

RFU63x, RFU65x

RFID read/write devices (UHF)

SICK
Sensor Intelligence.



Described product

RFU63x-131xx

RFU63x-041xx

RFU65x-101xx

Manufacturer

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Original document

This document is an original document of SICK AG.

Conformities

Due to the country-specific approvals for the devices, the respective conformities are type-dependent. For conformance information on the specific device that you have (type description on the type label), see the online type-specific data sheet at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

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1 About this document

1.1 Information on the operating instructions

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

Prerequisites for safe work are:

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

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



NOTE

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

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

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

1.2 Scope

These operating instructions serve to incorporate the device into a customer system. These operating instructions form part of the documentation provided to users. The operating instructions supplement the Quick Start Guide with more detailed and additional information. A printed copy of the Quick Start Guide for initial commissioning is included with the device and can, if required, be downloaded online at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

The following topics are covered in more detail, or only described in the operating instructions:

- Type code
- Product features and functions (overview)
- Measures and requirements for mounting and electrical installation of the device if the device is operated at ambient temperatures below 0 °C
- Measures to suppress ground potential equalization currents in applications with widely distributed systems
- Supply voltage: Compensating for cable length related voltage drops
- Wiring the individual interfaces of the device
- Electrical wiring plans for the CDB650-204 and CDM420-0006 connection modules when used in conjunction with an RFU63x or RFU65x device
- Function of the additional status indicators
- Overview of operating options and available configuration tools
- Measures for eliminating interference

Instructions are given in stages for all actions required.

These instructions apply to all available device variants of the products. Functions specific to special devices are, where necessary, described in additional documents.

More detailed information for identification of the available device type see "Type code", page 15.



NOTE

The device approval was granted for a specific region. The region assignment cannot be changed. The device must not be operated in a different region! Should the device be passed on to a third party, these operating instructions and the Quick Start Guide should be handed over with it.

The available device variants, and information about the radio equipment approvals are listed on the online product page:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

Commissioning is described using one particular device variant as an example and based on a default configuration of the device parameters. The example is based on a simple application of detecting (reading) a **transponder on an object**.

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**

Further documentation for the device can be found on the online product page at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

The following information is available for download there:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawing, and specification diagrams
 - EU declaration of conformity for the product family
 - Certificates of 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
 - RFU parameter description available in English and German, and in other languages if necessary
 - Other publications related to the devices described here
 - Publications dealing with accessories
-

**NOTE**

In addition to the existing operating instructions, the use of the RFU parameter description is recommended. This document explains the UHF-RFID-specific parameters of all device variants of the RFU6xx product family at the "Service" user level.

The parameter description supports the user in configuring applications with the SOPAS ET configuration software.

1.5 SICK service

If you require any technical information, our SICK Service will be happy to help. To find your agency, see the final page of this document.

**NOTE**

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

2 Safety information

2.1 Intended use

The RFU63x and RFU65x read/write devices are intelligent 4Dpro sensors from the SICK RFU6xx (UHF) product family. Version (working range): Long Range.

These devices are used for the automated, fixed identification of wireless-based data cards (transponders) on moving or stationary objects and for the management of these data cards. The RFU630 and RFU650 base models process all standard passive transponders in accordance with EPCglobal UHF C1G2 and ISO/IEC 18000-6C in the regional UHF carrier frequency range.

Thanks to their intelligent process logic, the devices can be used either as a stand-alone solution or as part of a group in a CAN network. In read mode, the devices transmit the results via a host interface to a higher-level computer (e.g. PLC) for further centralized processing.

RFU63x

- The compact RFU63x-131xx device includes an internal antenna that is integrated into the housing.
- The RFU63x-041xx device variant does not include an internal antenna. At least one external antenna needs to be connected.
- Where complex identification tasks need to be performed, it is possible to connect external antennas to the device:
 - a maximum of 3 antennas on the RFU63x-131xx
 - a maximum of 4 antennas on the RFU63x-041xx

RFU65x

- The compact RFU65x-101xx device includes an internal antenna that is integrated into the housing. Besides detection, the antenna can also recognize the passage and direction of moving transponders.

The devices can be operated within a wide ambient temperature range. For details, [see "Technical data", page 87](#)

The devices are primarily designed for use in industrial and logistics areas. They meet the applicable requirements for industrial robustness, interfaces, and data processing. They can, if necessary, be programmed to implement customer-specific modifications.



NOTE

The USB interface of the device is used in industrial environments only as a service interface for temporary use (e.g. for configuration, troubleshooting). Permanent use in real operation of the system as a host interface is not intended.

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

2.1.1 Operational restrictions



NOTICE **Operational restrictions!**

The frequency band of the device is configured for the specific type and region when delivered. This enables the device to be operated in the respective approved region without interfering with protected frequencies (such as mobile communications).

