OPERATING INSTRUCTIONS

Lector64x/65x Flex, Lector65x Dynamic Focus

Image-based code readers

SICK
Sensor Intelligence.

Described product

Lector64x Flex

Lector65x Flex

Lector65x Dynamic Focus

Manufacturer

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

Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Information on the operating instructions

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

Prerequisites for safe work are:

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

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

NOTE
Read these operating instructions carefully before starting any work on the device, in order to familiarize yourself with the device and its functions.

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 in which the device is integrated. For information about this, refer to the operating instructions of the particular machine.

1.2 Scope

These operating instructions serve to incorporate the device into a customer system. Instructions are given by stages for all actions required.

These instructions apply to all available device variants of the product. More detailed information for the identification of the available device type see "Type code", page 11.

Available device variants are listed on the online product page:

- www.sick.com/lector64x
- www.sick.com/lector65x

Various device variants are used as examples for commissioning, based on the default parameter settings for the relevant device.

1.3 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.

1.4 Further information

NOTE
All the documentation available for the device can be found on the online product page at:

▶ www.sick.com

The following information is available for download there:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawings and diagrams
- EU declaration of conformity for the product family
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- These operating instructions, available in English and German, and in other languages if necessary
- Other publications related to the devices described here
- Publications dealing with accessories

1.4.1 Supplementary documents

Information about configuration of the sensor can be found in the online help function of the SOPAS ET configuration software.

1.4.2 Documents on request

Overview of command strings for the sensor.

1.5 Customer service

If you require any technical information, our customer service department will be happy to help. To find your representative, see the final page of this document.

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

2 Safety information

2.1 Intended use

The image-based code reader Lector6xx is an intelligent SICK-4Dpro sensor.

The code readers of the Lector6xx product family are used for automatic, fixed identification and decoding of codes on moving or stationary objects. They read all commonly used 1D codes (bar codes/stacked codes) and 2D codes (matrix codes). The code readers use the host interface to send the read data to a higher-level computer for further processing.

The code readers are primarily designed for use in industrial and logistics areas, and they meet the requirements for industrial ruggedness, interfaces and data processing. They are not safety components as per the Machinery Directive 2006/42/EC They are not intended and not permitted to be used in areas with explosive atmospheres, in corrosive environments, or in extreme ambient conditions.

2.2 Incorrect 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.

If the device is to be used under other conditions or in different environments, then the manufacturing service may issue an operating license in consultation with the customer and in exceptional cases.

2.3 IP technology

NOTE

SICK uses standard IP technology in its products. The emphasis is placed on availability of products and services. SICK always assumes that the integrity and confidentiality of the data and rights affected by the use of the aforementioned products will be ensured by the customer. In all cases, appropriate security measures, such as network separation, firewalls, virus protection, and patch management, must be taken by the customer on the basis of the situation in question.

2.4 Limitation of liability

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

- Failing to observe the operating instructions
- Incorrect use
- Use by untrained personnel
- 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.

2.5 Modifications and conversions

NOTICE
Modifications and conversions to the device and/or the installation 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.

Before technical modifications to and expansions of the device, the prior written approval of the manufacturer must be obtained.

2.6 Requirements for skilled persons and operating personnel

WARNING
Risk of injury due to insufficient training.
Improper handling of the device may result in considerable personal injury and material damage.

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

The operating instructions state the following qualification requirements for the various areas of work:

- **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. In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g. Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

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 device control and operation in the particular application concerned (e.g. conveying line)
Commissioning, configuration	■ Basic knowledge of the Windows™ operating system in use ■ Basic knowledge of the design and setup of the described connections and interfaces ■ Basic knowledge of data transmission ■ Basic knowledge of bar code technology
Operation of the device for the particular application	■ Knowledge of device control and operation in the particular application concerned (e.g. conveying line) ■ Knowledge of the software and hardware environment for the particular application concerned (e.g. conveying line)

Table 1: Activities and technical requirements

2.7 Hazard warnings and operational safety

2.7.1 Operational safety and special hazards

Please observe the safety notes and the warnings listed here and in other chapters of these operating instructions to reduce the possibility of risks to health and avoid dangerous situations.

CAUTION
Class 1 laser beam!

The accessible beam does not represent a hazard even if you view it directly for a long period of time (base period of 100 seconds). With visible lasers (red), it is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, impairment of color vision), particularly in conditions of dim lighting.

- Never look into the laser beam directly with optical instruments (e.g., magnifying glasses, microscopes, telescopes/binoculars).
- Current national regulations regarding laser protection must be observed.

CAUTION
LED risk group 1

The accessible beam from the illumination unit (RG1) does not represent a risk due to the normal restrictions imposed by human behavior.

LED risk group 2

The accessible beam from the illumination unit (RG2) does not represent a risk due to aversion responses to very bright light sources and the perception of heat.

For both types of beams

It is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, impairment of color vision) at flashing frequencies between 1 Hz and 160 Hz, depending on the configuration, particularly in conditions of dim lighting. No safety precautions are required.

Comply with the latest version of the applicable regulations on photobiological safety of lamps and lamp systems as well as on laser protection.

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 HAZARDOUS RADIATION

If any operating or adjusting devices other than those specified here are used or other methods are employed, this can lead to dangerous exposure to radiation. Damage to the eyes is possible.

- 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.
- Do not look into the light source when it is switched on.
- Comply with the latest version of the applicable regulations on photobiological safety of lamps and lamp systems as well as on laser protection.

Only the illumination from SICK intended for the application can be used as internal lighting.

2.8 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.

3 Product description

3.1 Product ID

3.1.1 Type label

The type label gives information for identification of the sensor.

UL certification is dependent on the type. Information on the existing UL certification can be found on the type label.

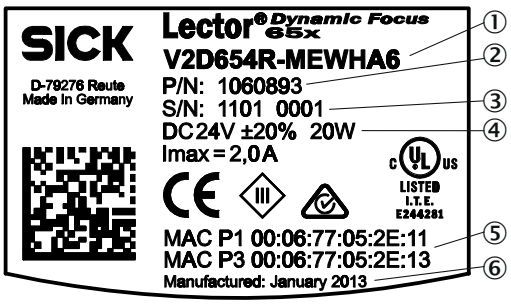


Figure 1: Type label design for the sensor

① Type code
② Product identification number
③ Serial number
④ Power consumption
⑤ MAC addresses
⑥ Date of manufacture

3.1.2 Type code

1	2	3	4	5	6	7		8	9	10	11	12	13

1 ... 5	Product family V2D6xx Lector6xx
6	**Image sensor resolution** 2: 2 megapixels (2048 px x 1088 px) • For Lector642: 1.7 megapixels (1,600 px x 1,088 px) • For Lector652: 2.1 megapixels (2,048 px x 1,088 px) 4: 4.2 megapixels (2,048 px x 2,048 px)
7	**Function** R: Reading D: Standard 1D & 2D decoder, DPM decoder, OCR
8	**Image sensor type** M: Monochrome
9	**Lens unit type** E: Electrical focus (dynamic, auto, teach-auto) C: C-mount thread
10	**Illumination** R: Red/Amber W: White B: Blue X: No illumination unit installed

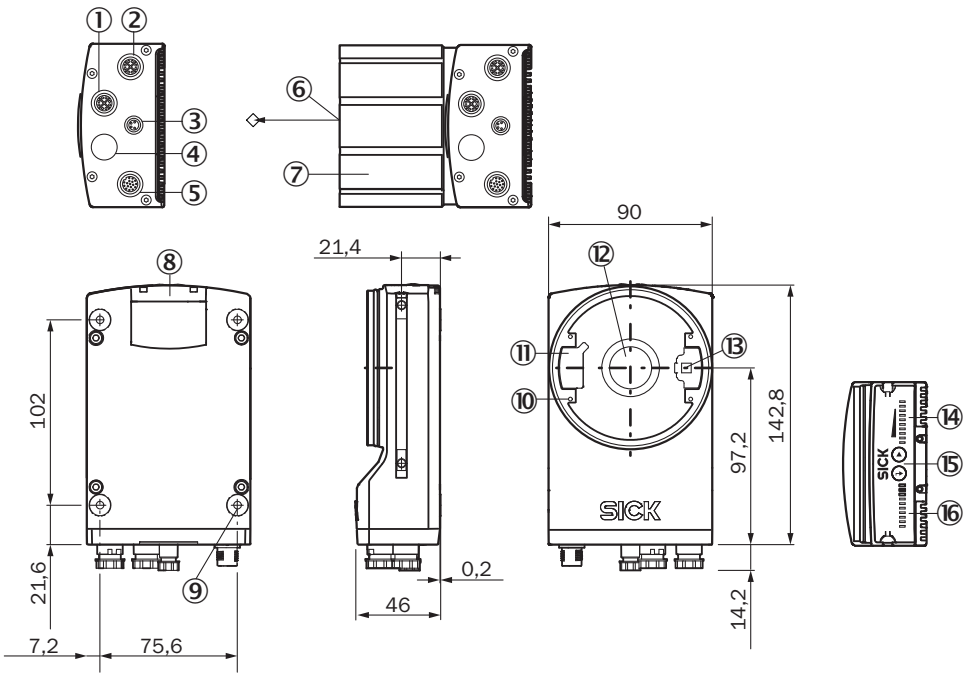
1 ... 5	Product family V2D6xx Lector6xx
11	**Focal distance (lens unit)** H: 54 mm K: 40 mm X: No lens installed
12	**Connection variants**[1)] A: Connection variant 1 F: Connection variant 2 H: Connection variant 3
13	**IP protection class and front screen** 5: IP 65: Plastic front screen 6: IP 65: Glass front screen

1) see "Overview of the electrical connections", page 31

3.2 Product characteristics

3.2.1 Device view

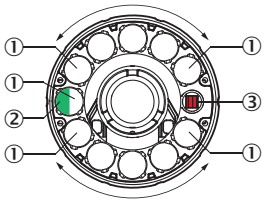
Dimensional drawing



① Connection P1, function and design dependent on type
② Connection P3, function and design dependent on type
③ Connection X2, function and design dependent on type
④ Connection P2, function and design dependent on type
⑤ Connection X1, function and design dependent on type
⑥ Reference point for working distance (center of front screen) from device to object
⑦ Protective cover for optics
⑧ Black cover for the micro SD memory card slot
⑨ M5 blind tapped holes, 5 mm deep (4 x), for mounting the device
⑩ M2 blind tapped holes (4 x), for mounting the spacer
⑪ Connection for integratable illumination
⑫ C-mount thread for lens installation

⑬ Outlet opening for light beam from aiming laser
⑭ Bar graph display (10 x LEDs)
⑮ Function buttons (2 x)
⑯ Status indicators, 2 levels (10 x LEDs)

Integrable illumination unit (option)



① Illumination = 11 x LEDs
② Feedback LED, green (e.g., for pass), after a successful read operation (default), it briefly generates a light spot on the object within the field of view
③ Opening in illumination unit for aiming laser (alignment), 1 x red laser LED, can be disengaged. Generates a red cross in the field of view on the object

3.2.2 Status indicators and functions

① Return pushbutton
② Arrow pushbutton

Status indicators on the first display level

Display	LED	Color	Status
Ready		Green	Sensor ready
		Red	Hardware or software error
Result		Green	Analysis successful
		Red	Analysis unsuccessful
Light		Green	Operation: Illumination on, internal trigger active
Funct		Green	Function can be defined by user
		Yellow	Function can be defined by user
		Blue	Function can be defined by user
		Red	Function can be defined by user

= illuminated, = flashing

Status indicators on the second display level

Display	LED	Color	Status
Tst (Test)		Blue	Test (reading diagnostics) selected
		Blue	Test started
Tch (Teach-in)		Blue	Teach-in selected (default: Match code)
		Blue	Teach-in started
		Green	Teach-in successful
		Red	Teach-in unsuccessful (match code default setting: Unable to teach in any code)
A-S (Auto-Setup)		Blue	Set-up selected
		Blue	Set-up started
		Green	Set-up successfully quit
		Yellow	Set-up partially successful (in at least one of the 3 parameter modules)
		Red	Set-up was unsuccessful
Usr (User)		Green	Function can be defined by user
		Yellow	Function can be defined by user
		Blue	Function can be defined by user
		Red	Function can be defined by user

= illuminated, = flashing

Test (reading diagnostics)

Percentage analysis: The sensor records a series of images and uses the current reading performance settings to decode them. The read rate of the last 10 read operations is displayed in % using the bar graph.

Teach

When you teach in a match code, the sensor reads the code that is presented and saves it permanently (in accordance with the default setting) as a target code for future code comparisons during read mode. Pharmacode is only supported following activation with SOPAS ET.

Setup

The sensor adjusts itself automatically to suit the lighting conditions, working distance[1)] and quality of the code presented. It saves the calculated values permanently in accordance with the default setting.

1) Only applies for Dynamic Focus

3.2.3 Product features and functionality

The Lector64/65x image-based code reader with integratable illumination is an intelligent SICK-4Dpro sensor. It is used for automatic, fixed identification and decoding of codes on moving or stationary objects. The Lector64x/65x reads all commonly used 1D codes (bar codes/stacked codes) and 2D codes (matrix codes). The Lector64/65x Flex sends the read data to a higher-level computer via its host interface for further processing.

The device is available in the Flex variant with C-mount thread and optional optics kit or in the Dynamic Focus variant with pre-mounted lens and illumination.

The intuitive device equipment – featuring function buttons, auto-setup, aiming laser, an acoustic feedback signal, and a green feedback LED – reduce the amount of work required for training and installation.

4 Transport and storage

4.1 Transport

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

NOTE

Damage to the device 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 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 Transport inspection

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

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

NOTE

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

4.3 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- So that any residual damp can 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 74.
- Relative humidity: see "Technical data", page 74.
- 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 Overview of mounting procedure

The mounting of the device is divided into the following steps:

- Mount the device.
- Align the device with the object.
- Connect the device to interfaces and supply voltage.
- Adjust the device.

5.2 Scope of delivery

Depending on the device version and the accessories ordered, the scope of delivery will include the listed items:

- The version of the camera housing ordered, with a C-mount threaded connection (Lector6xx Flex) **or** Lector6xx Dynamic Focus (incl. pre-mounted lens and illumination)
- Two sliding nuts, M5
- Light inlet and electrical connections fitted with protective caps/plugs.
- SW 2 hexagon key for opening and closing the cover of the micro SD card slot and mounting the integrable illumination unit from the optic kit (Lector6xx Flex)
- SICK lens cloth (only with Flex variant)
- Printed Quickstart instructions in German and English

Accessories

Accessories, such as the optic kit, brackets, and connecting cables, are only supplied if ordered separately.

5.3 Optic kit scope of delivery

Figure 2: Optic kit

The optic kit is an accessory which can be ordered as an option for the Lector6xx Flex product family and is mounted on the camera housing.

NOTE
The IP protection class IP65 can only be guaranteed with the optic protective hood (can also be ordered individually).

The following components are included in the scope of delivery of the optic kit:

- Application-specific lens unit
- Application-specific VI83I illumination unit (ring light), luminous field appropriate for focal distance of lens
- Two spacers, one with a plated-through connection for the electrical connection
- Screws: 4 x M2, 5 x 6 mm, 4 x M2, 5 x 12 mm, all screws have a hexagon cylinder head, SW 2
- IP65 optics protective hood with screw thread and viewing window

5.4 Preparation for mounting

5.4.1 Mounting requirements

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

- Typical space requirement: See type-specific dimensional drawing and field of view diagram
- Comply with technical data, such as the permitted ambient conditions for operation (e.g., temperature range, EM interference emissions, ground potential), see "Technical data", page 74
- To prevent condensation, avoid exposing the device to rapid changes in temperature
- Protect from direct sunlight
- Ensure that there is good heat transfer from the device, in particular at high ambient temperatures (e.g., via the bracket to the mounting base or ensure that the back of the device is a sufficient distance from the wall of a housing)
- Only to be mounted using the threaded mounting holes provided for this purpose or the sliding nuts.
- Shock and vibration-free mounting
- Clear view of the objects to be detected

Equipment required

- Mounting device (bracket) with sufficient load-bearing capacity and suitable dimensions
- Two or four M5 screws for mounting on a mounting device supplied by the customer. Screw length is dependent on the mounting base (wall thickness of the bracket)
  When using an optional SICK bracket, the screws for mounting are included with delivery.
- Tool and tape measure

5.4.2 Mounting the device

The device is mounted using threaded mounting holes (M5) or sliding nuts.

The threaded mounting holes are located on the rear of the device.

The sliding nuts can each be inserted into a slot on the side of the housing.

SICK offers prefabricated brackets which are optimally suited for mounting the device in a wide range of applications (www.sick.com).

User-supplied brackets

A user-supplied bracket must meet the following requirements:

- Alignment of the device in the x and y axes can be adjusted
- The mounting device must be able to bear the weight of the device and connecting cables free of vibrations
- In mounting situations with strong vibrations, shock mounts may need to be provided
- Mounting options must be available for the 4 threaded mounting holes or the two sliding nuts

5.5 Mount the optics

NOTE
This mounting step is only required if the optional optics accessory has been included in the order for a code reader of the Lector6xx Flex product family.

5.5.1 Mounting the lens and illumination

NOTICE
Possible impairment of image quality!

Dust and fingerprints on optical boundary surfaces can reduce image quality and may also affect the analysis performance of the device.

- When mounting the optics accessories, always ensure that the environment is free of dust.
- Do not touch the image sensor (CMOS) in the light inlet opening of the sensor or the glass lenses at either end of the lens unit.

NOTE
When mounting the optics accessories on the camera housing, always ensure that there is no power to the system.

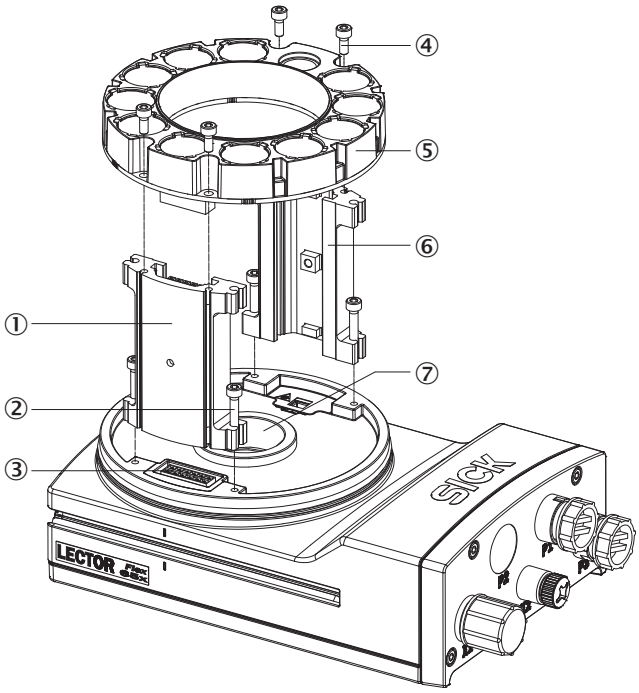
NOTICE
Risk of damage due to electrostatic discharge

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

The illumination variants for lenses with a focal distance of 12 mm or 16 mm do not feature any plastic lenses in front of the LEDs in the round recesses.

- Do not insert your fingers into the recesses.
- Do not touch the open contacts of the electrical connection for the illumination unit on the camera housing.

Mounting the optics



① Spacer, left with electrical connection
② Screw, long (4 x)
③ Electrical connection for ring light
④ Screw, short (4 x)
⑤ Ring light
⑥ Spacer, right
⑦ Light inlet with threaded connection for lens

1. Peel off the white protective sticker on the camera housing that covers the electrical connection ③ for the illumination unit.
2. Place the camera housing on a nonslip base.
3. Remove the protective cap from the round light inlet.
4. If necessary, carefully insert the filter (optional) and spacer disk into the light inlet.
5. Screw the lens unit into the C-mount thread. This will also lock the optional filter in place at the same time (if applicable).
6. Take two pairs of long screws and screw them into the threaded mounting holes to attach each spacer (① and ⑥) to the correct side of the camera housing.
7. Use the 4 short screws to attach the illumination unit ⑤ to the two spacers.
8. Manually preset the sharpness and mask of the lens unit.

