

## 10.9    Dimensional drawing of external illumination



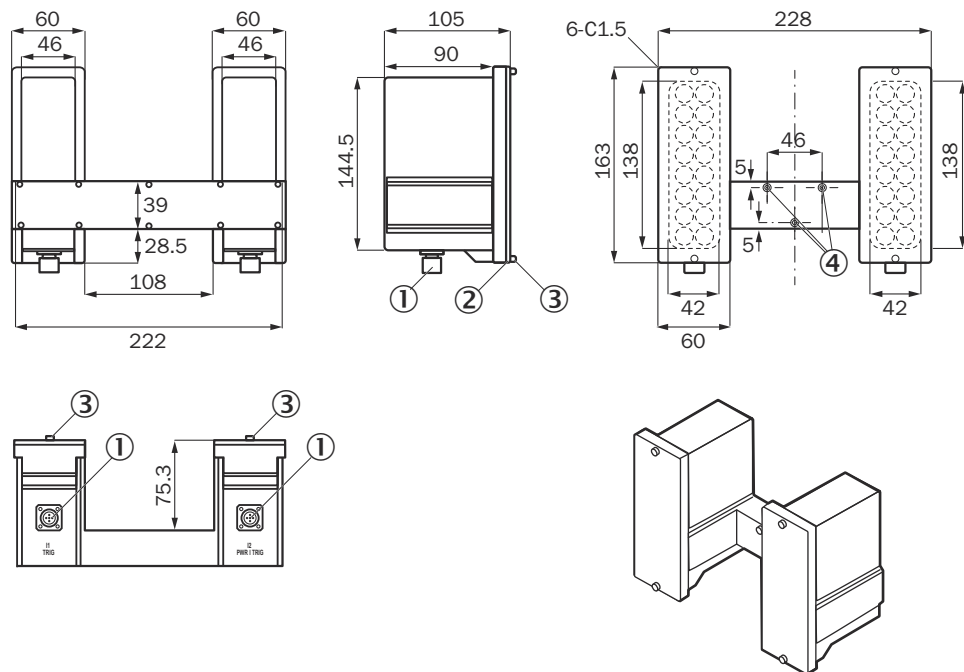*Figure 33: Structure and device dimensions, unit: mm (inch), decimal separator: period*

①     Electrical connections

②     Polarizing filter

③     Screws for mounting the polarizing filter

④     M5 screws for mounting the external illumination unit on the mounting bracket

# 11    Accessories

Accessories and, if applicable, associated mounting information can be found on the product page.

The call is made 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 call is made 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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