Operating the device in other regions, however, can interfere with protected frequencies.

- Only use the device in the region for which it has been approved.
- When reselling the device, inform the buyer of the fixed region assignment.
- For further country-specific operating requirements, see the Quick Start Guide, a printed copy of which is enclosed with the device or can be downloaded online (PDF) at:
 - www.sick.com/RFU63x
 - www.sick.com/RFU65x

2.1.2 Regulatory notes

Europe: simplified EU declaration of conformity

RFU63x

SICK AG hereby declares that the RFU63x-131xx and RFU63x-041xx radio equipment comply with the 2014/53/EU directive. The complete text of the EU declaration of conformity is available at the following web address:

- www.sick.com/RFU63x

RFU65x

SICK AG hereby declares that the RFU65x-101xx radio equipment complies with the 2014/53/EU directive. The complete text of the EU declaration of conformity is available at the following web address:

- www.sick.com/RFU65x

2.2 Improper use

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

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



WARNING **Danger due to improper use!**

Any improper use can result in dangerous situations.

Therefore, observe the following information:

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

2.3 Internet protocol (IP) technology

**NOTE**

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

SICK always assumes the following prerequisites:

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

2.4 Limitation of liability

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

- Failing to observe the operating instructions
- Incorrect use
- Use of untrained staff
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, consumables, and accessories

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

**NOTE**

The product is a programmable device. The respective programmer is therefore responsible for his/her programming work and the resultant operation of the device. The liability and warranty of SICK AG is limited to the device specification (hardware functionality and any programming interfaces) according to the agreed conditions. SICK AG will therefore not be liable, among other things, for any damages resulting from the programming of the product by the customer or third parties.

2.5 Modifications and conversions

**NOTICE**

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

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

2.5.1 Exception: temporarily opening the cover on the device



NOTICE

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

In open state, the device does not conform to a specified enclosure rating. The device must be protected appropriately against moisture and dust.

- ▶ Operate the device only for a short time without closed cover.



NOTE

The USB interface of the device is used in industrial environments only as a service interface for temporary use (e.g. for configuration, troubleshooting). Permanent use in real operation of the system as a host interface is not intended.

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

2.5.2 Conditions for specified enclosure rating

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

- The side cover for the USB interface and the microSD card slot must be screwed tight to the device. Recommended tightening torque for the cover screws: 40 Ncm \pm 5 Nm.
- The cables plugged into the electrical M12 connections must be screwed tight.
- Any electrical M12 connections that are not being used must be sealed with protective plugs or caps, depending on type. These plugs or caps must be screwed tight (as delivered).
- RFU63x: Any electrical connections for external antennas (TNC reverse) that are not being used must be fitted with screw-on protective caps (as supplied).
- The same also applies to the EMC requirement (ESD) according to CE.



NOTICE

The device can, if necessary, be operated for a short time **without the side cover** to perform the following tasks:

- Inserting or removing the optional memory card
- Temporary use of the USB interface as a servicing interface

During this time, protect the device against moisture and dust.

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:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"> ■ Basic practical technical training ■ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	<ul style="list-style-type: none"> ■ Practical electrical training ■ Knowledge of current electrical safety regulations ■ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	<ul style="list-style-type: none"> ■ Basic knowledge of the 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 RFID technology (identification with radio-based data cards)
Operation of the device for the particular application	<ul style="list-style-type: none"> ■ Knowledge of the operation and control of the devices in their particular application ■ Knowledge of the software and hardware environment for the particular application

2.7 Operational safety and particular 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.



WARNING **Electrical voltage!**

Electrical voltage can cause severe injury or death.

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

**WARNING****Dangerous equipotential bonding currents!**

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

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

RFU63x-131xx (with internal antenna):**WARNING****High-frequency electromagnetic radiation!**

High-frequency electromagnetic radiation poses a potential health risk.

The **RFU63x-13100**¹⁾ device is designed for operation according to ETSI EN 302208. When operating with an internal antenna and/or external **RFA630-x00**²⁾ antennas, the human exposure regulations covered by EN 50364 must be observed.

- In order to limit human exposure to electromagnetic fields, suitable safety distances must be maintained during both short-term and long-term work in the radiation range of the antennae.
Minimum distances to be maintained between the antenna and the human body during long-term transmission:
30 cm at max. antenna radiation power of 2 W ERP as per ETSI
15 cm at reduced radiation power of 1 W ERP
10 cm at radiation power of 0.5 W ERP

The **RFU63x-13101**³⁾ device satisfies the limit values of the FCC for exposure to radiation in an uncontrolled environment.

- During operation with the integrated antenna and/or the external **RFA630-x01**⁴⁾ antennas, a safety distance of at least 30 cm must be maintained between the antenna and the human body.