NOTE
If the required adjustments are not carried out immediately, mount the optics protective hood.

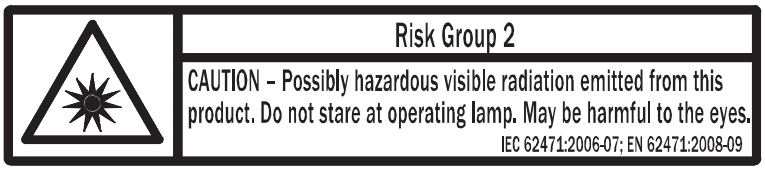
5.5.2 Attaching the warning label

Devices and illumination units equipped with LEDs in risk group RG 2 feature the following warning label.

The warning label is located on the exterior of the housing of the devices. For the illumination units, the warning label is located on the outer ring.

Integrable illumination unit types in risk group RG 2 that are to be mounted by the user are accompanied by an additional black and yellow warning label for RG 2 optical radiation.

Attach the additional warning label to the outside of the protective optics cover in a clearly visible location. When the protective optics cover is mounted, the warning label on the illumination unit is hidden.



1. Affix the illumination unit to the device housing.
2. Attach the protective optics cover and screw it tight.
3. Attach the warning label to the protective optics cover near the light outlet so that it is clearly visible.
4. If the device itself is integrated into machinery, for example, in a way which obscures the warning label attached, additional, clearly visible labels should be attached to the machinery close to where the light is emitted.

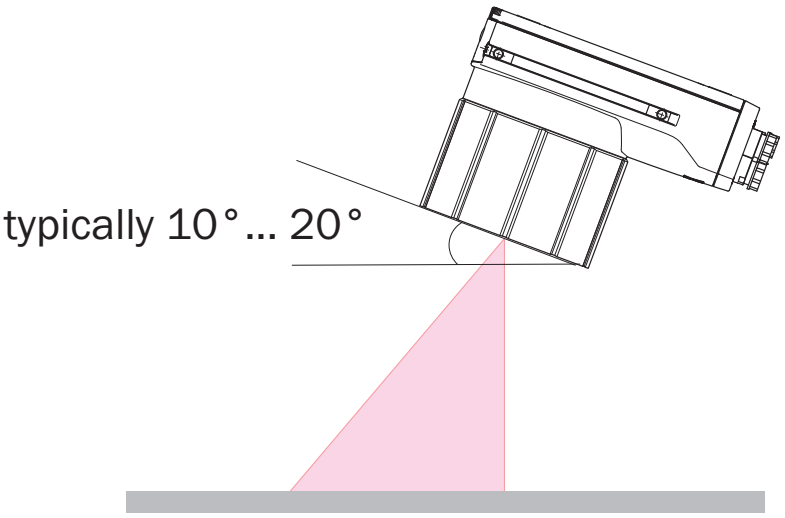
5.6 Mounting location

5.6.1 Working distance

Depending on the device type, the maximum working distance is between 50 mm and 2,200 mm.

5.6.2 Mounting bracket and reflection prevention

In order to avoid reflections from the surfaces to be scanned, the device is tilted so it is perpendicular to the surface.

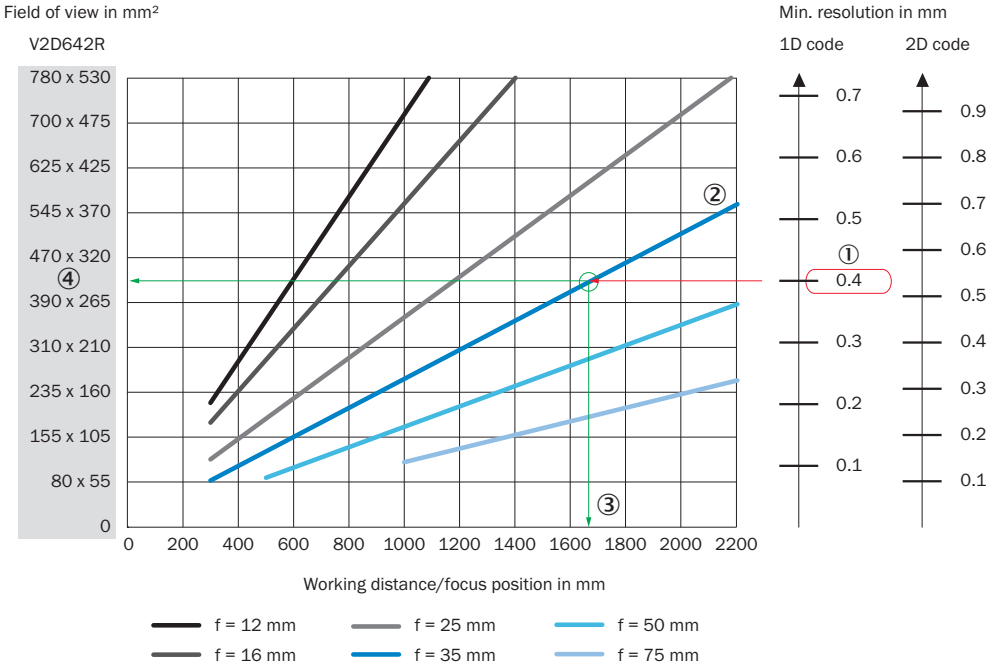


Typical values are between 10° and 20°.

Depending on the application, an angle of between 0° (bright field light) and 45° (dark field light) may be advisable.

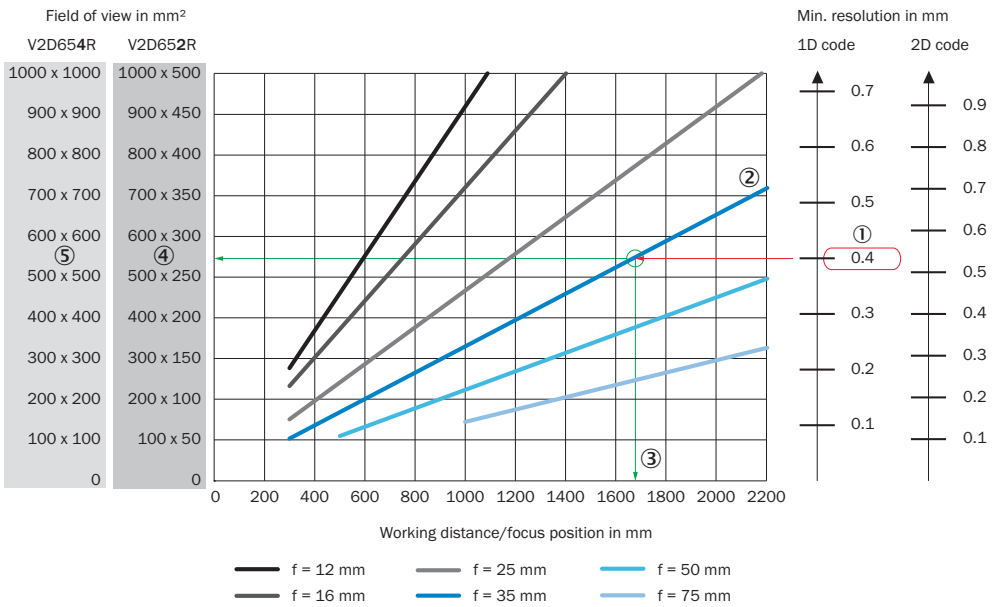
5.6.3 Field of view diagrams

Lector64x Flex



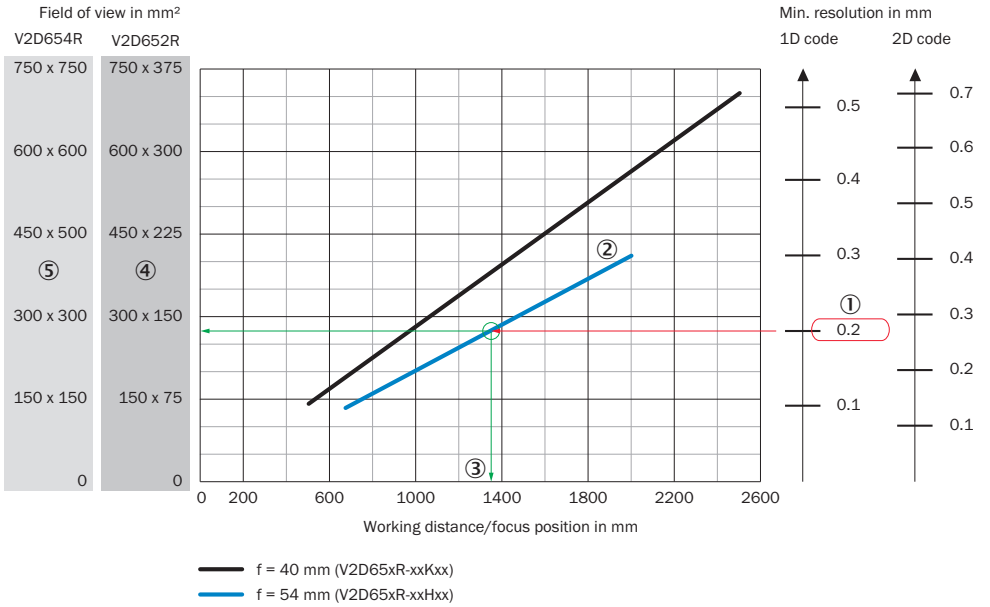
① Code resolution
② Lens focal length
③ Working distance (max.)
④ Field of view (mm x mm)

Lector65x Flex



① Code resolution
② Lens focal length
③ Working distance (max.)
④ Field of view Lector652 (mm x mm)
⑤ Field of view Lector654 (mm x mm)

Lector65x Dynamic Focus



① Code resolution
② Lens focal length
③ Working distance (max.)
④ Field of view Lector652R (mm x mm)
⑤ Field of view Lector654R (mm x mm)

5.7 Mounting the device

Mounting the device

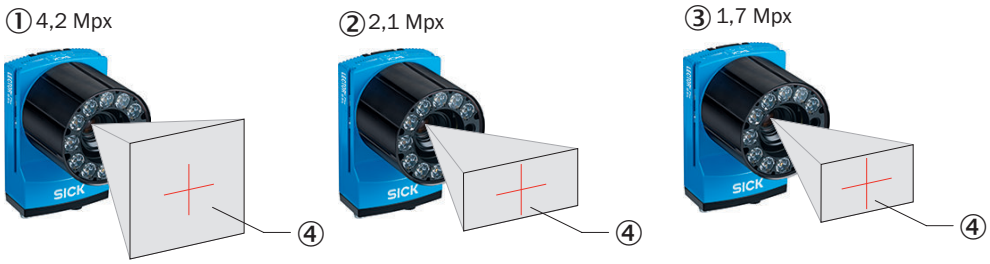
Mount the device on a bracket using M5 screws. To do this, either use all 4 threaded mounting holes on the rear of the device or, alternatively, use the two M5 sliding nuts in the lateral slots.

Insert the screws into the threaded mounting holes/sliding nuts by a maximum of 5 mm.

Alternatively, attach the SICK bracket that has been ordered separately (e.g., mounting bracket) to the device using the two sliding nuts.

Aligning the device plus inspection window with the object

Remember to consider the shape and alignment of the field of view in front of the device.



① Lector654 with 4.2 Mpx image sensor
② Lector652 with 2.1 Mpx image sensor
③ Lector642 with 1.7 Mpx image sensor
④ Field of view

The device must be aligned in consideration of the field of view (see "Mounting requirements", page 18) and the application circumstances (see "Field of view diagrams", page 22).

6 Electrical installation

6.1 Safety

6.1.1 Notes on the electrical installation

NOTICE
Equipment damage due to incorrect supply voltage!

An incorrect supply voltage may result in damage to the equipment.

The device must only be fed by a voltage supply which fulfills the following requirements:

- SELV (EN 60950-1) or ES-1 (EN 62368-1)
- LPS (EN 60950-1 or EN 62368-1)

NOTICE
Equipment damage or unpredictable operation due to working with live parts.

Working with live parts may result in unpredictable operation.

- Only carry out wiring work when the power is off.
- Only connect and disconnect electrical connections when the power is off.

- **The electrical installation must only be performed by electrically qualified personnel.**
- **Standard safety requirements must be met when working in electrical systems.**
- Only switch on the supply voltage for the device when the connection tasks have been completed and the wiring has been thoroughly checked.
- When using extension cables with open ends, ensure that bare wire ends do not come into contact with each other (risk of short-circuit when supply voltage is switched on!). Wires must be appropriately insulated from each other.
- Wire cross-sections in the supply cable from the customer's power system must be designed in accordance with the applicable standards. When this is being done in Germany, observe the following standards: DIN VDE 0100 (Part 430) and DIN VDE 0298 (Part 4) and/or DIN VDE 0891 (Part 1).
- Circuits connected to the device must be designed as SELV circuits (SELV = Safety Extra Low Voltage).
- Protect the device with a separate fuse at the start of the supply circuit.

NOTE
Layout of data cables

- Use screened data cables with twisted-pair wires.
- Implement the screening design correctly and completely.
- To avoid interference, e.g. from switching power supplies, motors, clocked drives, and contactors, always use cables and layouts that are suitable for EMC.
- Do not lay cables over long distances in parallel with power supply cables and motor cables in cable channels.

The IP 67 enclosure rating for the device is only achieved under the following conditions:

- The cables plugged into the M12 and M8 connections are screwed tight.
- Any electrical connections that are not being used must be fitted with protective caps/plugs that are screwed tight (as in the delivery condition).
- The black cover of the USB interface must be closed and lie flush on the device.

If this is not done, the device does not fulfill any specified IP enclosure rating!

6.1.2 Wiring notes

NOTICE

Faults due to incorrect wiring.

Incorrect wiring may result in operational faults.

- For data transmission, use only screened cables with twisted-pair wires.
- Follow the wiring notes precisely.

NOTE

Preassembled cables can be found online at:

- ▶ www.sick.com/lector64x
- ▶ www.sick.com/lector65x

All electrical connections of the device are configured as round connectors . The IP65 protection class is only achieved with screwed plug connectors or cover caps.

Please observe the following wiring notes:

- A correct and complete cable shielding design is required for trouble-free data transmission.
- The cable shield must be connected at both ends 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, see figure 6.
- Appropriate measures must be taken 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 4 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 sensor cables, communication signals, bus signals
  - Group 3: Cables which are a source of interference, such as control cables for inductive loads, motor brakes
  - Group 4: Cables which are powerful sources 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 3
  - ▷ Cables in groups 1, 2 and 3, 4 must be routed in different cable channels or metallic separators must be used see figure 4 and see figure 5. This applies particularly where cables of devices with a high level of radiated emission, such as frequency converters, are laid parallel to sensor cables.

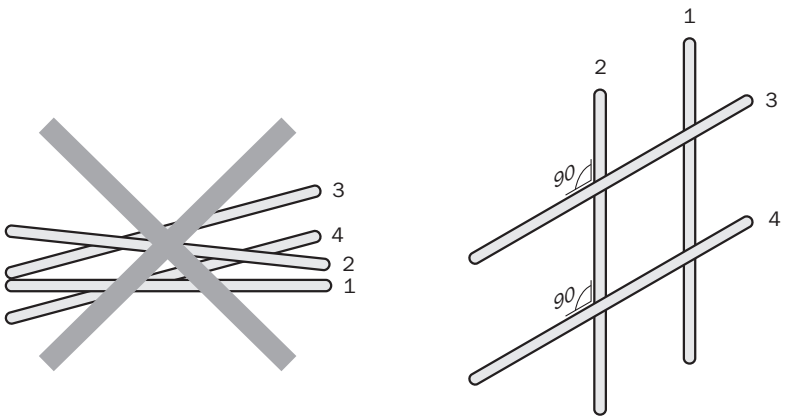


Figure 3: Cross cables at right angles

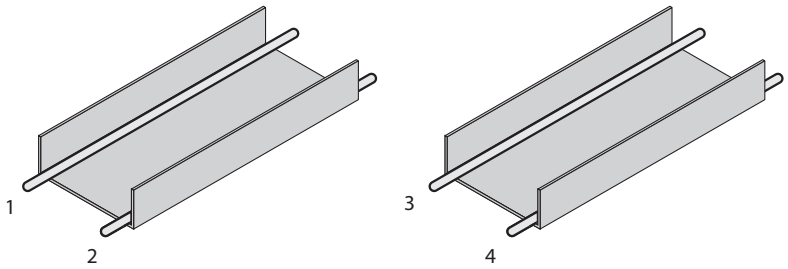


Figure 4: Ideal laying – Place cables in different cable channels

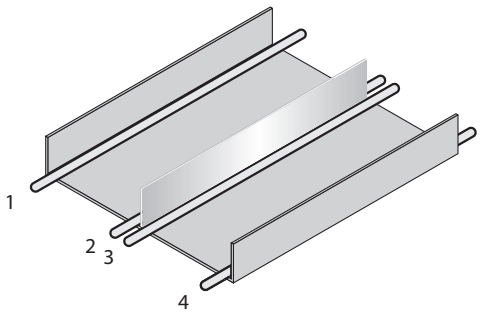


Figure 5: Alternative laying – Separate cables with metallic separators

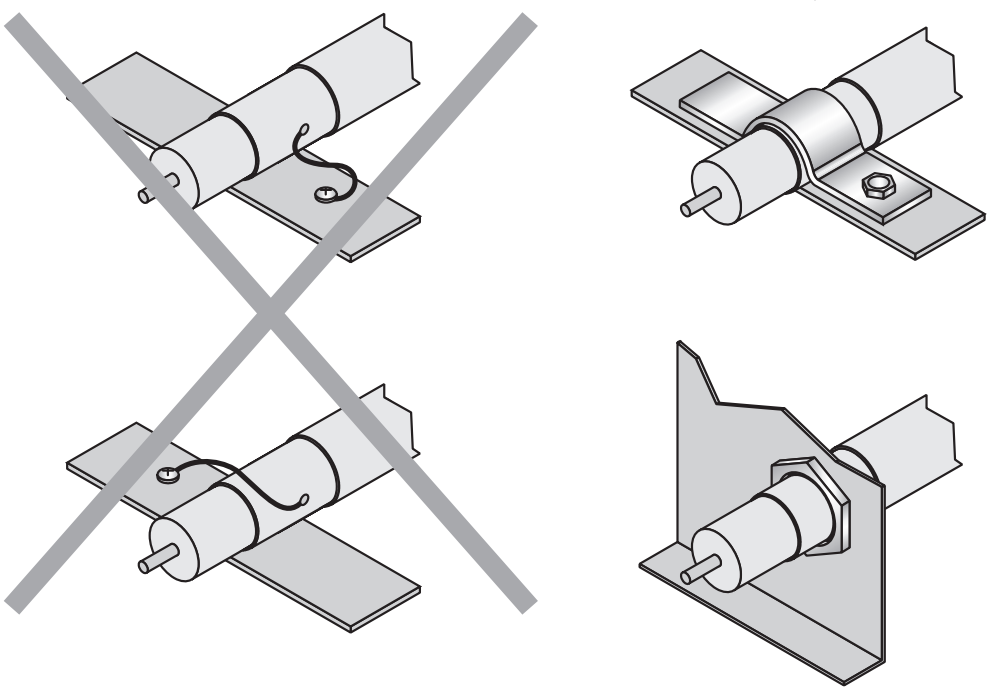


Figure 6: Make an extensive and low-impedance ground connection of the cable shield in the control cabinet.

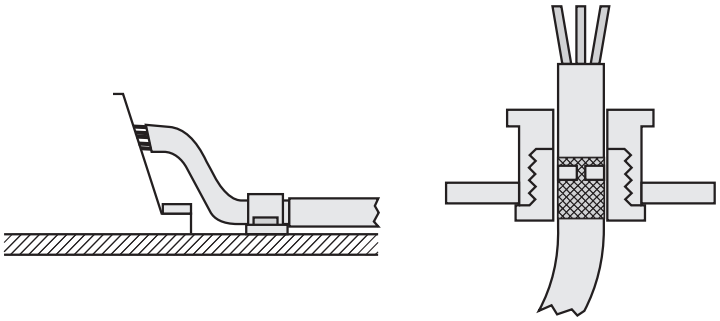


Figure 7: Shield connection in plastic housings

6.1.3 Prerequisites for the safe operation of the device in a system

WARNING
Risk of injury and damage caused by electrical current!

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

- Metal housings are vulnerable to dangerous currents
- 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.
- ▶ Ensure that the ground potential is the same at all grounding points.
- ▶ If the cable insulation is damaged, disconnect the voltage supply immediately and have the damage repaired.
- ▶ Where local conditions are unfavorable and therefore do not meet conditions for a safe grounding method (same ground potential at all grounding points), take measures in accordance with the following formats.

The device is designed and tested for electrical safety in accordance with EN 60950-1. It is connected to the peripheral devices (voltage supply, any local trigger sensor(s), PLC) via shielded cables. The cable shield – for the data cable, for example – rests against the metal housing of the SICK device. The device can either be grounded through the cable shield or through one of the threaded mounting holes.

If the peripheral devices have metal housings and if the cable shields also lie on 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
- Correct grounding of the devices/metal surfaces in the system.
- If necessary: low-impedance and current-carrying equipotential bonding between areas with different ground potentials

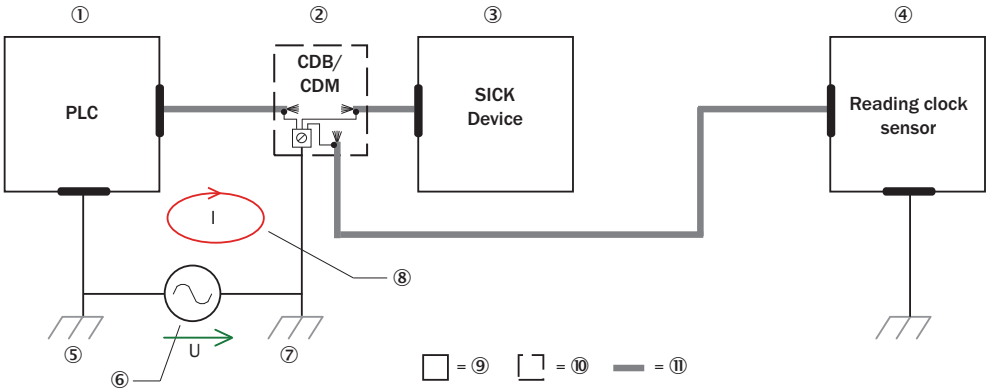


Figure 8: Occurrence of equipotential bonding currents in the system configuration

① PLC (programmable logic controller)
② CDB/CDM connection module
③ SICK device
④ Trigger sensor (e.g., photoelectric sensor)
⑤ Grounding point 1

⑥ Ground potential difference
⑦ Grounding point 2
⑧ Closed current loop with equalizing currents via cable shield
⑨ Metal housing
⑩ Plastic housing
⑪ 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; this can be dangerous. 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 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 while at the same time complying with all the requirements of EN 60950-1.

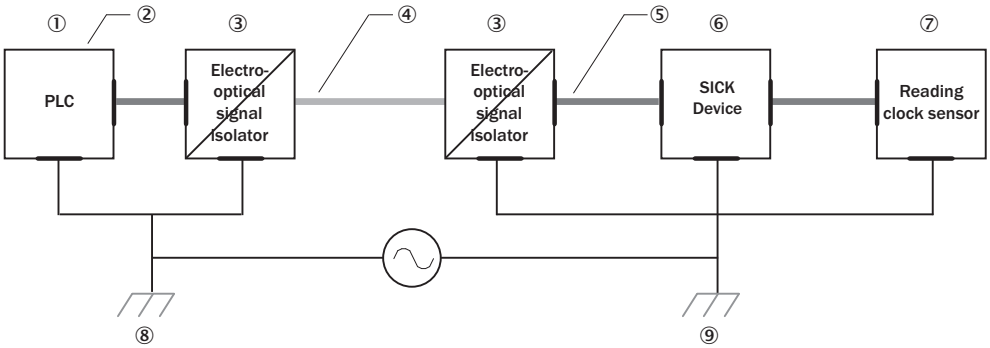


Figure 9: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators

① PLC (programmable logic controller)
② Metal housing
③ Electro-optical signal isolator
④ Optical fiber
⑤ Shielded electrical cable
⑥ SICK device
⑦ Trigger sensor (e.g., photoelectric sensor)
⑧ Grounding point 1
⑨ Grounding point 2

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 SICK device and of peripheral devices may be a sufficient solution.

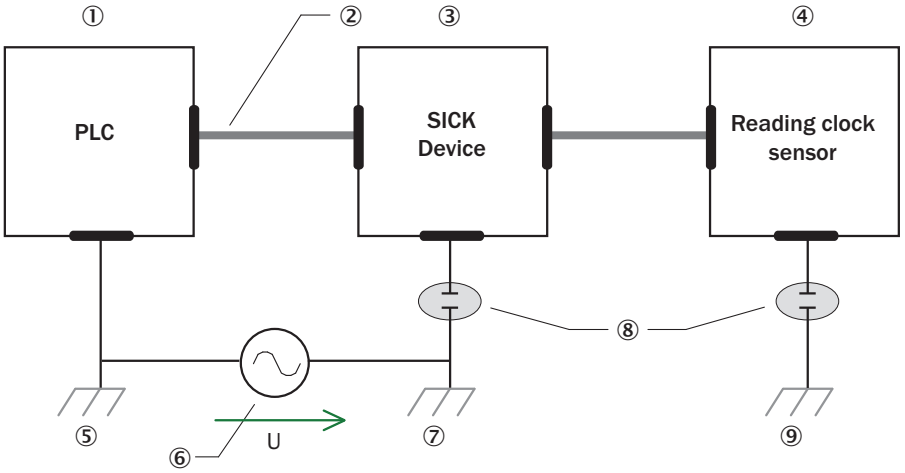


Figure 10: Prevention of equipotential bonding currents in the system configuration by insulated mounting of the device

① PLC (programmable logic controller)
② Shielded electrical cable
③ SICK device
④ Trigger sensor (e.g., photoelectric sensor)
⑤ Grounding point 1
⑥ Ground potential difference
⑦ Grounding point 2
⑧ Insulated mounting
⑨ Grounding point 3

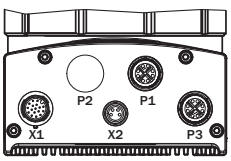
Even in the event of large differences in the ground potential, ground loops are effectively prevented. As a result, equalizing currents can no longer flow via the cable shields and metal housing.

NOTICE

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

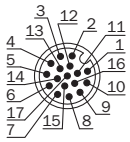
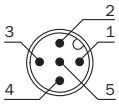
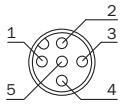
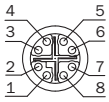
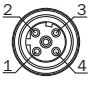
Under certain circumstances, a tangible potential can develop between the insulated metal housings and the local ground potential.

6.2 Overview of the electrical connections



Connection	V2D6xxR-MCxxAx connection variant 1	V2D6xxR-MCxxFx connection variant 2 (for Systems)	V2D6xxR-MCxxHx connection variant 3 (with Dual-Port PROFINET)
X1	Power/SerialData/CAN/IO	CAN IN	Power/SerialData/CAN/IO
X2	USB	Triggering of external illumination	USB
P1	GB Ethernet	GB Ethernet	Ethernet (100 Mbit/s)
P2	–	CAN OUT	Ethernet (100 Mbit/s)
P3	GB Ethernet	GB Ethernet	GB Ethernet

6.3 Connections and pin assignment

Pin	Power/ SerialData/CAN/IO	CAN IN	CAN OUT	USB	Triggering of external illumination	GB Ethernet	Ethernet
	 17-pin M12 male connector, A-coded	 5-pin M12 male connector, A-coded	 5-pin M12 female connector, A-coded	 4-pin M8 female connector	 3-pin M8 female connector	 8-pin M12 female connector, X-coded	 4-pin M12 female connector, D-coded
1	GND	Shield	Shield	+5 V	Sensor 1	TRD0_P	TX+
2	DC 24 V ± 20%	DC 24 V ± 20%	DC 24 V ± 20%	Data-	–	TRD0_N	RX+
3	CAN L	GND	GND	Data+	Result 4	TRD1_P	TX-
4	CAN H	CAN H	CAN H	GND	SensGND	TRD1_N	RX-
5	TD+ (RS-422), Host	CAN L	CAN L	–	–	TRD3_P	–
6	TD- (RS-422), Host TxD (RS-232), Host	–	–	–	–	TRD3_N	–
7	TxD (RS-232), Aux	–	–	–	–	TRD2_P	–
8	RxD (RS-232), Aux	–	–	–	–	TRD2_N	–
9	SensGND	–	–	–	–	–	–
10	Sensor 1 switching input	–	–	–	–	–	–
11	RD+ (RS-422), Host	–	–	–	–	–	–
12	RD– (RS-422), Host RxD (RS-232), Host	–	–	–	–	–	–
13	Result 1 switching output	–	–	–	–	–	–
14	Result 2 switching output	–	–	–	–	–	–
15	Sensor 2 switching input	–	–	–	–	–	–
16	Result 3 switching output	–	–	–	–	–	–
17	Result 4 switching output	–	–	–	–	–	–

6.4 Connection diagrams

Connection principle

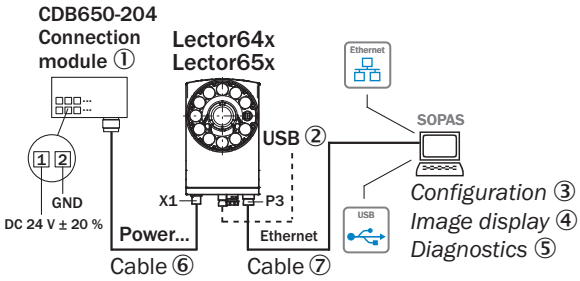


Figure 11: Only valid for connection variant 1. Connection variants for Systems and DualPort are not entirely taken into account in this view.

① CDB650-204 connection module
② Alternative USB, e.g. cable part no. 6051164 (2 m)
③ Configuration
④ Image display
⑤ Diagnostics
⑥ Cable, e.g. part no. 6051194 (3 m)
⑦ Cable, e.g. part no. 6049728 (2 m)

Wiring without SICK connection module

When using customer-specific connection units, the wiring principle for the signals can be found in the connection diagrams for the connection module CDM420-0006, see "Connecting the Lector63x...65x to the CDM420-0006", page 35.

6.4.1 Connecting the Lector63x...65x to the CDB650-204

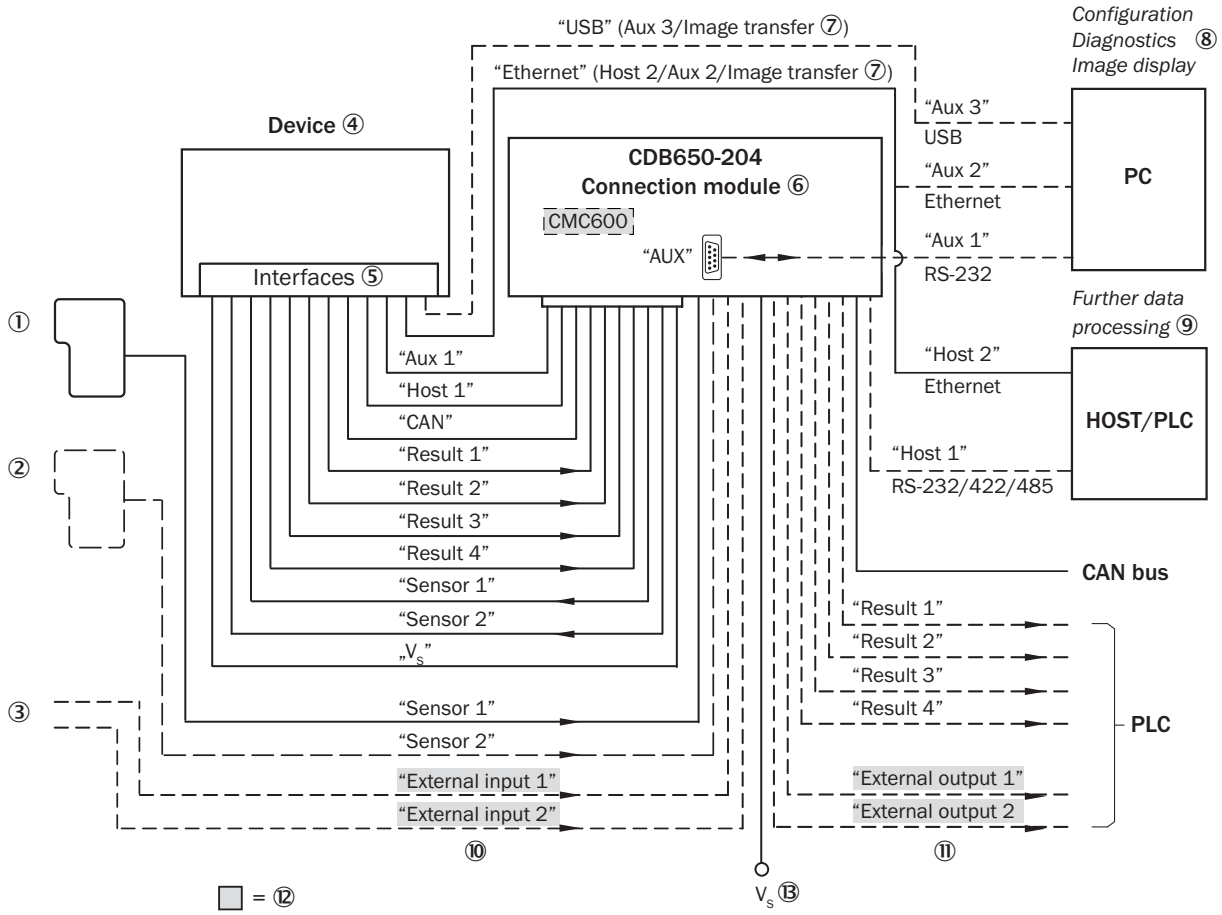


Figure 12: Connecting the device to the peripheral devices using the CDB650-204 (overview)

① Start/stop trigger (e.g., photoelectric sensor)
② Application-dependent: alternative stop trigger (e.g., photoelectric sensor) or travel increment (incremental encoder)
③ Other functions
④ Device
⑤ Interfaces
⑥ Connection module
⑦ Image transmission
⑧ Configuration, diagnostics, and image display
⑨ Further data processing
⑩ External switching inputs
⑪ External switching outputs
⑫ Parameter cloning module CMC600 required in order to be able to use the additional external switching inputs and outputs of the device (grayed out)
⑬ Supply voltage $V_S = U_V$

6.4.2 Connecting the Lector63x...65x to the CDM420-0006

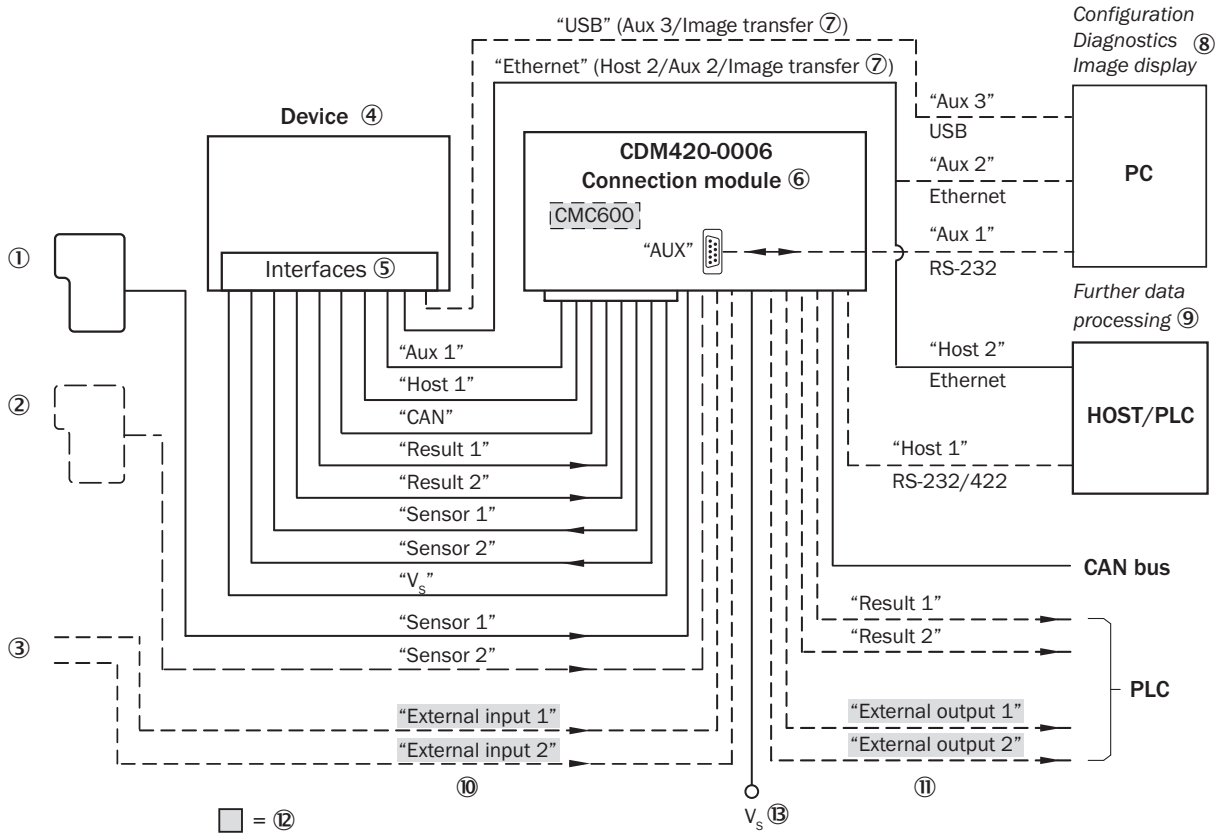


Figure 13: Connecting the device to the peripheral devices using the CDM420-0006 (overview)

① Start/stop trigger (e.g., photoelectric sensor)
② Application-dependent: alternative stop trigger (e.g., photoelectric sensor) or travel increment (incremental encoder)
③ Other functions
④ Device
⑤ Interfaces
⑥ Connection module
⑦ Image transmission
⑧ Configuration, diagnostics, and image display
⑨ Further data processing
⑩ External switching inputs
⑪ External switching outputs
⑫ Parameter cloning module CMC600 required in order to be able to use the additional external switching inputs and outputs of the device (grayed out)
⑬ Supply voltage $V_S = U_V$

6.5 Connecting the device

6.5.1 Connecting the supply voltage

The device must be connected to a power supply unit with the following properties:

- Electricity source with at least 30 W power
- Additional 0.5 W output power when using the optional CMC600 parameter memory module in the CDB650-204/CDM420-0006 connection module

Protecting the supply cables

To ensure protection against short-circuits/overload in the customer's supply cables, the conductor cross sections used must be appropriately selected and protected.

The following standards must be observed in Germany:

- DIN VDE 0100 (part 430)
- DIN VDE 0298 (part 4) and/or DIN VDE 0891 (part 1)

The infeed of the supply voltage is carried out using the connection module; for more on this, see:

Connection module	Interface	Reference
CDB650-204	Supply voltage	page 41
CDM420-0006	Supply voltage	page 53

The connection module CDB650-204 has a 3 A fuse (slow-blow), the CDM420-0006 has a 2 A fuse (slow-blow) in the circuit after switch S1.

6.5.2 Wiring the data interface

Wiring the Ethernet interface

1. Connect the sensor to the Ethernet connection of the PC via the adapter cable.
2. Set up communication via SOPAS ET configuration software.

NOTE

The Ethernet interface for the sensor has an Auto-MDIX function. This automatically adjusts the transmission speed as well as any necessary crossover connections.