RFU63x-041xx (without internal antenna):

1) For regional assignment, see type-specific online data sheet in the Internet at: www.sick.com/RFU63x
 2) For regional assignment, see the online data sheet in the Internet at: www.sick.com/RFU63x
 3) For regional assignment, see the type-specific online data sheet in the Internet at: www.sick.com/RFU63x



WARNING

High-frequency electromagnetic radiation!

High-frequency electromagnetic radiation poses a potential health risk.

The **RFU63x-04100**¹⁾ device is designed for operation according to ETSI EN 302208. When operating with external **RFA630-x00**²⁾ antennas, the human exposure regulations covered by EN 50364 must be observed.

- In order to limit human exposure to electromagnetic fields, suitable safety distances must be maintained during both short-term and long-term work in the radiation range of the antennae.
Minimum distances to be maintained between the antenna and the human body during long-term transmission:
30 cm at max. antenna radiation power of 2 W ERP as per ETSI
15 cm at reduced radiation power of 1 W ERP
10 cm at radiation power of 0.5 W ERP

The device **RFU63x-04101**³⁾ satisfies the limit values of the FCC for exposure to radiation in an uncontrolled environment.

- During operation with the external antennas **RFA630-x01**⁴⁾, a safety distance of at least 30 cm must be maintained between the antenna and the human body.

RFU65x-101xx (with internal antenna):



WARNING

High-frequency electromagnetic radiation!

High-frequency electromagnetic radiation poses a potential health risk.

The **RFU65x-10100**⁵⁾ device is designed for operation according to ETSI EN 302208. During operation, the human exposure regulations covered by EN 50364 must be observed.

- In order to limit human exposure to electromagnetic fields, suitable safety distances must be maintained during both short-term and long-term work in the radiation range of the internal antenna.
Minimum distances to be maintained between the antenna and the human body during long-term transmission:
30 cm at max. antenna radiation power of 2 W ERP as per ETSI,
15 cm at reduced radiation power of 1 W ERP,
10 cm at radiation power of 0.5 W ERP.

The **RFU65x-10101**⁵⁾ device satisfies the limit values of the FCC for exposure to radiation in an uncontrolled environment.

- During operation, a safety distance of at least 30 cm must be maintained between the antenna and the human body.

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.

1) For regional assignment, see type-specific online data sheet in the Internet at: www.sick.com/RFU63x
2) For regional assignment, see online data sheet in the Internet at: www.sick.com/RFU63x
3) For regional assignment, see type-specific online data sheet on the Internet at: www.sick.com/RFU63x
4) For regional assignment, see the online data sheet on the Internet at: www.sick.com/RFU63x
5) For regional assignment, see type-specific online data sheet in the Internet at: www.sick.com/RFU65x

3 Product description

3.1 Product ID

3.1.1 Type label

The type label gives information for identification of the device.

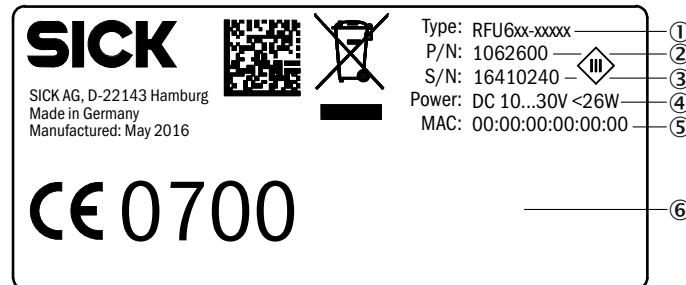


Figure 1: Structure of the type label

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

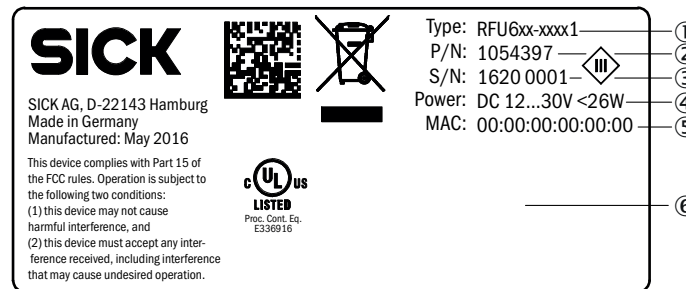


Figure 2: Structure of the type label with UL symbol

- ① Type designation
- ② Part number
- ③ Serial number
- ④ Supply voltage and power consumption
- ⑤ MAC address (placeholder)
- ⑥ Approval-related details (region-specific)

3.1.2 Type code

The devices of the RFU6xx product family are arranged according to the following type code:

RFUxyz-abcde

R	F	U	x	y	z	-	a	b	c	d	e
1	2	3	4	5	6		7	8	9	10	11

Position	Description	Characteristic
1 ... 2	RF (Radio Frequency Identification)	-
3	Frequency band	U: Ultra High Frequency
4 ... 5	Product family/version (working range)	62: ≤2 m (Mid Range) 63: ≤10 m (Long Range) 65: ≤10 m (Long Range)