Wiring the serial data interfaces

The maximum data transmission rate for the serial interface depends on the cable length and on the type of interface. The following recommendations apply:

Interface Type	Data transmission rate	Distance to the Target Computer (Host)
RS-232	Up to 19.2 kBd 38.4 kBd ... 57.6 kBd 115.2 kBd ... 500 kBd	Max. 10 m Max. 3 m Max. 2 m
RS-422/485[1)]	Up to 38.4 kBd 38.4 kBd ... 57.6 kBd 57.6 kBd ... 500 kBd	Max. 1200 m Max. 500 m Max. 10 m

1) For RS-422/485-suitable cable and corresponding cable termination as per specification

NOTICE

Risk of damage to the internal interface modules!

If the serial data interfaces are wired incorrectly, then electronic components in the sensor could get damaged.

- ▶ Observe the information on wiring.
- ▶ Carefully check the wiring prior to switching on the sensor.

If the wiring is carried out via a connection module:

Connection module	Data interface	Reference
CDB650-204	RS-232	page 42
	RS-422	page 42
CDM420-0006	RS-232	page 54
	RS-422	page 54

Termination of the RS-422 data interface

Termination can be implemented in the CDB650-204/CDM420-0006 connection module via switches.

Additional information on this can be found in the operating instructions for the relevant module.

6.5.3 Wiring the CAN interface

If the wiring of the CAN interface is carried out via a connection module:

Connection module	Data interface	Reference
CDB650-204	CAN	page 44
CDM420-0006	CAN	page 56

Connection type 2 (for Systems)

For this connection type, the devices can be directly switched in series without a connection module (line typology). The devices communicate with each other and are supplied with voltage via the CAN In/CAN Out connections.

A maximum of 3 devices can be supplied with voltage via the CAN cable. If a device network/CAN network with more than 3 participants is needed, a separate voltage supply must be used for every 3 devices. Communication between all devices in the network is done via CAN.

Other information on using system devices combined with a system controller can be found in the operation instructions of the controller, e.g. material number 8011539.

6.5.4 Wiring digital switching inputs

Physical switching inputs on the device

The two physical switching inputs “Sensor 1” and “Sensor 2” can be used for starting and/or ending the trigger or for feeding an incremental signal.

The switching inputs are available both on the 17-pin M12 male connector on the device, on the adapter cable (17-pin M12 female connector/15-pin D-Sub. HD male connector) and on the open end of the adapter cable (17-pin M12 female connector/open end).

When using the M12 adapter cable (17-pin M12 female connector/12-pin M12 male connector) in combination with the CDB650 or when using the cable with one open end (17-pin M12 female connector/open end), 4 physical switching outputs, Result 1–4, are available.

Extension: additional logical switching inputs in the device in the case of physical "external" switching inputs on the optional connection module

Thanks to the optional CMC600 parameter memory module in combination with the CDB650-204 or CDM420-0006 connection module, the two external switching inputs "External input 1" and "External input 2" on the relevant terminals in the connection module are additionally available.

NOTE
These two external switching inputs are not suitable for time-critical applications.

If the wiring of the inputs is carried out via a connection module:

CDB650-204	Sensor 1 and Sensor 2	page 45
	External input 1 ("Ext. in 1") and External input 2 ("Ext. in 2")	page 47
CMD420-0006	Sensor 1 and Sensor 2	page 57
	External input 1 ("AUX. in 1") and External input 2 ("AUX. in 2")	page 59

6.5.5 Wiring digital switching outputs

Physical switching outputs on the sensor

The two physical switching outputs "Result 1" and "Result 2" can be allocated independently of each other with various functions for the output of the result status. If the allocated event occurs in the analysis process, then the corresponding switching output is live after the end of the trigger for the selected pulse duration.

The switching outputs are available both on the 17-pin M12 male connector on the device, on the adapter cable (17-pin M12 female connector/15-pin D-Sub HD male connector) and on the open end of the adapter cable (17-pin M12 female connector/open end).

When using the M12 adapter cable (17-pin M12 female connector/17-pin M12 male connector) in combination with the CDB650 or when using the cable with one open end (17-pin M12 female connector/open end), 4 physical switching outputs, Result 1–4, are available.

Extension: additional logical switching outputs in the sensor in the case of physical "external" switching outputs on the optional connection module

Thanks to the optional CMC600 parameter memory module in combination with the CDB650-204 or CDM420-0006 connection module, the two external switching outputs "External output 1" and "External output 2" on the connection terminals in the connection module are additionally available.

NOTE
These two external switching outputs are not suitable for time-critical applications.

If the wiring of the outputs is carried out via a connection module:

Connection module	Output signal switching device	Reference
CDB650-204	Result 1 ... 4 (RES/OUT 1 ...4)	page 49
	External output 1 (“Ext. Out 1“) and External output 2 (“Ext. Out 2”)	page 50
CDM420-0006	Result 1 and Result 2	page 61
	External output 1 (“AUX. Out 1“) and External output 2 (“AUX. Out 2”)	page 62

NOTE
Capacitive loads on the switching outputs have an effect on the switch-on and switch-off behavior. The maximum capacity of 100 nF is a limit value.

6.6 Wiring diagrams for the CDB650-204 connection module

6.6.1 Wiring overview for Lector63x ... 65x (1 switching input used)

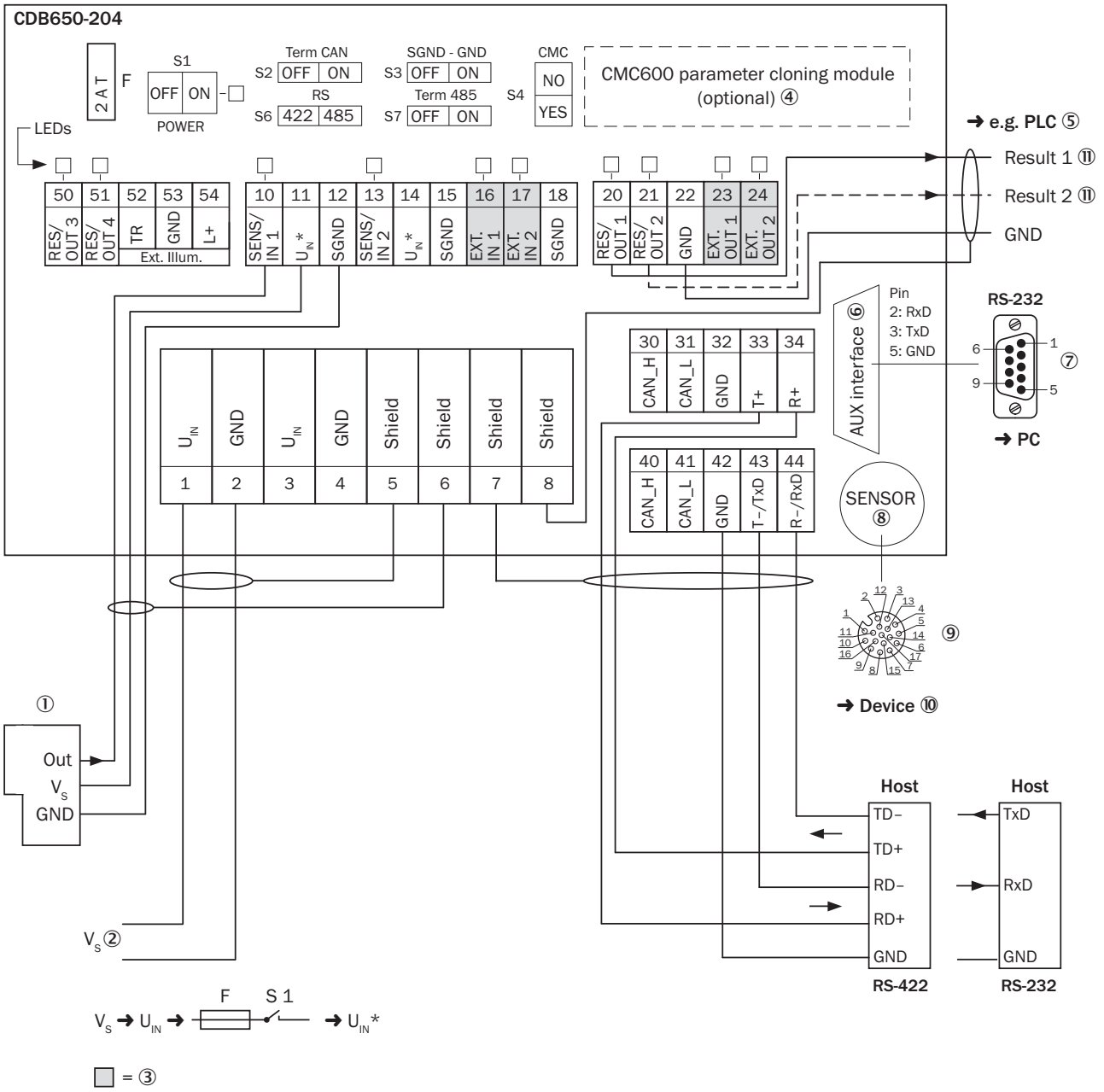


Figure 14: Connecting the device to the CDB650-204 connection module (overview)

① External trigger (e.g., photoelectric sensor)

② Supply voltage $V_S = U_V$

③ CMC600 parameter cloning module required in order to be able to use the additional labeled switching inputs and outputs on the device (type-dependent)

④ CMC600 parameter cloning module (optional)

⑤ E.g., PLC (programmable logic controller)

⑥ Auxiliary interface “AUX”

⑦ Male connector, D-Sub, 9-pin

⑧ Sensor = Device

⑨ Female connector, M12, 17-pin, A-coded

⑩ Device to be connected

⑪ Name of the switching output

6.6.2 Connecting supply voltage of the Lector63x...65x in the CDB650-204

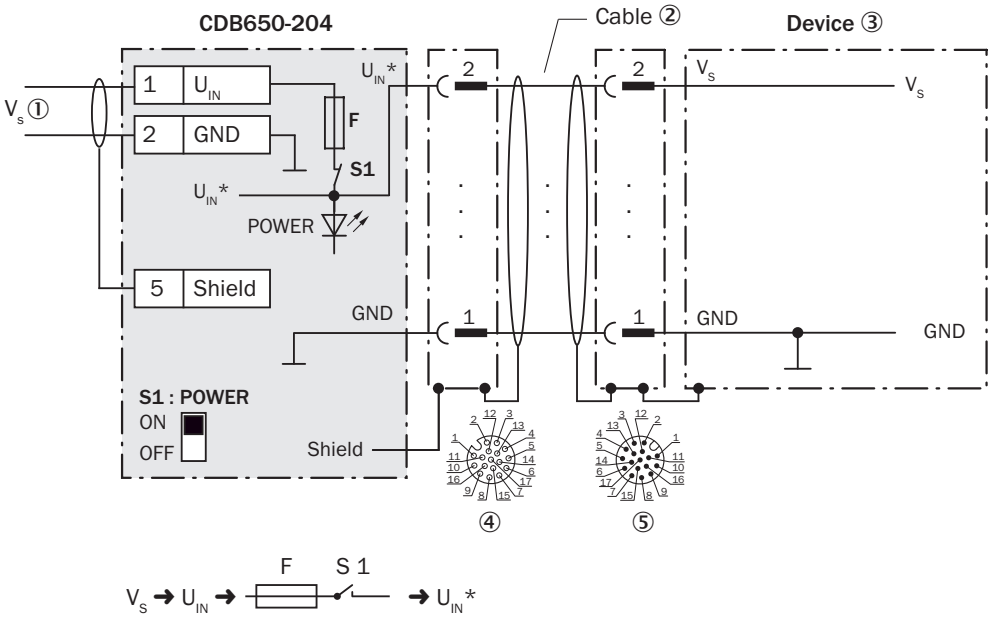


Figure 15: Connecting the device supply voltage in the CDB650-204 connection module

① Supply voltage $V_S = U_V$

② Connecting cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)

③ Device

④ Female connector, M12, 17-pin, A-coded

⑤ Male connector, M12, 17-pin, A-coded

Function switch S1

Switch setting	Function
ON	Supply voltage U_{IN} supplied to CDB650-204 and device via fuse as U_{IN}*. Voltage U_{IN}* also available at terminals 11 and 14.
OFF	CDB650-204 and device isolated from supply voltage. Recommended position for all connection work.

Table 2: Switch S1: power

6.6.3 Wiring the serial host interface RS-232 in the CDB650-204

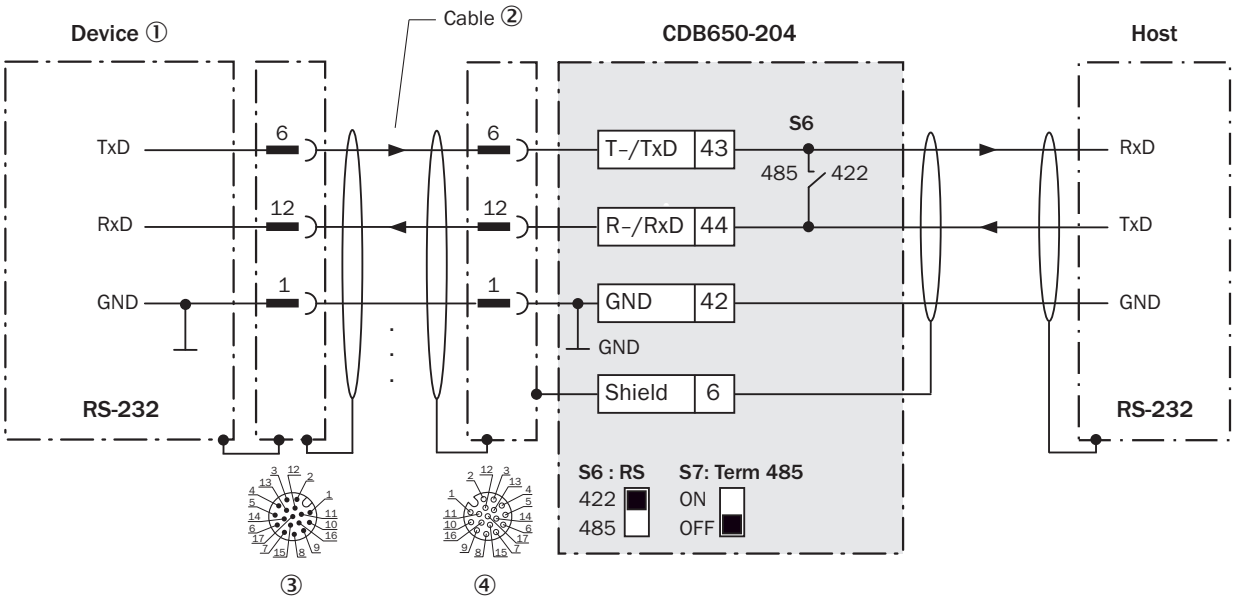


Figure 16: Wiring the RS-232 data interface

① Device
② 1:1 connecting cable, e.g., part no. 6052286 (2 m)
③ Male connector, M12, 17-pin, A-coded
④ Female connector, M12, 17-pin, A-coded

6.6.4 Wiring the serial host interface RS-422 in the CDB650-204

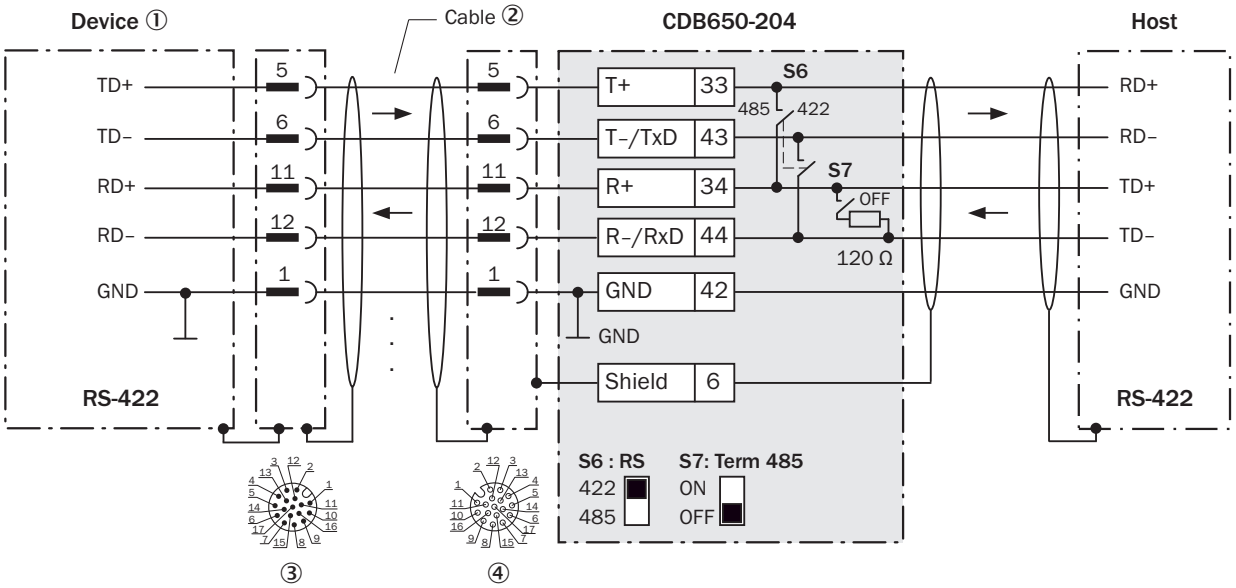


Figure 17: Wiring the RS-422 data interface

① Device
② Connecting cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
③ Male connector, M12, 17-pin, A-coded
④ Female connector, M12, 17-pin, A-coded

Function switch S7

Switch setting	Function
ON	Terminates the RS-422 receiver in the device in order to improve the interference distance to the cable.
OFF	No termination

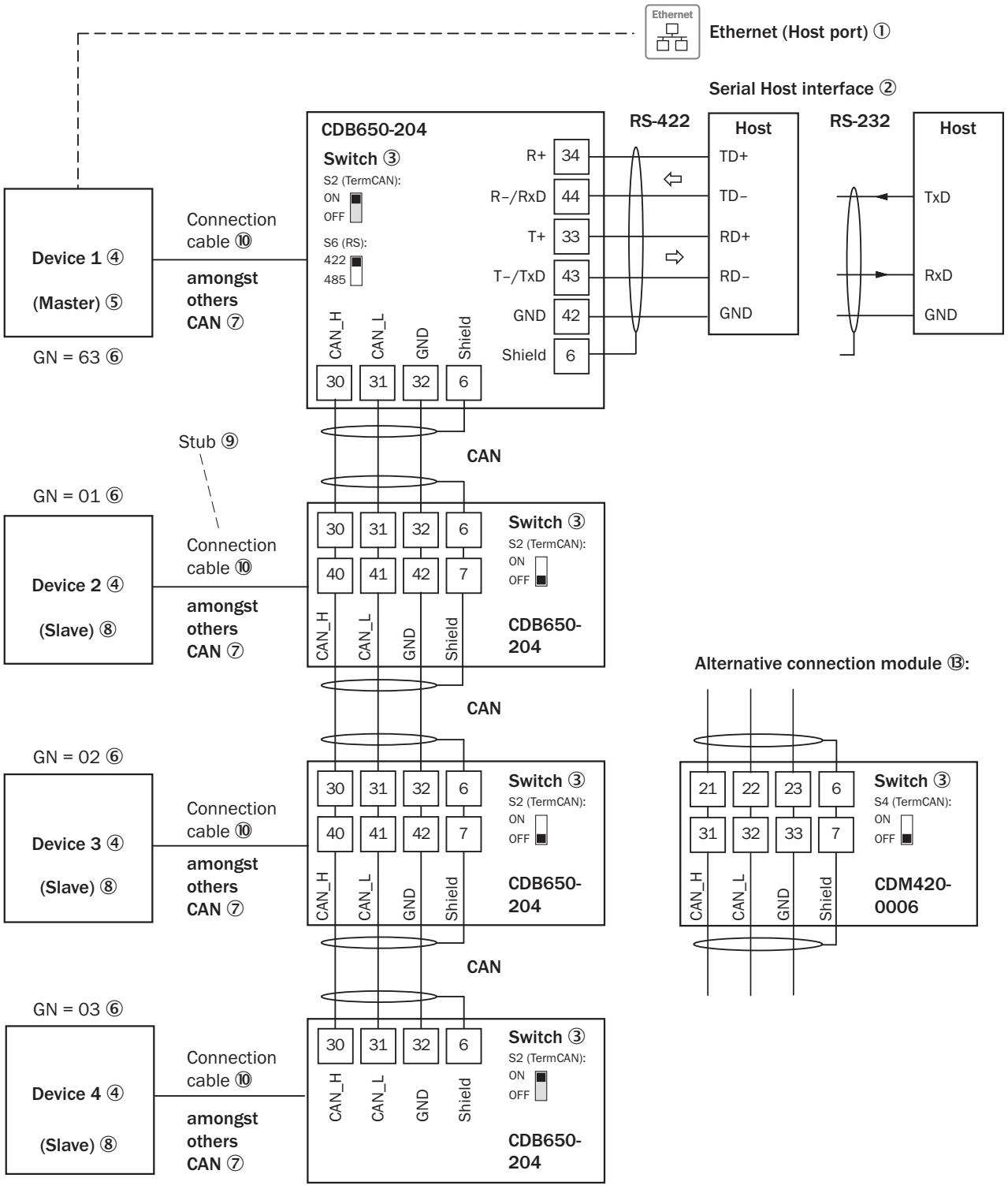
Table 3: Switch S7: Term 485

NOTE

Use of the RS-422 data interface:

- The relevant interface drivers of the device comply with the standard for RS-422.
- Activation of the interface in the device with SOPAS ET configuration software (point-to-point).
- The connection shown above is configured for operation of the host with permanently activated drivers (often described as “RS-422 operation”).