Position	Description	Characteristic
6	Device type	0: Base type (EPCglobal UHF Class 1 Generation 2, ISO/IEC 18000-6C)
7	Internal antenna	0: No internal antenna 1: With internal antenna, circularly polarized
8	Connections for external antennas	0: No connection 3: Three connections 4: Four connections
9	Electrical connections	1: 1 x male connector, M12, 17-pin, A-coded; 1 x female connector, M12, 4-pin, D-coded 4: Cable with male connector, D-Sub-HD, 15-pin 5: 1 x female connector, M12, 8-pin, X-coded
10 ... 11	Country-specific radio equipment approval	00: Europe ... Type-dependent, see type-specific online data sheet at: <ul style="list-style-type: none"> • www.sick.com/RFU63x • www.sick.com/RFU65x



NOTE

Not all combinations are possible according to the type code. The available device variants can be found online at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

3.1.2.1 Device variants

RFU63x

The RFU63x product family consists of 2 variant lines:

- RFU63x-**131**xx (variant with internal antenna)
- RFU63x-**041**xx (variant without internal antenna)

The variant lines differ with respect to the following features:

Table 2: Differences between the variant lines

Feature	RFU63x-131xx	RFU63x-041xx
Internal antenna	Yes	No
Number of connections for external antennas	3 x female connector, TNC reverse	4 x female connector, TNC reverse
Housing dimensions	238.6 mm x 238.6 mm x 64.3 mm	239 mm x 197 mm x 40.1 mm

Within the same variant line, the device types differ with respect to the following region-related, non-modifiable features:

- Radio equipment approval
- Carrier frequency range
- Maximum transmitting power of the internal antenna (RFU63x-131xx only) and the external antennas

RFU65x

The RFU65x product family consists of one variant line:

- RFU65x-101xx (device with internal antenna)

It is not possible to connect an external antenna.

The device types differ with respect to the following region-related, non-modifiable features:

- Radio equipment approval
- Carrier frequency range
- Maximum transmitting power of the internal antenna

3.2 Product characteristics

3.2.1 Device view

RFU63x-131xx

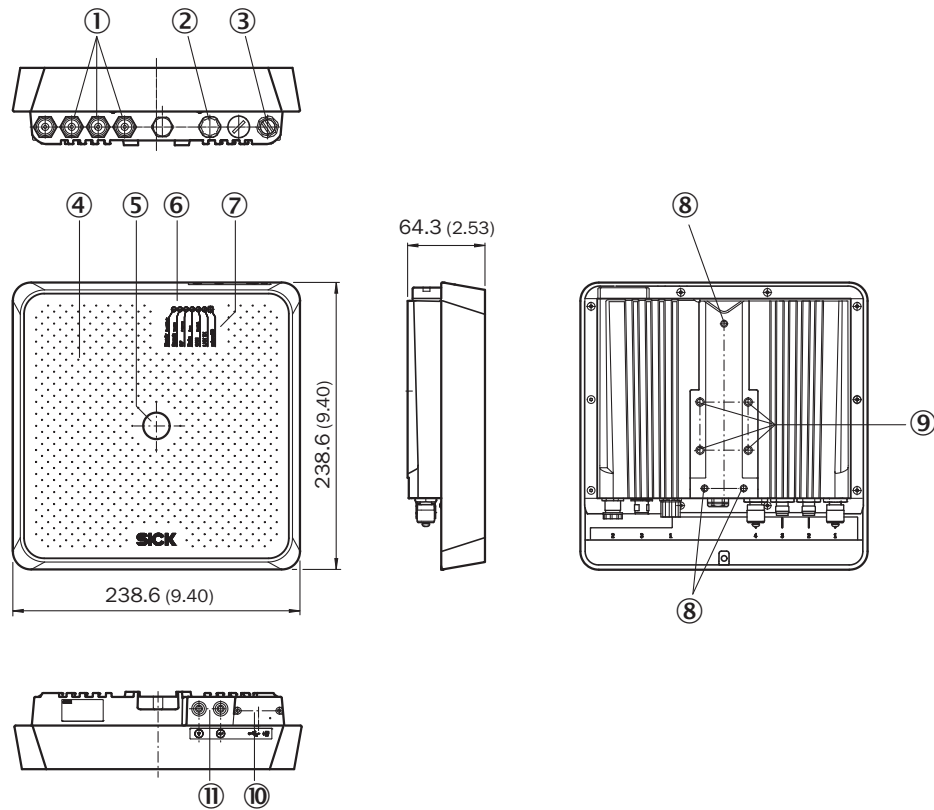


Figure 3: RFU630-131xx (with internal antenna): design and device dimensions, all dimensions in mm or inch

- ① 3 x “external” antennae connection (female connector, TNC reverse)
- ② “Power/Serial Data/CAN/I/O” connection (male connector, M12, 17-pin, A-coded)
- ③ “Ethernet” connection (female connector, M12, 4-pin, D-coded)
- ④ Cover with internal antenna
- ⑤ 1 x LED, multi-colored (process feedback)
- ⑥ 7 x LED, multi-colored (status indicator)
- ⑦ Acoustic opening of the beeper, under a cover film
- ⑧ 3 x M5 blind tapped hole, 8 mm deep, for mounting the device
- ⑨ 4 x M6 blind tapped hole, 11 mm deep, for alternative mounting of the device
- ⑩ “USB” connection (female connector, 5-pin, type Micro-B) and slot for microSD memory card, behind screw-mounted cover. USB interface as a temporary servicing interface only.
- ⑪ 2 x function buttons (Step ▼ and Enter ◀)

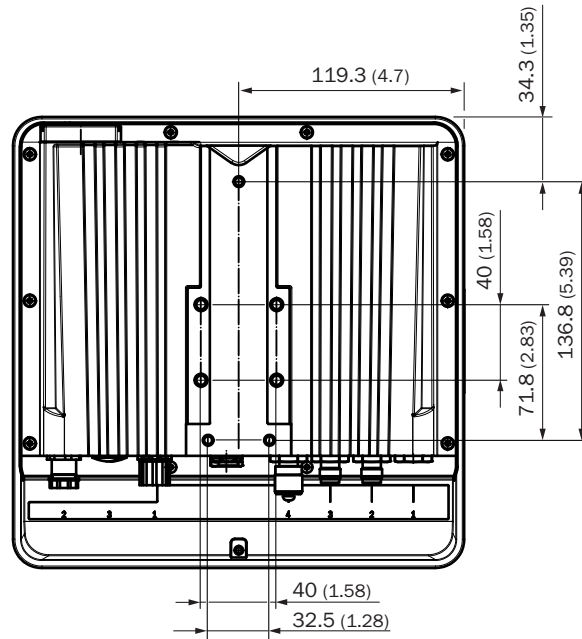


Figure 4: RFU630-131xx: dimensioning of the fastening threads, all dimensions in mm or inch

RFU63x-041xx

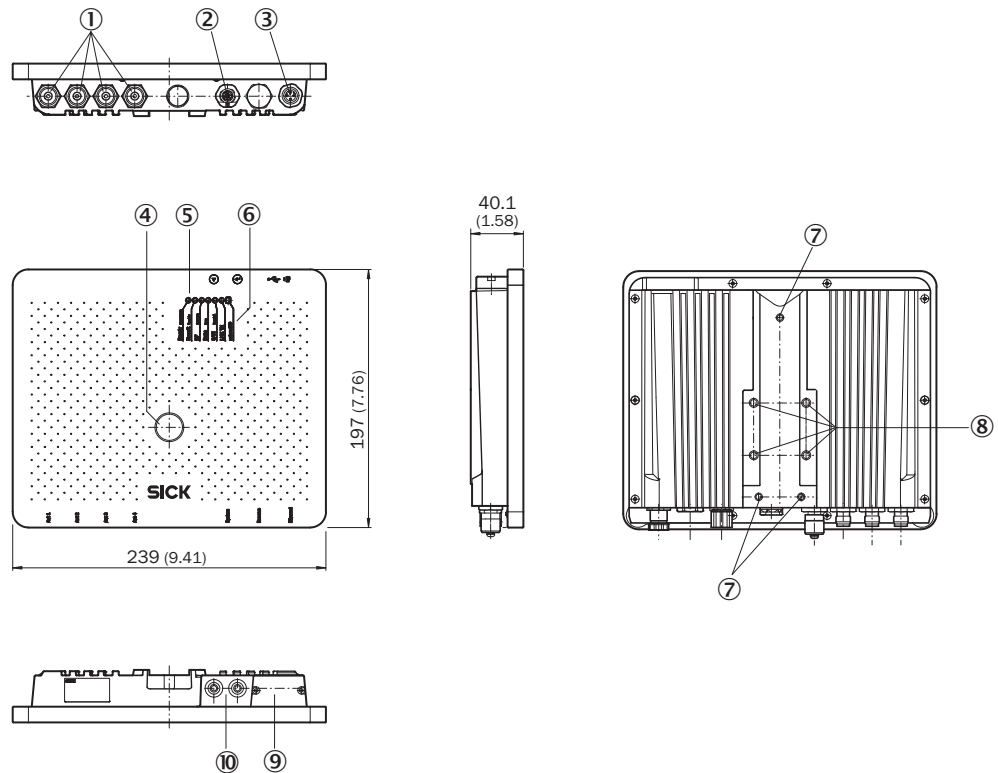


Figure 5: RFU630-041xx (without internal antenna): design and device dimensions, all dimensions in mm or inch