6.6.5 Wiring the CAN interface of the Lector63x...65x in the CDB650-204



GN = Device number ⑪
(max. 32 participants) ⑫

Figure 18: Wiring the CAN interface of the device in the CDB650-204 connection module Connection and looping of the supply voltage and connection of the trigger sensor, e.g., to the master not discussed here!

① Ethernet (host port)
② Serial host interface

③ Switch
④ Device
⑤ Master
⑥ Device number
⑦ CAN, for example
⑧ Slave
⑨ Stub cable
⑩ Connecting cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
⑪ Device number
⑫ Max. 32 nodes
⑬ Alternative connection module An adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin) is required to connect the device

6.6.6 Wiring switching inputs “Sensor 1” and “Sensor 2” in the CDB650-204

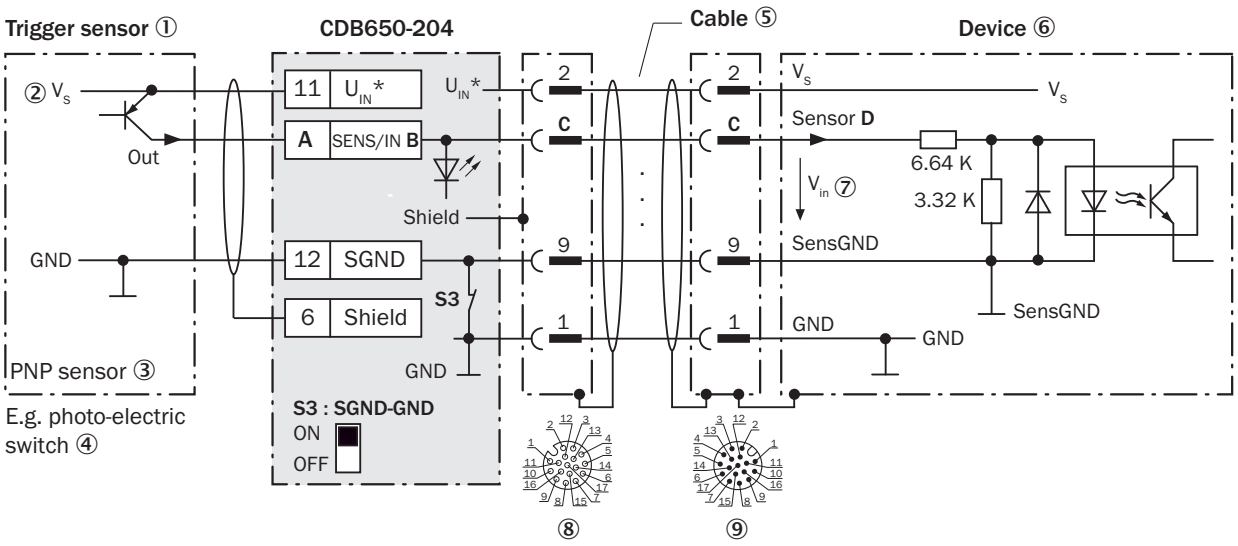


Figure 19: Trigger sensor powered by the CDB650-204

① Trigger sensor
② Supply voltage $V_S = U_V$
③ PNP sensor
④ E.g., photoelectric sensor
⑤ Connecting cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
⑥ Device
⑦ Input voltage $V_{in} = U_e$. Maximum DC 30 V.
⑧ Female connector, M12, 17-pin, A-coded
⑨ Male connector, M12, 17-pin, A-coded

CDB650-204			Device
Terminal A	**Signal B**	**Pin C**	**Sensor D**
10	SENS/IN 1	10	1
13	SENS/IN 2	15	2

Table 4: Assignment of placeholders to the switching inputs

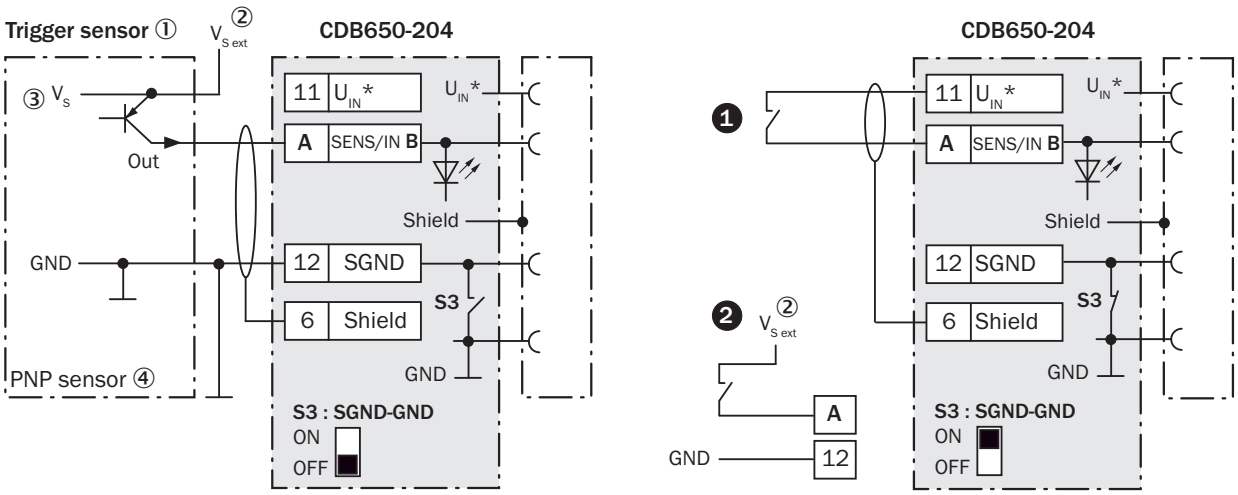


Figure 20: Left: trigger sensor connected volt-free and powered externally. Right: alternative switch, ❶ powered by CDB650-204 or ❷ connected volt-free and powered externally. Switch setting S3 as in the left-hand figure.

① Trigger sensor

② External supply voltage $V_{S\ ext}$ = $U_{V\ ext}$

③ Supply voltage V_S = U_V

④ PNP sensor

Function switch S3

Switch setting	Function
ON	GND of the trigger sensor connected to GND of the CDB650-204 and GND of the device
OFF	Trigger sensor connected to the CDB650-204 and the device volt-free. The shared, insulated reference potential for all switching inputs = SGND.

Table 5: Switch S3: SGND - GND

Characteristic data for digital switching inputs

Logic	Power to the input starts the assigned function, e.g. Start analysis . Default setting for device: logic not inverted (active high), debouncing 10 ms
Properties	• Opto-decoupled, reverse-polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $U_e \leq 2$ V; $I_e \leq 0.3$ mA High: 6 V ≤ $U_e \leq 30$ V; 0.7 mA ≤ $I_e \leq 5$ mA

Table 6: Characteristic data for the switching inputs “Sensor 1” and “Sensor 2”

NOTE

Functional assignment for the switching inputs is done with SOPAS ET configuration software.

6.6.7 Wiring the switching inputs “External input 1” and “External input 2” in the CDB650-204

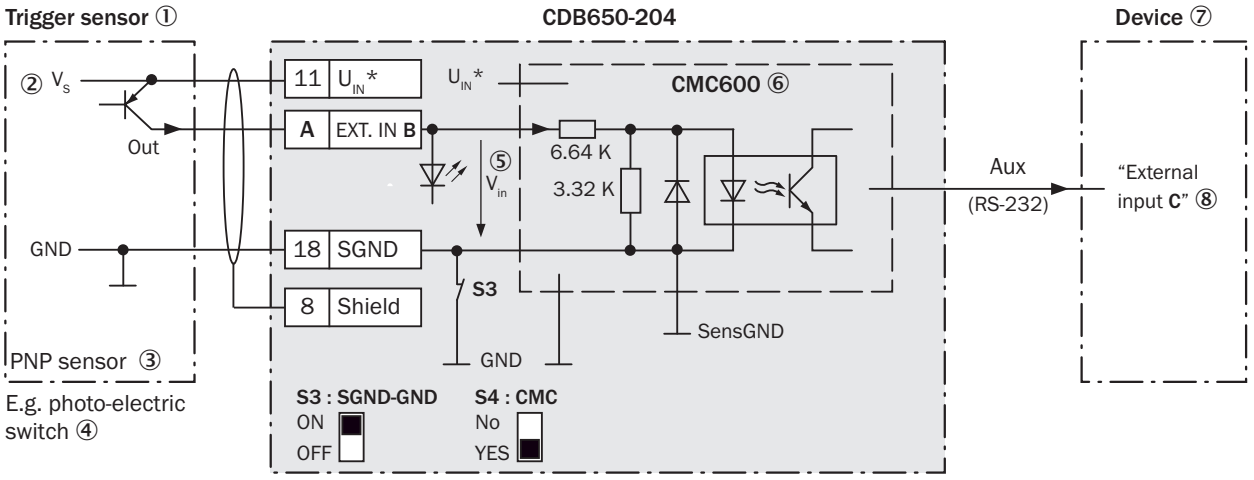


Figure 21: Trigger sensor powered by the CDB650-204

① Trigger sensor
② Supply voltage $V_S = U_V$
③ PNP sensor
④ E.g., photoelectric sensor
⑤ Input voltage $V_{in} = U_e$. Maximum DC 30 V.
⑥ CMC600 parameter cloning module required in order to be able to use the additional external switching inputs of the device
⑦ Device
⑧ Logical “External input” in device

CDB650-204		Device
Terminal A	**Signal B**	**External input C**
16	EXT. IN 1	1
17	EXT. IN 2	2

Table 7: Assignment of placeholders to the switching inputs

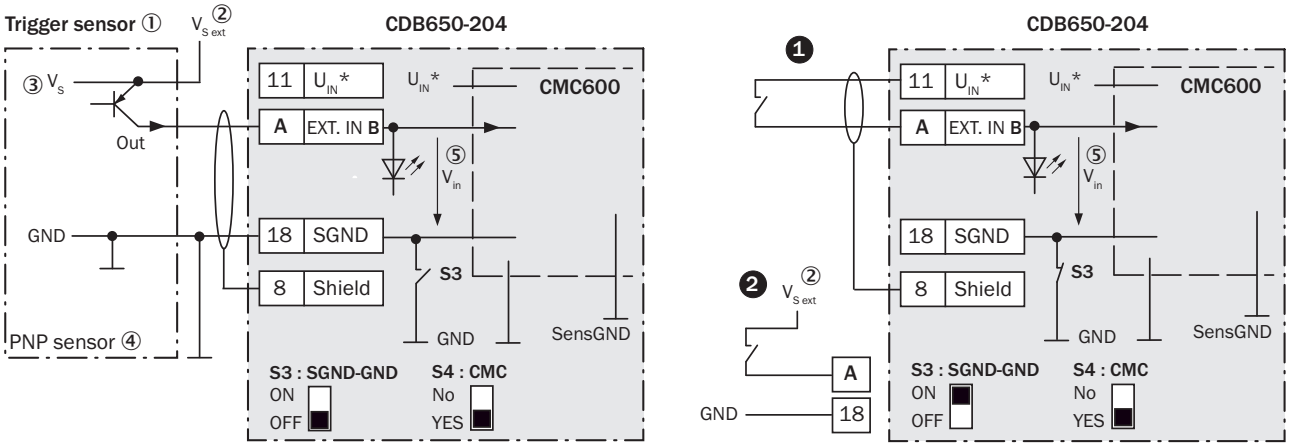


Figure 22: Left: trigger sensor connected volt-free and powered externally. Right: alternative switch, ❶ powered by CDB650-204 or ❷ connected volt-free and powered externally. Switch setting S3 as in the left-hand figure.

① Trigger sensor
② External supply voltage $V_{S\,ext} = U_{V\,ext}$
③ Supply voltage $V_S = U_V$

④ PNP sensor

⑤ Input voltage V_{in} = U_e. Maximum DC 30 V.

Function switch S3

Switch setting	Function
ON	GND of the trigger sensor connected to the GND of the CDB650-204 and CMC600.
OFF	Trigger sensor connected volt-free to the CDB650-204 and CMC600. The shared, insulated reference potential for all switching inputs = SGND.

Table 8: Switch S3: SGND - GND

The software causes the CMC600 to automatically transfer the output state of its physical inputs “EXT. IN 1” and “EXT. IN 2” to the serial AUX-interface of the device via the connecting cable. The device internally applies these statuses to its logical inputs “External input 1” and “External input 2”.

NOTE

Neither of the external switching inputs are suitable for time-critical applications.

Characteristic data for digital switching inputs

Logic	Current to input starts the assigned function, e.g., start trigger. Default setting for device: logic not inverted (active high), debouncing 10 ms
Properties	• Opto-decoupled, reverse-polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $U_e \leq 2$ V; $I_e \leq 0.3$ mA High: 6 V ≤ $U_e \leq 30$ V; 0.7 mA ≤ $I_e \leq 5$ mA

Table 9: Characteristic data for the switching inputs “External input 1” and “External input 2”

NOTE

Functional assignment for the switching inputs is done with SOPAS ET configuration software.

6.6.8 Wiring “Result 1” to “Result 4” switching outputs of the Lector63x...65x in the CDB650-204

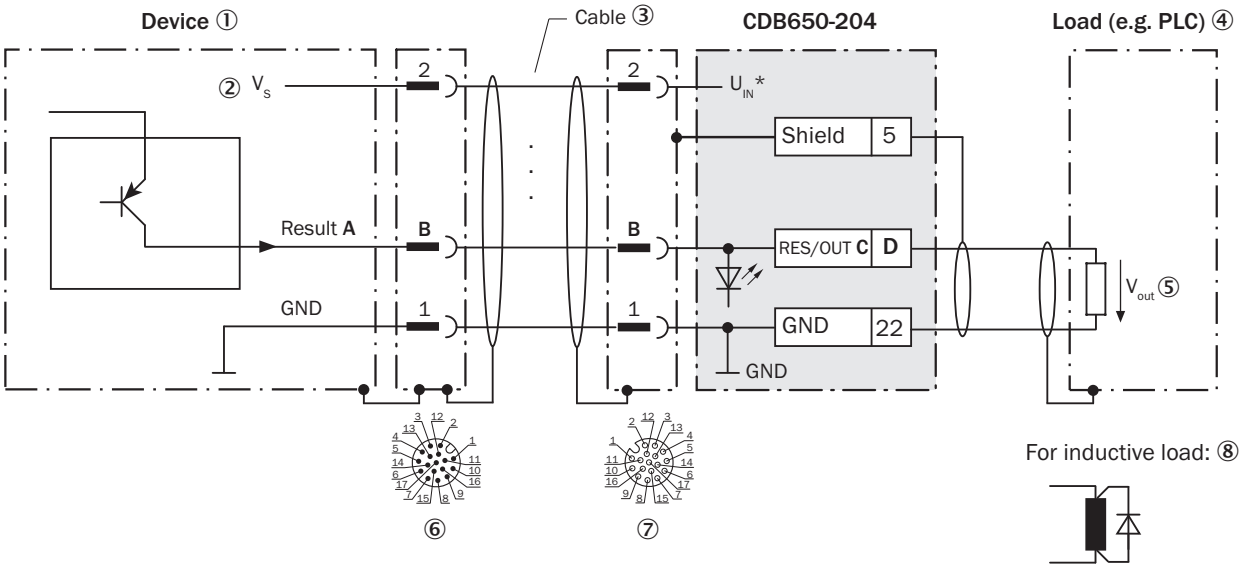


Figure 23: Wiring the switching outputs

① Device
② Supply voltage $V_S = U_V$
③ Connecting cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
④ Load (e.g., PLC)
⑤ Output voltage $V_{out} = U_a$
⑥ Male connector, M12, 17-pin, A-coded
⑦ Female connector, M12, 17-pin, A-coded
⑧ In the case of inductive loads: see note

Inductive load

NOTE
In the case of inductive loads, the switching output is equipped with arc-suppression. To use, directly apply a freewheeling diode to the load.

Device		CDB650-204	
Output A	**Pin B**	**Signal C**	**Terminal D**
Result 1	13	RES/OUT 1	20
Result 2	14	RES/OUT 2	21
Result 3	16	RES/OUT 3	50
Result 4	17	RES/OUT 4	51

Table 10: Assignment of placeholders to the switching outputs

Characteristic data of digital switching outputs

Logic	PNP switching to supply voltage U_V Default device setting: no function, logic: not inverted (active high)
Properties	• Short-circuit protected + temperature protected • Not electrically isolated from U_V

Table 11: Characteristic data of the switching outputs “Result 1” to “Result 4”

Logic	PNP switching to supply voltage U_V Default device setting: no function, logic: not inverted (active high)
Electrical values	$0\ V \leq U_a \leq U_V$ $(U_V - 1.5\ V) \leq U_a \leq U_V$ at $I_a \leq 100\ mA$

Table 11: Characteristic data of the switching outputs “Result 1” to “Result 4”

NOTE
The SOPAS ET configuration software is used to assign functions to the switching outputs.

6.6.9 Wiring the switching outputs “External output 1” and “External output 2” in the CDB650-204

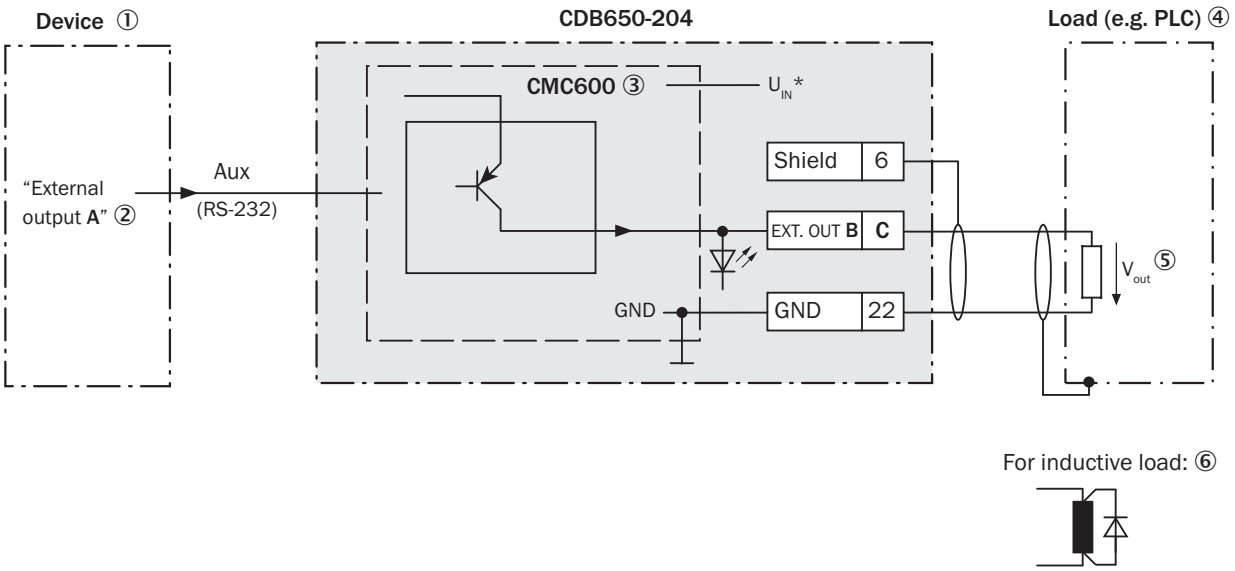


Figure 24: Wiring external switching outputs

① Device
② Logical “external output” in device
③ CMC600 parameter cloning module required in order to be able to use the additional external switching outputs of the device
④ Load (e.g., PLC)
⑤ Output voltage $V_{out} = U_a$
⑥ In the case of inductive loads: see note

Inductive load

NOTE
In the case of inductive loads, the switching output is equipped with arc-suppression.
To use, directly apply a freewheeling diode to the load.