- ① 4 x “external” antenna connections (female connector, TNC reverse)
- ② “Power/Serial Data/CAN/I/O” connection (male connector, M12, 17-pin, A-coded)
- ③ “Ethernet” connection (female connector, M12, 4-pin, D-coded)
- ④ 1 x LED, multi-colored (process feedback)
- ⑤ 7 x LED, multi-colored (status indicator)

- ⑥ Acoustic opening of the beeper, under a cover film
- ⑦ 3 x M5 blind tapped hole, 8 mm deep, for mounting the device
- ⑧ 4 x M6 blind tapped hole, 11 mm deep, for alternative mounting of the device
- ⑨ “USB” connection (female connector, 5-pin, type Micro-B) and slot for microSD memory card, behind screw-mounted cover. USB interface only for temporary use (servicing).
- ⑩ 2 x function buttons (Step ▼ and Enter ◀)

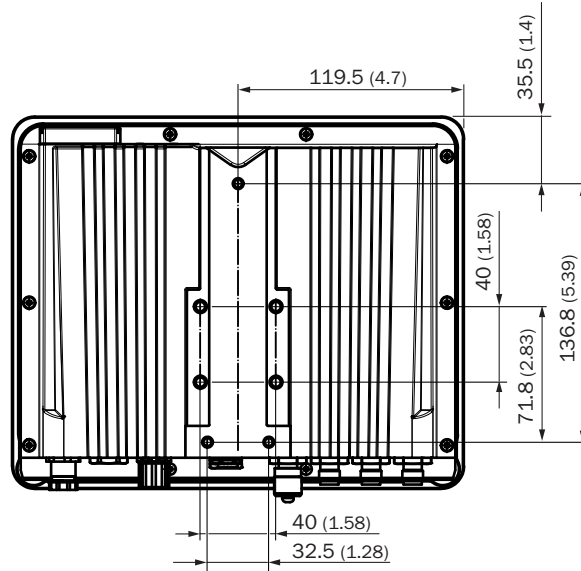


Figure 6: RFU630-041xx: dimensioning of the fastening threads, all dimensions in mm or inch

RFU65x

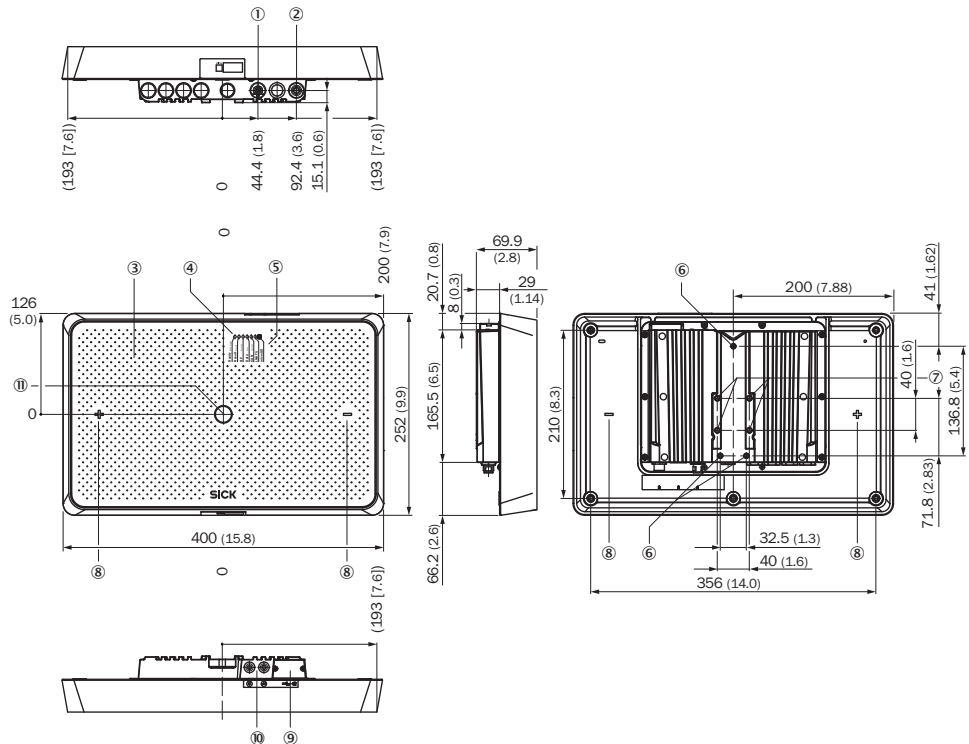


Figure 7: RFU650: design and device dimensions, all dimensions in mm or inch

- ① “Power/Serial Data/CAN/I/O” connection (male connector, M12, 17-pin, A-coded)
- ② “Ethernet” connection (female connector, M12, 4-pin, D-coded)

- ③ Cover with internal antenna
- ④ 7 x LED, multi-colored (status indicator)
- ⑤ Acoustic opening of the beeper, under a cover film
- ⑥ 3 x M5 blind tapped hole, 8 mm deep, for mounting the device
- ⑦ 4 x M6 blind tapped hole, 11 mm deep, for alternative mounting of the device
- ⑧ Range definition for angle measurement of the transponders within this working range
- ⑨ “USB” connection (female connector, 5-pin, type Micro-B) and slot for microSD memory card, behind screw-mounted cover. USB interface only for temporary use (servicing).
- ⑩ 2 x function buttons (Step ▼ and Enter ◀)
- ⑪ 1 x LED, multi-colored (process feedback)

3.2.2 Working range of the antenna (sensing range of the reading and writing field)

The UHF field is influenced by its environment, making it impossible to provide a “clear” demarcation of the sensin range:

- Application-specific reflections can result in both overreaches and “holes” (destructive interferences).
- Other factors that can significantly impact the sensing range include:
 - Quality of the transponder (antenna gain, the integrated transponder IC and related sensitivity, reflected energy)
 - Material of the carrier object (plastic, wood, metal)
 - Objects between the device and transponder that can affect the UHF field (items, liquids, people)

In addition to the read results, the RFU device can also output diagnostic data that provide an indication of the write and read quality. This data can be used to achieve optimum read results when setting up the system.

RFU63x

RFU63x-131xx (with internal antenna)

The radiation pattern shown here for the device’s antenna was obtained in a reproducible environment (absorber chamber as a reflection-free space) for illustrative purposes. It may therefore only have limited applicability to your specific application. The diagram shows how the UHF field propagates in a reflection-free space, but cannot be used to draw any conclusions on the likely sensing range in a real on-site application.

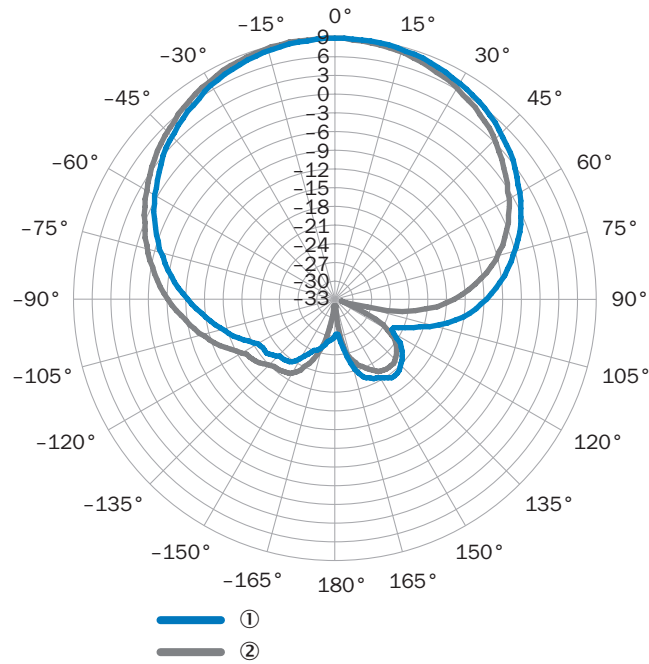


Figure 8: Radiation pattern of the internal antenna of the RFU630-13 xxx (typical): Measured antenna gain in dBic at 866.5 MHz, RHCP (right-hand circularly polarized)

- ① Tilt level (horizontal)
- ② Evaluation level (vertical)

RFU63x-041xx (without internal antenna)

External RFA630-x00 antenna

The radiation pattern shown here for the external RFA630-x00 UHF antenna ⁶⁾ was obtained in a reproducible environment (absorber chamber as a reflection-free space) for illustrative purposes. It may therefore only have limited applicability to your specific application. The diagram shows how the UHF field propagates in a reflection-free space, but cannot be used to draw any conclusions on the likely sensing range in a real on-site application.

6) For region assignment information, see the online data sheet at: www.sick.com/RFU63x