Device	CDB650-204	
External output A	**Signal B**	**Terminal C**
1	EXT. OUT 1	23
2	EXT. OUT 2	24

Table 12: Assignment of placeholders to the switching outputs

The device indicates the output state of its logical outputs “External output 1” and “External output 2” via its serial AUX interface. The software causes the CMC600 to automatically identify the statuses via the connecting cable and to apply them to its physical outputs “EXT. OUT 1” and “EXT.OUT 2” in the CDB650-204.

NOTE
Neither of the external switching outputs are suitable for time-critical applications.

Characteristic data of digital switching outputs

Logic	PNP switching to supply voltage U_V Default device setting: no function, logic: not inverted (active high)
Properties	• Short-circuit protected + temperature protected • Not electrically isolated from U_V
Electrical values	$0\ V \leq U_a \leq U_V$ $(U_V - 1.5\ V) \leq U_a \leq U_V$ at $I_a \leq 100\ mA$

Table 13: Characteristic data of the switching outputs “External output 1” and “External output 2”

NOTE
Functional assignment for the switching outputs is done with SOPAS ET configuration software.

6.7 Wiring diagrams for the CDM420-0006 connection module

6.7.1 Wiring overview for Lector63x ... 65x (1 switching input used)

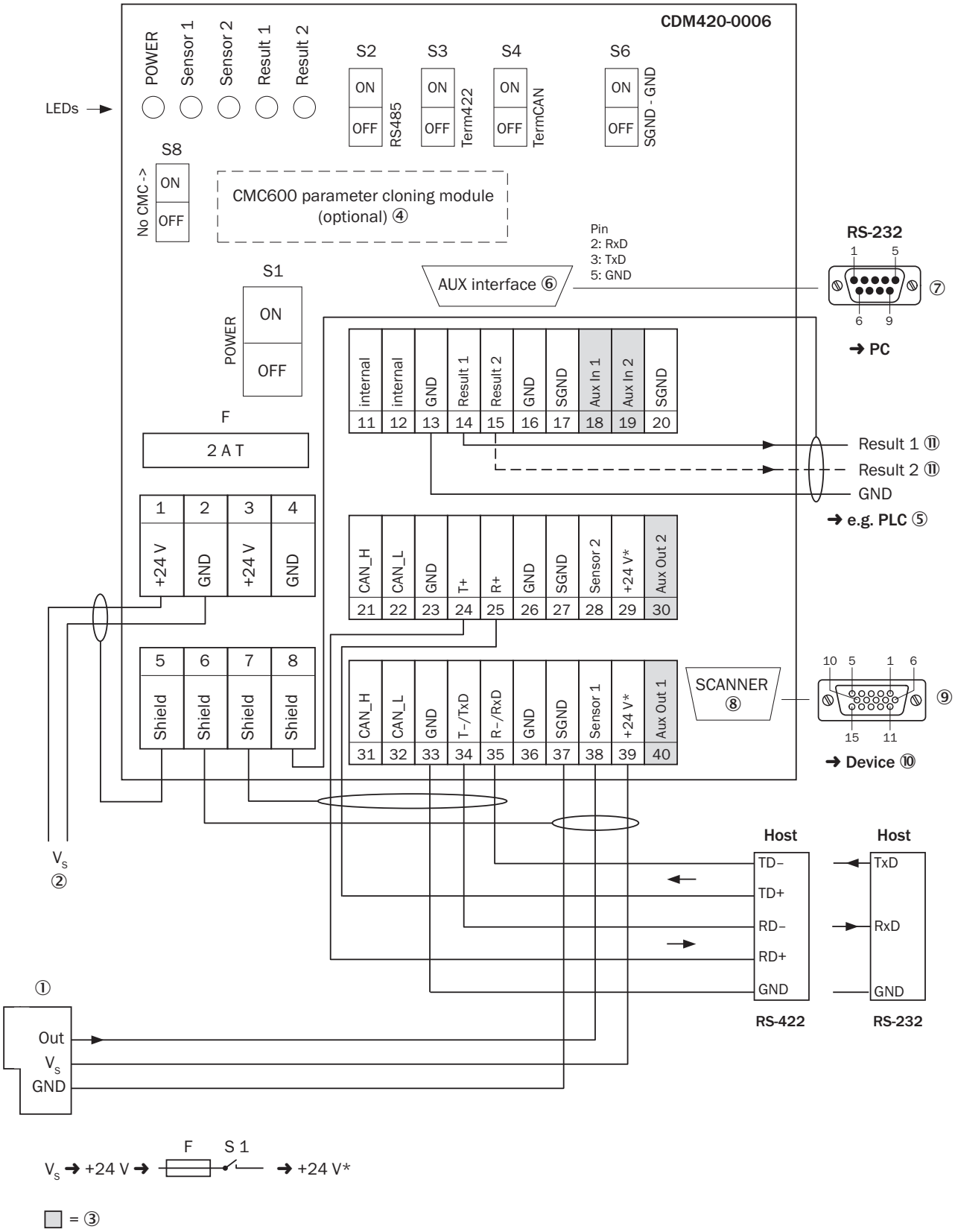


Figure 25: Connecting the device to the CDM420-0006 connection module (overview)

① External trigger (e.g., photoelectric sensor)

② Supply voltage V_S = U^V

③ CMC600 parameter cloning module required in order to be able to use the additional labeled switching inputs and outputs on the device (type-dependent)
④ CMC600 parameter cloning module
⑤ E.g., PLC (programmable logic controller)
⑥ Auxiliary interface “AUX”
⑦ Male connector, D-Sub, 9-pin
⑧ Sensor = Device
⑨ Female connector, D-Sub-HD, 15-pin
⑩ Device to be connected
⑪ Name of the switching output

6.7.2 Connecting supply voltage of the Lector63x...65x in the CDM420-0006

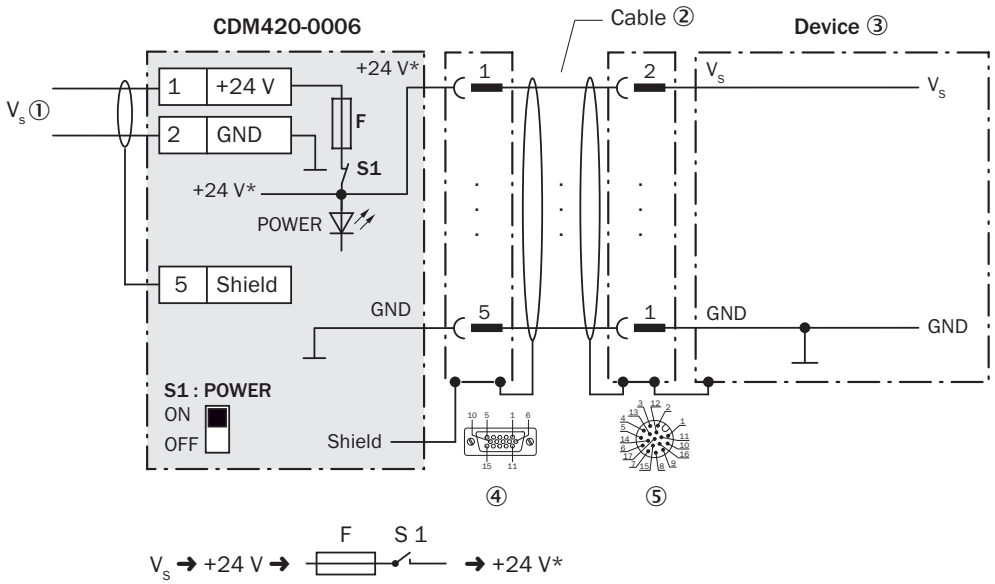


Figure 26: Connecting the device supply voltage in the CDM420-0006 connection module

① Supply voltage $V_S = U_V$
② Adapter cable, e.g., part no. 2055419 (2 m)
③ Device
④ Female connector, D-Sub-HD, 15-pin
⑤ Male connector, M12, 17-pin, A-coded

Function switch S1

Switch setting	Function
ON	+24 V supply voltage supplied to CDM420-0006 and device via fuse as +24 V*. +24 V* voltage also available at terminals 29 and 39.
OFF	CDM420-0006 and device isolated from supply voltage. Recommended position for all connection work.

Table 14: Switch S1: power

6.7.3 Wiring the serial host interface RS-232 in the CDM420-0006

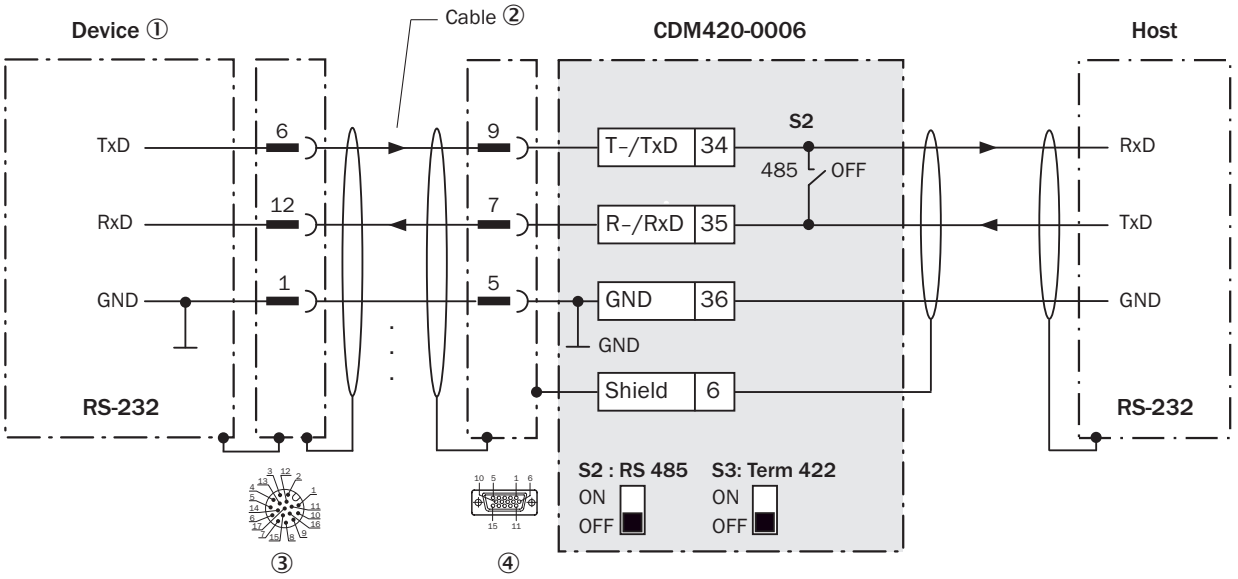


Figure 27: Wiring the RS-232 data interface

① Device
② Adapter cable, e.g., part no. 2055419 (2 m)
③ Male connector, M12, 17-pin, A-coded
④ Female connector, D-Sub-HD, 15-pin

6.7.4 Wiring the serial host interface RS-422 in the CDM420-0006

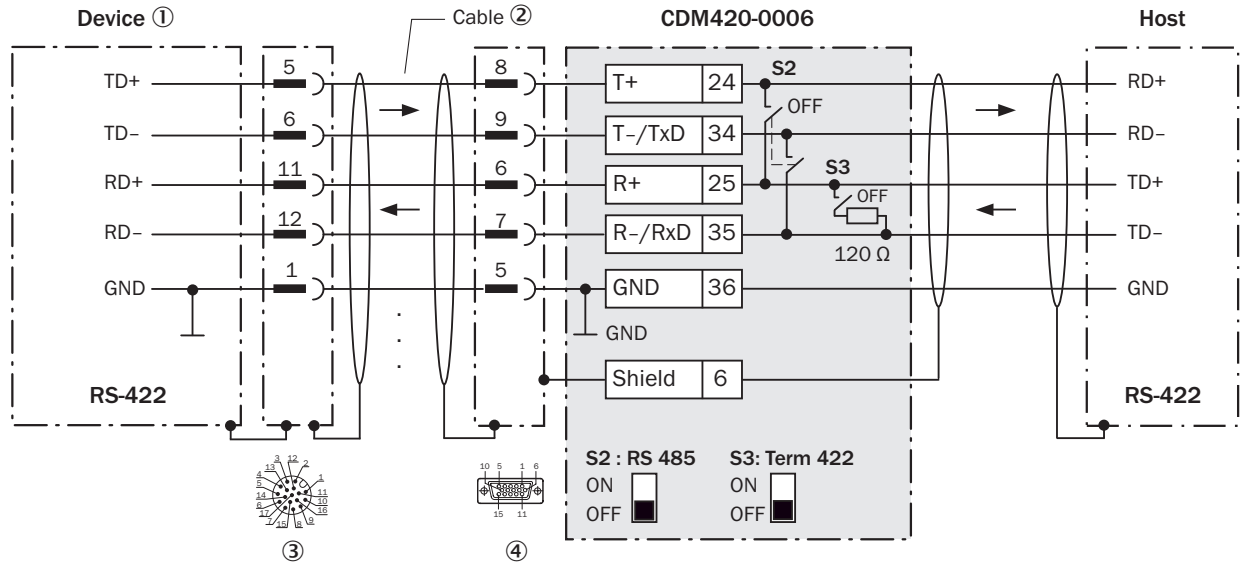


Figure 28: Wiring the RS-422 data interface

① Device
② Adapter cable, e.g., part no. 2055419 (2 m)
③ Male connector, M12, 17-pin, A-coded
④ Female connector, D-Sub-HD, 15-pin

Function switch S3

Switch setting	Function
ON	Terminates the RS-422 receiver in the device in order to improve the interference distance to the cable.
OFF	No termination

Table 15: Switch S3: Term 485

NOTE

Use of the RS-422 data interface:

- The relevant interface drivers of the device comply with the standard for RS-422.
- Activation of the interface in the device with SOPAS ET configuration software (point-to-point).
- The connection shown above is configured for operation of the host with permanently activated drivers (often described as “RS-422 operation”).

6.7.5 Wiring the CAN interface of the Lector63x...65x in the CDM420-0006

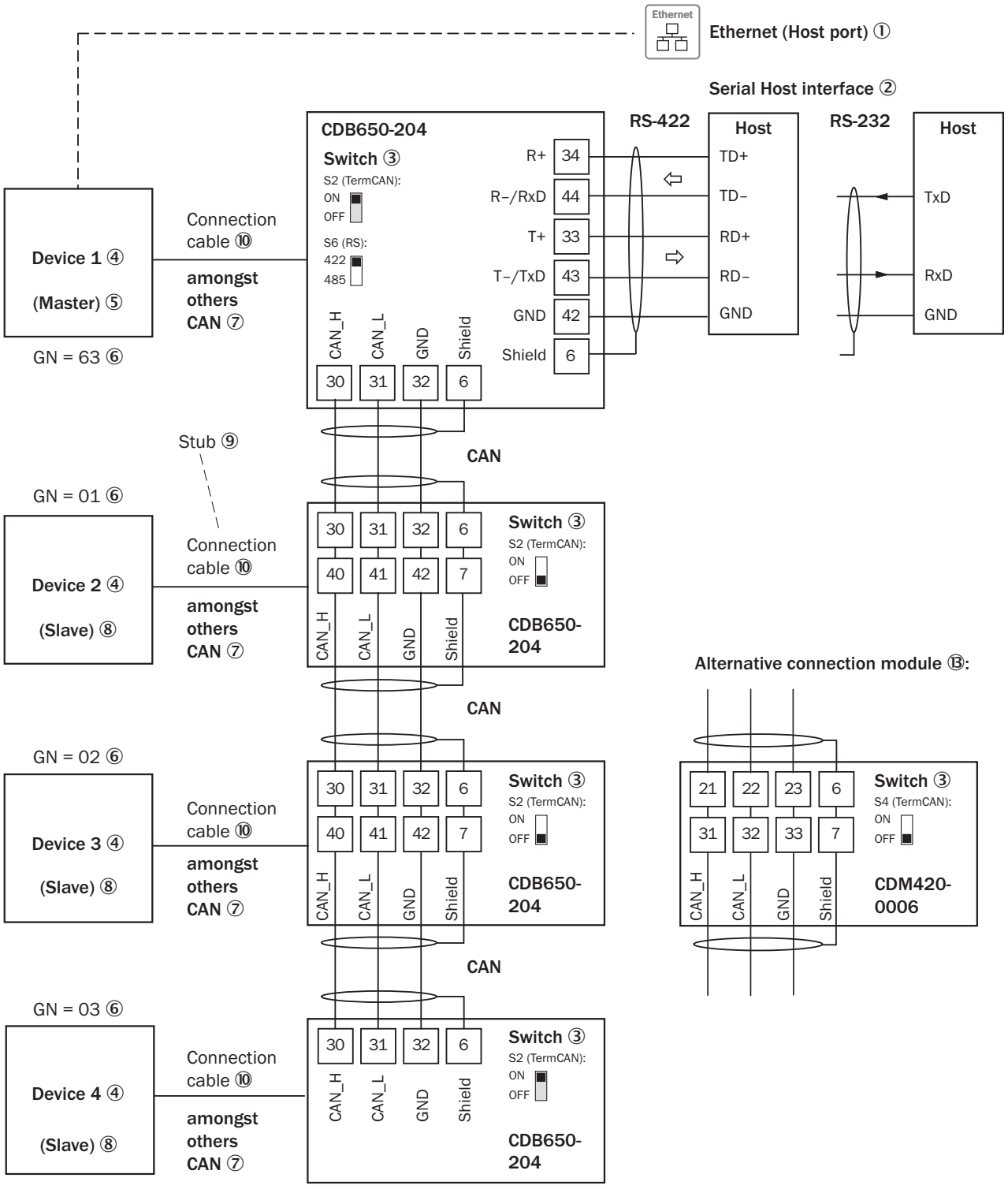


Figure 29: Wiring the CAN interface of the device in the CDM420-0006 connection module Connection and looping of the supply voltage and connection of the trigger sensor, e.g., to the master not discussed here!

① Ethernet (host port)

② Serial host interface

③ Switch
④ Device
⑤ Master
⑥ Device number
⑦ CAN, for example
⑧ Slave
⑨ Stub cable
⑩ Adapter cable, e.g., part no. 2055419 (2 m)
⑪ Device number
⑫ Max. 32 nodes
⑬ Alternative connection module: in order to connect the device, a 1:1 connecting cable is required, e.g. part no. 6052286 (2 m)

6.7.6 Wiring the switching inputs “Sensor 1” and “Sensor 2” in the CDM420-0006

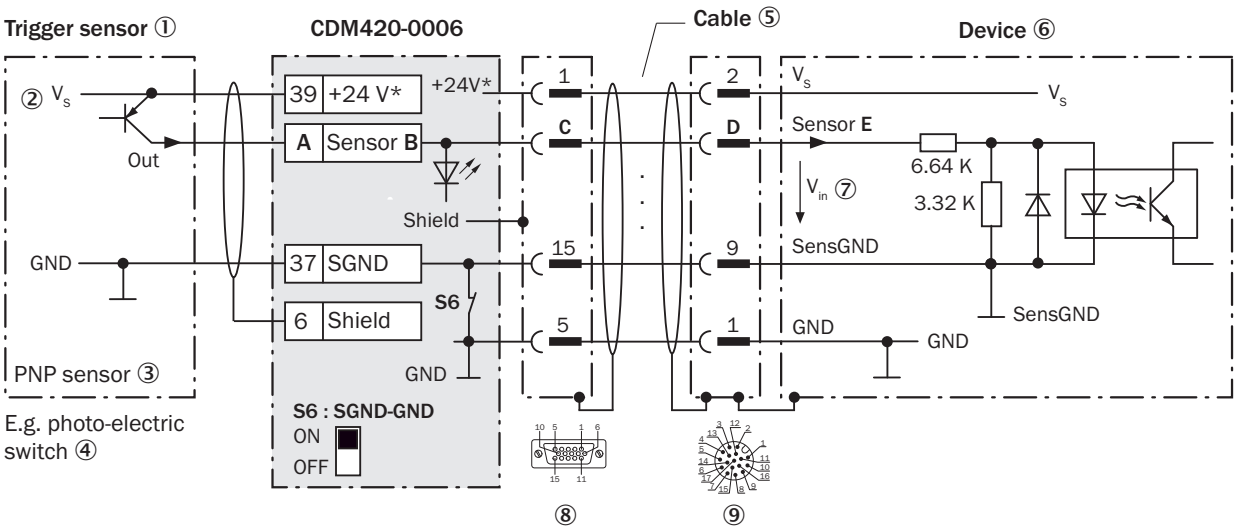


Figure 30: Trigger sensor powered by the CDM420-0006

① Trigger sensor
② Supply voltage $V_S = U_V$
③ PNP sensor
④ E.g., photoelectric sensor
⑤ Adapter cable, e.g., part no. 2055419 (2 m)
⑥ Device
⑦ Input voltage $V_{IN} = U_e$. Maximum DC 30 V.
⑧ Female connector, D-Sub-HD, 15-pin
⑨ Male connector, M12, 17-pin, A-coded

CDM420-0006			Device	
Terminal A	**Signal B**	**Pin C**	**Pin D**	**Sensor E**
38	Sensor 1	14	10	1
28	Sensor 2	4	15	2

Table 16: Assignment of placeholders to the switching inputs

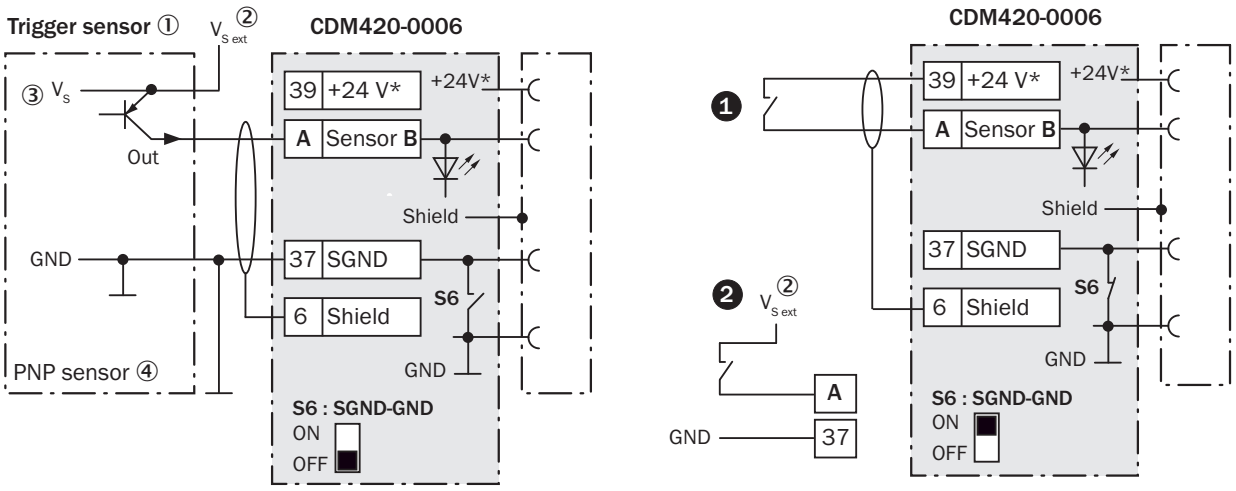


Figure 31: Left: trigger sensor connected volt-free and powered externally. Right: alternative switch, ❶ powered by CDM420-0006 or ❷ connected volt-free and powered externally. Switch setting S6 as in the left-hand figure.

① Trigger sensor

② External supply voltage $V_{S\ ext}$ = $U_{V\ ext}$

③ Supply voltage V_S = U_V

④ PNP sensor

Function switch S6

Switch setting	Function
ON	GND of the trigger sensor connected to GND of the CDM420-0006 and GND of the device
OFF	Trigger sensor connected to the CDM420-0006 and the device volt-free. The shared, insulated reference potential for all switching inputs = SGND.

Table 17: Switch S6: SGND - GND

Characteristic data for digital switching inputs

Logic	Current to input starts the assigned function, e.g., start trigger. Default setting for device: logic not inverted (active high), debouncing 10 ms
Properties	• Opto-decoupled, reverse-polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $U_e \leq 2$ V; $I_e \leq 0.3$ mA High: 6 V ≤ $U_e \leq 30$ V; 0.7 mA ≤ $I_e \leq 5$ mA

Table 18: Characteristic data for the switching inputs “Sensor 1” and “Sensor 2”

NOTE

Functional assignment for the switching inputs is done with SOPAS ET configuration software.

6.7.7 Wiring the switching inputs “External input 1” and “External input 2” in the CDM420-0006

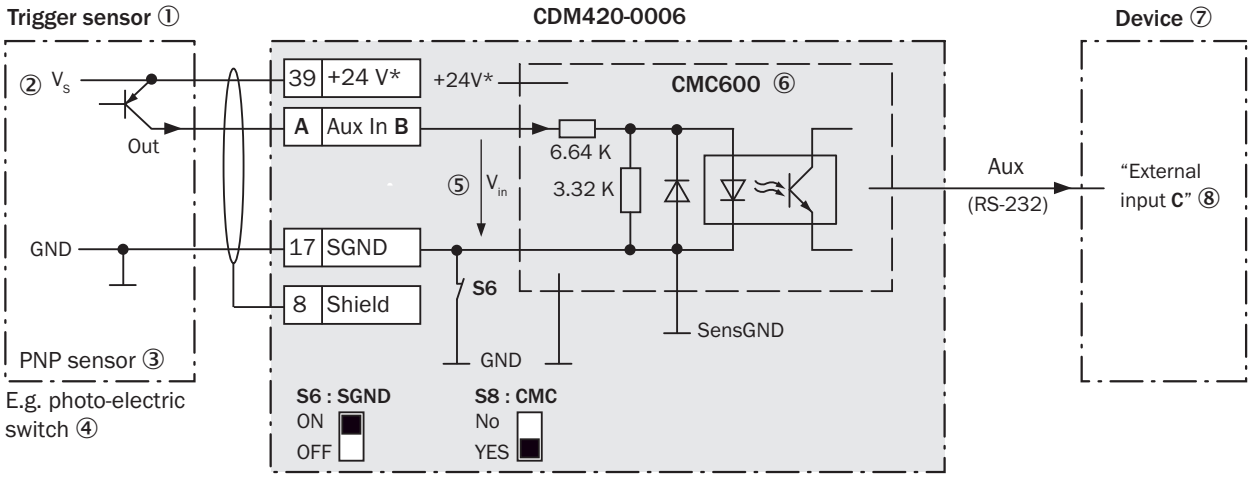


Figure 32: Trigger sensor powered by the CDM420-0006

① Trigger sensor

② Supply voltage $V_S = U_V$

③ PNP sensor

④ E.g., photoelectric sensor

⑤ Input voltage $V_{IN} = U_e$. Maximum DC 30 V.

⑥ CMC600 parameter cloning module required in order to be able to use the additional external switching inputs of the device

⑦ Device

⑧ Logical “External input” in device

CDM420-0006		Device
Terminal A	**Signal B**	**External input C**
18	AUX In 1	1
19	AUX In 2	2

Table 19: Assignment of placeholders to the switching inputs

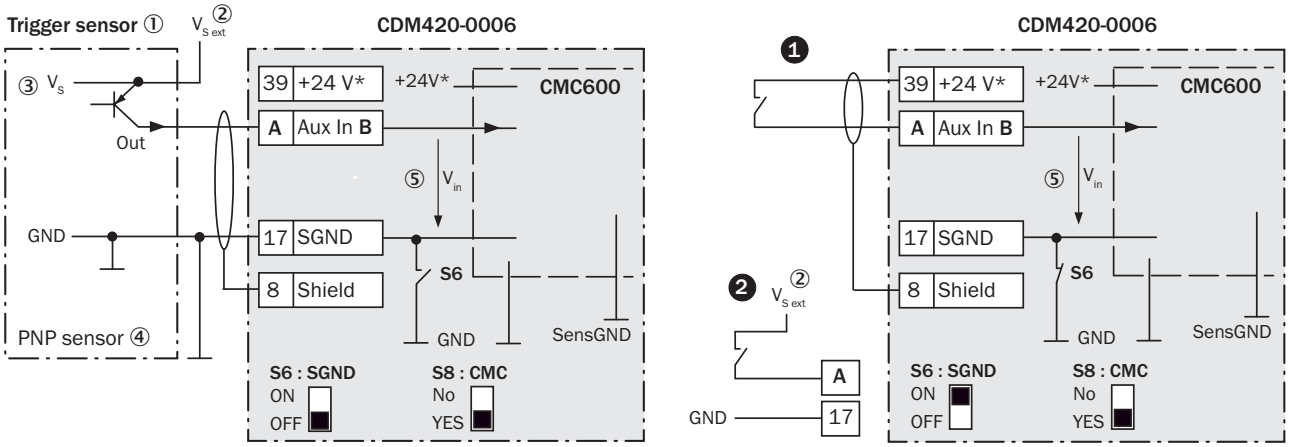


Figure 33: Left: trigger sensor connected volt-free and powered externally. Right: alternative switch, ❶ powered by CDM420-0006 or ❷ connected volt-free and powered externally. Switch setting S6 as in the left-hand figure.

① Trigger sensor

② External supply voltage $V_{S\,ext} = U_{V\,ext}$

③ Supply voltage $V_S = U_V$

④ PNP sensor

⑤ Input voltage $V_{IN} = U_e$. Maximum DC 30 V.

Function switch S6

Switch setting	Function
ON	GND of the trigger sensor connected to the GND of the CDM420-0006 and CMC600.
OFF	Trigger sensor connected volt-free to the CDM420-0006 and CMC600. The shared, insulated reference potential for all switching inputs = SGND.

Table 20: Switch S6: SGND - GND

The software causes the CMC600 to automatically transfer the output state of its physical inputs “AUX. In 1” and “AUX. In 2” to the serial AUX interface of the device via the connecting cable. The device internally applies these statuses to its logical inputs “External input 1” and “External input 2”.

NOTE
Neither of the external switching inputs are suitable for time-critical applications.

Characteristic data for digital switching inputs

Logic	Current to input starts the assigned function, e.g., start trigger. Default setting for device: logic not inverted (active high), debouncing 10 ms
Properties	• Opto-decoupled, reverse-polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $U_e \leq 2$ V; $I_e \leq 0.3$ mA High: 6 V ≤ $U_e \leq 30$ V; 0.7 mA ≤ $I_e \leq 5$ mA

Table 21: Characteristic data for the switching inputs “External input 1” and “External input 2”

NOTE
Functional assignment for the switching inputs is done with SOPAS ET configuration software.

6.7.8 Wiring the switching outputs “Result 1” and “Result 2” in the CDM420-0006

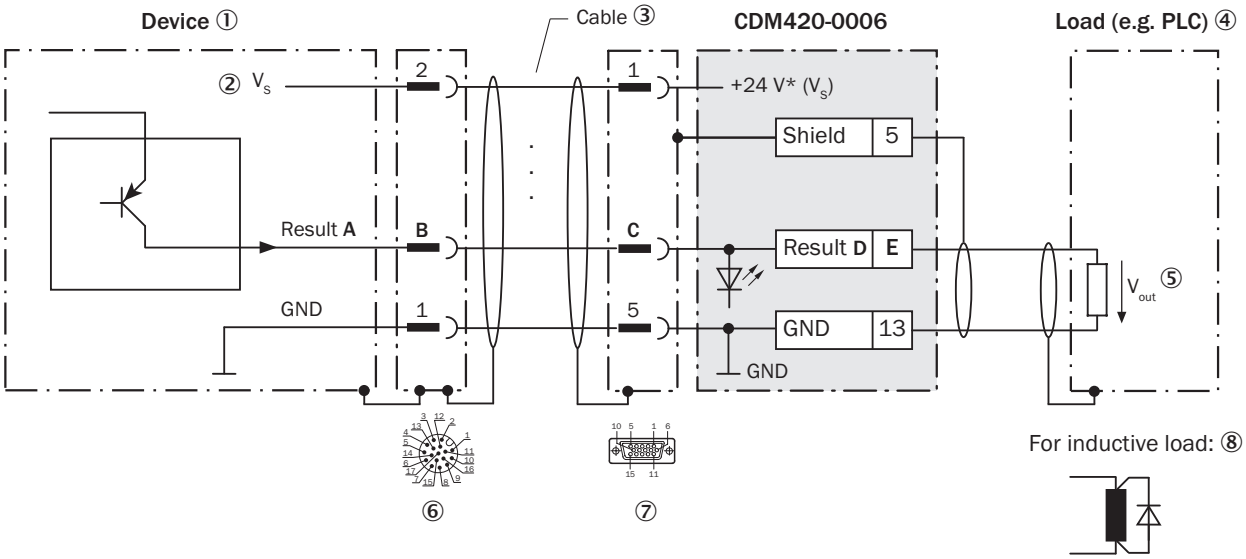


Figure 34: Wiring the switching outputs

① Device
② Supply voltage $V_S = U_V$
③ Adapter cable, e.g., part no. 2055419 (2 m)
④ Load (e.g., PLC)
⑤ Output voltage $V_{OUT} = U_a$
⑥ Male connector, M12, 17-pin, A-coded
⑦ Female connector, D-Sub-HD, 15-pin
⑧ In the case of inductive loads: see note

Inductive load

NOTE
In the case of inductive loads, the switching output is equipped with arc-suppression. To use, directly apply a freewheeling diode to the load.

Device		CDM420-0006		
Output A	**Pin B**	**Pin C**	**Signal D**	**Terminal E**
Result 1	13	12	Result 1	14
Result 2	14	13	Result 2	15

Table 22: Assignment of placeholders to the switching outputs

Characteristic data of digital switching outputs

Logic	PNP switching to +24 V* supply voltage Default device setting: no function, logic: not inverted (active high)
Properties	• Short-circuit protected + temperature protected • Not electrically isolated from +24 V* supply voltage
Electrical values	0 V ≤ U_a ≤ +24 V* (+24 V* −1.5 V) ≤ U_a ≤ +24 V* at I_a≤ 100 mA

Table 23: Characteristic data of the switching outputs “Result 1” and “Result 2”

NOTE
The SOPAS ET configuration software is used to assign functions to the switching outputs.

6.7.9 Wiring the switching outputs “External output 1” and “External output 2” in the CDM420-0006

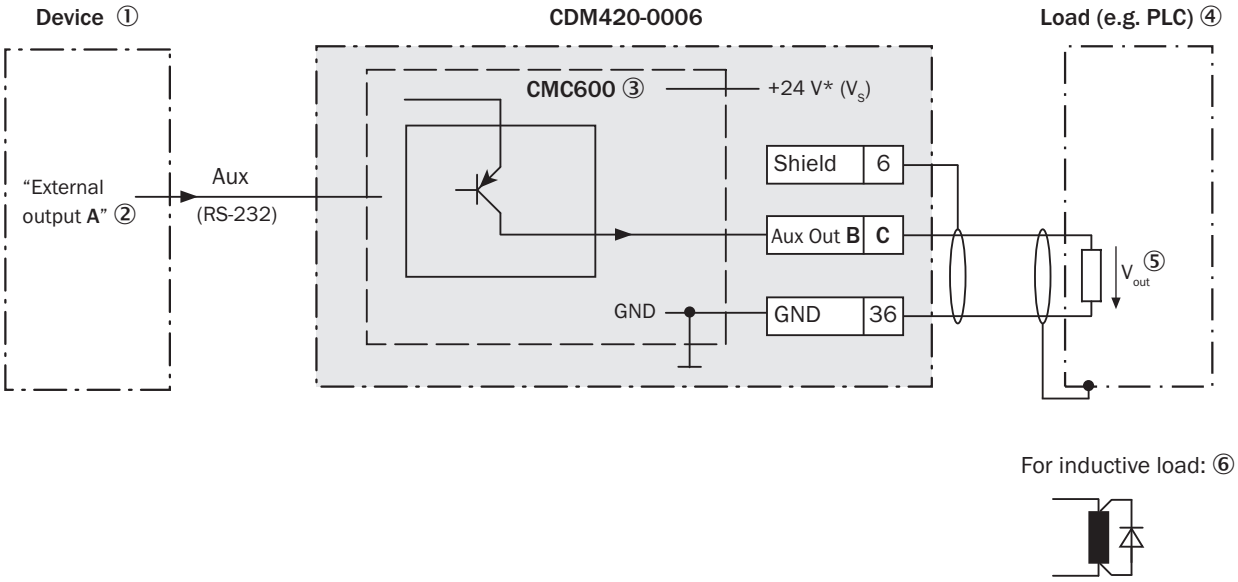


Figure 35: Wiring external switching outputs

① Device
② Logical “external output” in device
③ CMC600 parameter cloning module required in order to be able to use the additional external switching outputs of the device
④ Load (e.g., PLC)
⑤ Output voltage $V_{OUT} = U_a$
⑥ In the case of inductive loads: see note

In the case of inductive loads

NOTE
In the case of inductive loads, the switching output is equipped with arc-suppression.
To use, directly apply a freewheeling diode to the load.

Device	CDM420-0006	
External output A	**Signal B**	**Terminal C**
1	AUX Out 1	40
2	AUX Out 2	30

Table 24: Assignment of placeholders to the switching outputs

The device indicates the output state of its logical outputs “External output 1” and “External output 2” via its serial AUX interface. The software causes the CMC600 to automatically identify the statuses via the connecting cable and to apply them to its physical outputs “AUX. Out 1” and “AUX.Out 2” in the CDM420-0006.

NOTE
Neither of the external switching outputs are suitable for time-critical applications.

Characteristic data of digital switching outputs

Logic	PNP switching to +24 V* supply voltage Default device setting: no function, logic: not inverted (active high)
Properties	• Short-circuit protected + temperature protected • Not electrically isolated from +24 V* supply voltage
Electrical values	0 V ≤ U_a ≤ +24 V* (+24 V* − 1.5 V) ≤ U_a ≤ +24 V* at I_a ≤ 100 mA

Table 25: Characteristic data of the switching outputs “External output 1” and “External output 2”

NOTE

Functional assignment for the switching outputs is done with SOPAS ET configuration software.

7 Commissioning

7.1 Configuring the device with SOPAS ET

Adjustment of the device parameters to the application as well as diagnostics in the event of malfunctions is undertaken using the SOPAS ET configuration as standard. The device supports this process by displaying the images it has recorded in SOPAS ET (requirement SOPAS ET: at least version 3.0).

If the reading performance of the device has been adapted without a PC, SOPAS ET is generally used to continue the configuration process (trigger, result formats, data interface, etc.).

Installing and starting the configuration software

1. Download and install the latest version of the SOPAS ET configuration software, as well as current device description files (*.sdd), from the online product page for the software by following the instructions provided there. www.sick.com/SOPAS_ET
   In this case, select the **complete** option as suggested by the installation wizard. Administrator rights may be required on the PC to install the software.
2. Start the program. Path: **Start** > **Programs** > **SICK** > **SOPAS EngineeringTool** > **SOPAS EngineeringTool**
3. Establish a connection between the software and the sensor via Ethernet or USB (depending on type).
   The connection wizard starts automatically.
4. The following IP addresses are configured by default on the sensor:
   - IP address P1: 192.168.1.1
   - Subnet mask: 255.255.255.0
5. Select the Lector64x Flex, Lector65x Flex or Lector65x Dynamic Focus from the available devices and add to the project by double-clicking. The Lector appears on the left side of the window. Open the device window by double-clicking again on the tile in the left-hand window and select the Standard view. SOPAS ET establishes communication with the device and loads the associated device description file for the device.
6. In the **Wizard** window, click the **Start** button.
   The device will now continuously record images, decode them and attempt to automatically find the appropriate settings for the image and the decoder. If the read is successful, these settings can be saved immediately. In the case of time-critical applications, fine adjustment can be used to automatically identify time-optimized settings to reduce the analysis time per image. Alternatively, it is possible to record images in Edit mode and manually adjust the settings on the right-hand side of the screen. The effects of any parameter changes are directly visible.

7.2 Configuring the sensor manually

Configuring the Lector64/65x Dynamic Focus manually

1. In the **Online Image** window, click the **Live** button. In **Live** mode, the device starts recording images consecutively and uses the current settings to decode them. The effects of any parameter changes become directly visible.

NOTE

The following functions are deactivated in **Live** mode:

- Switching inputs and outputs
- Data output via the host interface.

2. Align the sensor in the desired depth of field range with a medium-height object with a test code.
3. Click on the **Auto** button. The device automatically sets the correct sharpness value
4. If refocusing is required during operation due to lens changes, a height profile measuring sensor (e.g. MLG or VMS) must be connected upstream to provide the device with the focus height per object.

Configuring the Lector64/65x Flex manually

1. In the **Online Image** window, click the **Live** button. In **Live** mode, the device starts recording images consecutively and uses the current settings to decode them. The effects of any parameter changes become directly visible.

NOTE
The following functions are deactivated in **Live** mode:

- Switching inputs and outputs
- Data output via the host interface.

2. Align the sensor in the desired depth of field range with a medium-height object with a test code.
3. Click the **Camera & Illumination** configuration bar. Use the **Shutter timer** and **Brightness** sliders to adjust the image brightness so that the code is easy to see.
4. Activate the sharpness diagnosis bar. To do this, go to the **Camera & Illumination** area and click the **Display sharpness** checkbox.

Variants with C-mount lens: Adjusting the brightness and sharpness

1. Remove the optics protective hood.
2. Loosen the lock nut fitting on the lens or on the mask ring and sharpness ring. If necessary, adjust the mask using the aperture ring (top ring) on the lens to a low value.
3. If necessary, use the **Shutter time**, **Brightness** and **Contrast** slider controls to optimize the brightness and contrast until the test object is clearly visible in the image
   or
   Reduce the**Shutter time** and **Brightness** in SOPAS ET until the test object is clearly visible in the image.
4. If you have trouble adjusting the sharpness on the lens unit, you may wish to activate the sharpness diagnostics bar on the bottom left of the display window. To do this, click the **Display sharpness** check box. The sharpness diagnosis bar must be brought to its maximum position. The object must be clearly displayed in sharp focus so that all edges are easy to identify.
5. Keep adjusting the sharpness setting on the lens unit until the color of the bar graph changes to green.
6. Once the online image adjustment process has been successfully completed, use the locking screws to lock both adjusting rings of the lens unit in place.
7. Set the correct mask adjustment for depth of field. In order to do this, check the settings with the test object. Adjust the mask to a higher value. Bear in mind that using a greater mask value reduces image brightness, meaning that brightness must be increased using the **Brightness** slider in SOPAS ET. This reduces image quality.
8. Attach the optics protective hood and screw it tight.

Continuing the configuration

1. Make settings for additional functions during planned operation such as codes, trigger, result formats, data interface, etc.
2. Go to the image display window (Online images), click the **Operation** button, and test the settings in operation (real operation).

Completing the configuration

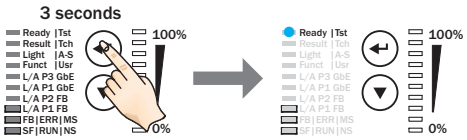
1. Saving the parameters set in non-volatile memory in the device:
   Click the  button.
2. Save the parameter set on the PC:
   Click the  button.

7.3 Configuring the device without software (SOPAS) using pushbuttons

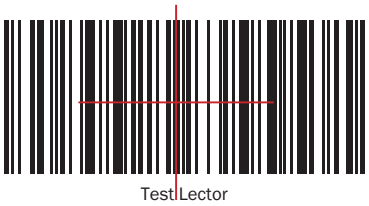
The two function buttons and the LEDs with their second display level are used for manually adjusting the analysis properties of the device.

The device uses the Setup function to adjust itself automatically to suit the lighting conditions and the quality of the object presented (not applicable to Pharmacode). In accordance with the default setting, the values calculated for the two parameter modules (image, decoder) during this process are saved, thereby overwriting the existing configuration.

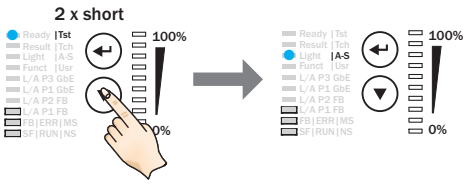
1. Start “Edit” mode.
   For the sake of clarity, the LED status indicators, function buttons, and bar graph are shown below in compressed form.



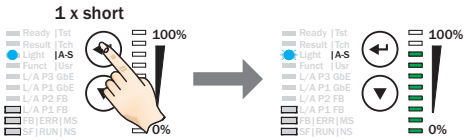
2. Align the device with the code.



3. Select Auto-Setup.



The bar graph shows the progress of the Auto-Setup function in percent. 100% means the Auto-Setup has finished. The color of the “Auto-Setup” LED now signals the success status.



4. Exit “Edit” mode and save the parameters.

Alternatively, the device saves the parameters automatically if 5 minutes elapse without a key being pressed, and it returns to operating mode.

8 Maintenance

8.1 Maintenance

The product requires the following maintenance work at regular intervals:

Interval	Maintenance work	To be carried out by
Cleaning interval depends on ambient conditions and climate	Clean housing and front screen	Specialist
Every 6 months	Check the screw connections and plug connections	Specialist

Table 26: Maintenance schedule

8.1.1 Lens maintenance

No maintenance is required in order to ensure compliance of the targeting laser with laser class 1 and LED risk group RG1 or RG2 for the illumination unit.

8.2 Cleaning the device

At regular intervals, check the inspection window and the housing of the device for accumulated dirt (see "Maintenance", page 68). This is especially relevant in harsh operating environments (dust, abrasion, damp, fingerprints, etc.).

The inspection window lens must be kept clean and dry during operation.

NOTICE
Equipment damage due to improper cleaning

Improper cleaning may result in equipment damage.

- Only use suitable cleaning agents.
- Never use sharp objects for cleaning.

Cleaning inspection window

NOTICE
Damage to the inspection window

Reduced analysis performance due to scratches or streaks on the inspection window.

- ▶ Clean the inspection window only when wet.
- ▶ Use a mild cleaning agent that does not contain powder additives. Do not use aggressive cleaning agents, such as acetone, etc.
- ▶ Avoid any movements that could cause scratches or abrasions on the inspection window.
- ▶ Only use cleaning agents suitable for the screen material.

The type of screen material used in the inspection window can be found on the type label (see "Type code", page 11).

NOTE

Static charge may cause dust particles to stick to the inspection window. This effect can be avoided by using an anti-static cleaning agent in combination with the SICK lens cloth (can be obtained from www.sick.com).

Cleaning procedure:

CAUTION
Class 1 laser beam!

The accessible beam does not represent a hazard even if you view it directly for a long period of time (base period of 100 seconds). With visible lasers (red), it is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, impairment of color vision), particularly in conditions of dim lighting.

- Never look into the laser beam directly with optical instruments (e.g., magnifying glasses, microscopes, telescopes/binoculars).
- Current national regulations regarding laser protection must be observed.

- Switch off the device for the duration of the cleaning operation. If this is not possible, use suitable laser protection goggles. These must absorb radiation of the device's wavelength effectively.
- Glass lens: Remove dust from the inspection window using a soft, clean brush. If necessary, also clean the inspection window with a clean, damp, lint-free cloth, and a mild anti-static lens cleaning fluid.
- Plastic lens: Clean the inspection window only with a clean, damp, lint-free cloth, and a mild anti-static lens cleaning fluid.

CAUTION
LED risk group 1

The accessible beam from the illumination unit (RG1) does not represent a risk due to the normal restrictions imposed by human behavior.

LED risk group 2

The accessible beam from the illumination unit (RG2) does not represent a risk due to aversion responses to very bright light sources and the perception of heat.

For both types of beams

It is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, impairment of color vision) at flashing frequencies between 1 Hz and 160 Hz, depending on the configuration, particularly in conditions of dim lighting. No safety precautions are required.

Comply with the latest version of the applicable regulations on photobiological safety of lamps and lamp systems as well as on laser protection.

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 HAZARDOUS RADIATION

If any operating or adjusting devices other than those specified here are used or other methods are employed, this can lead to dangerous exposure to radiation. Damage to the eyes is possible.

- 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.
- Do not look into the light source when it is switched on.
- Comply with the latest version of the applicable regulations on photobiological safety of lamps and lamp systems as well as on laser protection.

Only the illumination from SICK intended for the application can be used as internal lighting.

NOTE
If the inspection window is scratched or damaged (cracked or broken), the lens must be replaced. Contact SICK Service to arrange this.

Cleaning the housing

In order to ensure that heat is adequately dissipated from the device, the housing surface must be kept clean.

- ▶ Clear the build up of dust on the housing with a soft brush.

8.3 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 Troubleshooting

9.1 Overview of possible errors and faults

Situation	Error/fault
Mounting	■ Sensor poorly aligned to the object (e.g., dazzle).
Electrical installation	■ Data interfaces of the device incorrectly wired.
Configuration	■ Functions not adapted to local conditions, e.g. parameters for the data interface not set correctly. ■ Device limits not observed, e.g., working distance, aperture angle. ■ Trigger source for trigger not selected correctly.
Operation	■ Trigger control incorrect and/or not suitable for the object. ■ Device faults (hardware/software).

Table 27: Errors and faults

9.2 Detailed fault analysis

9.2.1 LEDs on the device

The conditions that can be read from the LED on the device housing (see "Status indicators and functions", page 13) include:

- Operational readiness (Ready)
- Status of the analysis result (pass or fail)
- Hardware fault
- Firmware download status
- Connection status of the device

The LED display can indicate any errors or faults with this. Further information for this can be found in the system information.

9.2.2 System information

The device outputs faults in different ways. Fault output is staggered and therefore allows for an increasingly detailed level of analysis:

- Communication errors can occur when transmitting data to the device. The device then returns a fault code.
- For faults that occur during reading, the device writes fault codes in the status log (see "Status log", page 71).

9.3 Status log

NOTE
The status log is retained even after switching the sensor off and on again.

The sensor distinguishes between four types of fault:

- Information
- Warning
- error
- Critical fault

The sensor saves only the last five entries for each fault type.

9.4 SICK Support

If the fault cannot be rectified, the device may be defective.

The device must not be repaired by the user. Interrupting or modifying the device will invalidate any warranty claims against SICK AG.

Rapid replacement of a device by the user is, however, possible.

- ▶ Where a fault cannot be rectified, make contact with the SICK Service department. To find your representative, see the final page of this document.

NOTE

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

9.5 Returning devices

- ▶ Do not dispatch devices to the SICK Service department without consultation.

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

10 Decommissioning

10.1 Environmental protection

ATTENTION

Danger to the environment due to improper disposal of the product!

Disposing of the product improperly may cause damage to the environment.

Therefore, take note of the following information:

- Always observe the valid regulations on environmental protection.
- Following correct disassembly, pass on any disassembled components for reuse.
- Separate the recyclable materials by type and place them in recycling containers.

10.2 Disposal

CAUTION

Risk of injury due to hot device surface!

In analysis mode, the surface of the device (particularly at the rear) can reach temperatures of up to 70 °C.

- Before commencing disassembly, switch off the device and allow it to cool down as necessary.

Any device which can no longer be used at the end of the product life cycle must be disposed of in an environmentally friendly manner in accordance with the respective applicable country-specific waste disposal regulations. As they are categorized as electronic waste, the device must never be disposed of with household waste.

11 Technical data

11.1 Optics and Illumination

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xR-MExxxx)
Focus	Manual adjustment of the sharpness and aperture on the optional lens unit	Dynamic and externally triggered electrical focus adjustment for working distance
Illumination for field of view	Optional e.g., variants of the VI83I integrable illumination unit: 11 x LEDs, visible light. White (λ = 6000 ± 500 K) Blue (λ = 455 ± 20 nm) Red (λ = 620 ± 30 nm)	11 x LEDs, visible light. White (λ = 6000 ± 500 K) Blue (λ = 455 ± 20 nm)
Feedback LED (spot in field of view)	Optional e.g., variants of the VI83I integrable illumination unit: 1 x LED, visible light. Green (λ = 525 ± 15 nm)	1 x LED, visible light. Green (λ = 525 ± 15 nm)
LED risk group of illumination unit	"White + Feedback LED" option "Blue – Medium + Feedback LED" option "Blue – Wide + Feedback LED" option • Risk group 1 (low risk) according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09. "Red + Feedback LED" option **Radiance:** L_B: < 10 x 10^3 W/(m^2sr) within 100 s; at a distance of ≥ 200 mm L_R: < 7 x 10^5 W/(m^2sr) within 10 s; at a distance of ≥ 200 mm	"White + Feedback LED" option • Risk group 1 (low risk) according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09. **Radiance:** L_B: < 10 x 10^3 W/(m^2sr) within 100 s; at a distance of ≥ 200 mm L_R: < 7 x 10^5 W/(m^2sr) within 10 s; at a distance of ≥ 200 mm
	"Blue – Narrow + Feedback LED" option • Risk group 2 (moderate risk) according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09 due to exposure to blue light. **Radiance:** L_B: < 10 x 10^3 W/(m^2sr) within 50 s (RG 2); at a distance of ≥ 200 mm L_R: < 7 x 10^5 W/(m^2sr) within 10 s (RG 1); at a distance of ≥ 200 mm Risk RG 1 (low risk) corresponding to L_B < 10 x 10^3 W/(m^2sr) within 100 s for distances > 1 m.	"Blue + Feedback LED" option • Risk group 2 (moderate risk) according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09 due to exposure to blue light. **Radiance:** L_B: < 10 x 10^3 W/(m^2sr) within 50 s (RG 2); at a distance of ≥ 200 mm L_R: < 7 x 10^5 W/(m^2sr) within 10 s (RG 1); at a distance of ≥ 200 mm Risk RG 1 (low risk) corresponding to L_B < 10 x 10^3 W/(m^2sr) within 100 s for distances > 1 m.
Aiming laser (field of view)	Visible light. Red (λ = 630 nm ... 680 nm), can be disengaged	
Laser class	Class 1 according to EN/IEC 60825-1: 2014. Complies with 21 CFR 1040.10 except for tolerances according to Laser Notice 50 from June 24, 2007. Laser class 1M for issue EN/IEC 60825-1:2007. P < 1.40 mW	

11.2 Performance

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xRMExxxx)
Code resolution	≥ 0.1 mm, depending on lens unit	≥ 0.2 mm, depending on distance
Working distance	see "Field of view diagrams", page 22	see "Field of view diagrams", page 22
Lens unit	Application-specific www.sick.com/lector64x www.sick.com/lector65x	see "Type code", page 11
Image sensor resolution	see "Type code", page 11	
Image sensor type	see "Type code", page 11	
Image recording rate	**Lector64x Flex** At 1.7 Mpx: 40 Hz **Lector65x Flex** At 2 Mpx: 70 Hz At 4 Mpx: 40 Hz	At 2 Mpx: 70 Hz At 4 Mpx: 40 Hz
Ambient light tolerance	2,000 lx on code	
Bar code types (1D)	2/5 Interleaved, Codabar, Code 128, Code 32, Code 39, Code 93, GS1 DataBar GS1-128/EAN 128, Pharmacode, UPC/GTIN/EAN	
Postal codes	Postnet, Planet, USPS 4SCB, Australia Post, Post Netherlands, Royal Mail, Post Sweden	
2D code types	Data Matrix ECC200, GS1 Data Matrix, MaxiCode, PDF417, QR code	
Image memory	Internally 512 MB, externally on optional micro SD card (max. 16 GB)	

11.3 Interfaces

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xR-MExxxx)
Serial[1)] RS-232/422/485	Host (300 Bd ... 115.2 kBd), for data output	
Serial RS-232[1)]	Aux (57.6 kBd), for configuration/diagnostics	
USB[1)]	Aux (USB 2.0), for configuration/diagnostics and image transmission	
Ethernet	Aux, Host, image transmission (FTP). 10/100/1000 Mbit/s, TCP/IP, Ethernet/IP. MAC address(es), see type label.	
CAN	20 kbit/s ... 1 Mbit/s Protocol: SICK CAN sensor network	
PROFIBUS[1)]	Optional via external fieldbus module CDF600-21xx	
PROFINET IO[1)]	Optional via external fieldbus module CDF600-2200	
Digital switching inputs[1)]	2 x physical 2 x additional external via optional CMC600 module in connection module CDB650-204 or CDM420-0006 U_e= max. 32 V, I_e= max. 5 mA, opto-decoupled, reverse polarity protected, adjustable debounce time	

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xR-MExxxx)
Digital switching outputs[1)]	4 x physical 2 x additional external via optional CMC600 module in connection module CDB650-204 or CDM420-0006 $U_a = U_V - 1.5$ V, $I_a \leq 100$ mA. Short-circuit protected, temperature protected. Not galvanically isolated from the supply voltage.	

1) Does not apply to system variants of type V2D64xR-MCxxFx, type V2D65xR-MCxxFx and V2D65xR-MExxFx for systems, connection variant 2

11.4 Mechanics and Electronics

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xR-MExxxx)
Optical indicators	10 x RGB LEDs: status indicators 1 x LED: feedback LED, green 10 x RGB LEDs: bar graph, blue	
Acoustic indicators	1 x beeper for signaling events, can be deactivated	
External backup of configuration data	Optional on plug-in micro SD memory card or via optional CMC600 module in connection module CDB650-204 or CDM420-0006.	
Supply voltage	DC 24 V ± 20% SELV (EN 60950-1: 2014-08) and LPS (EN 60950-1: 2014-08) or Class 2 (UL 1310) required	DC 24 V ± 20% SELV (EN 60950-1: 2014-08)
Current consumption	Max. 2.0 A (with switching outputs)	
Power consumption	Typically 20 W (with switching outputs without load)	
Weight	Max. 635 g, without optic kit	Max. 950 g, model-dependent
material Housing	Aluminum die cast	
material Reading window	Glass or plastic (PMMA), 2 mm thick, with scratch-proof coating: see "Type code", page 11	
Electrical protection class	III according to EN 60950-1 or EN 62368-1	
Enclosure rating	According to EN 60529: 2000-09: see "Type code", page 11 Maintaining the enclosure rating, see "Notes on the electrical installation", page 25.	

11.5 Ambient data

Type	Lector64x Flex (V2D64xR-MCxxxx) Lector65x Flex (V2D65xR-MCxxxx)	Lector65x Dynamic Focus (V2D65xRMExxxx)
Vibration resistance Shock resistance	According to EN 60068-2-6: 2008-02 According to EN 60068-2-27: 2009-05	
Ambient temperature	Operation[1)]: 0 °C ... +50 °C Storage –20 °C ... +70 °C	
Permissible relative humidity	0% ... 90%, non-condensing	

1) Notes regarding adequate dissipation of lost heat: see "Mounting requirements", page 18

12 Accessories

12.1 Additional accessories

Accessories such as brackets and cables can be found at www.sick.com.

13 Annex

13.1 Declaration of conformity

The EU declarations of conformity for the code readers Lector64x Flex, Lector65x Flex and Lector65x DynamicFocus can be found online at:

www.sick.com/lector64x

www.sick.com/lector65x

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