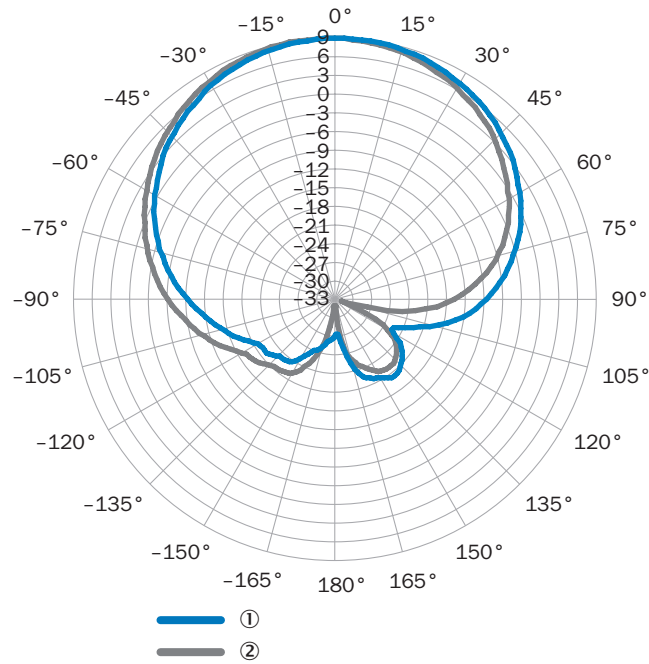


Figure 9: Radiation pattern of the RFA630-x00 external UHF antenna (typical): Measured antenna gain in dBic at 866.5 MHz, RHCP (right-hand circularly polarized)

- ① Azimuth plane (horizontal)
- ② Elevation plane (vertical)

RFU65x

The radiation pattern shown here for the device's antenna was obtained in a reproducible environment (absorber chamber as a reflection-free space) for illustrative purposes. It may therefore only have limited applicability to your specific application. The diagram shows how the UHF field propagates in a reflection-free space, but cannot be used to draw any conclusions on the likely sensing range in a real on-site application.

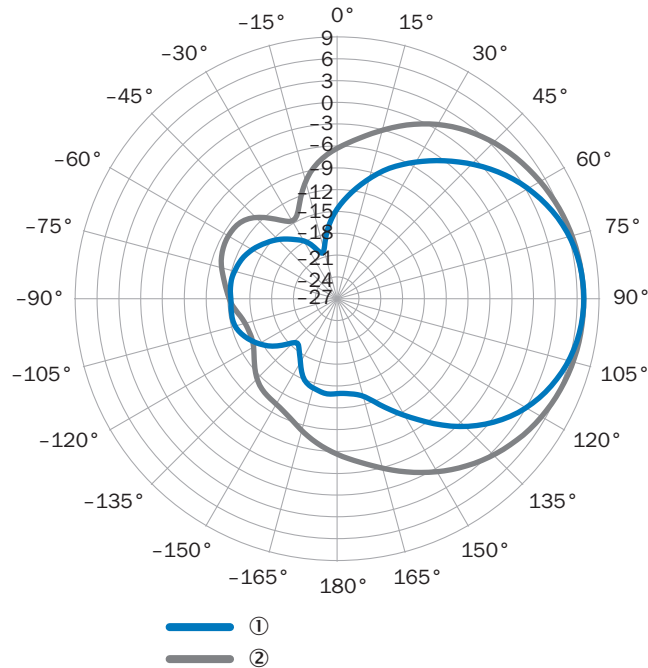


Figure 10: Radiation pattern of the internal antenna of the RFU650 (typical): Measured antenna gain in dBic at 866.5 MHz, RHCP (right-hand circularly polarized)

- ① Azimuth plane (horizontal)
- ② Elevation plane (vertical)

3.2.3 Scope of delivery

RFU63x

The delivery of the device includes the following components:

Table 3: RFU63x: scope of delivery

No. of units	Component	Notes
1	Device in the version ordered (variant line and region assignment)	M12 electrical connections fitted with screw-on protective caps or protective plugs. Antenna connections fitted with screw-on protective caps. Without connecting cables and brackets.
	Printed Quick Start Guide, the number of language versions depends on the country	All available language versions of the Quick Start Guide can also be found online as PDFs at: <ul style="list-style-type: none"> • www.sick.com/RFU63x



NOTE

The RFU63x-041xx does not have any internal antennae and requires at least one external antenna for operation. External antennas are not included in the scope of delivery.

RFU65x

The delivery of the device includes the following components:

Table 4: RFU65x: scope of delivery

No. of units	Component	Notes
1	Device in the version ordered (region assignment)	M12 electrical connections fitted with screw-on protective caps or protective plugs. Without connecting cables and brackets.
	Printed Quick Start Guide, the number of language versions depends on the country	All available language versions of the Quick Start Guide can also be found online as PDFs at: <ul style="list-style-type: none"> • www.sick.com/RFU65x

RFU63x/RFU65x

Associated components not contained in the delivery:

Table 5: RFU63x/RFU65x: other components

Component	Notes
SOPAS ET configuration software and device description file (*.sdd-file) for the RFU63x or RFU65x	Available online at: <ul style="list-style-type: none"> • www.sick.com/SOPAS_ET
RFU63x/RFU65x operating instructions in PDF format and in English and German. Other languages also available online where applicable.	Available online at: <ul style="list-style-type: none"> • www.sick.com/RFU63x • www.sick.com/RFU65x

Accessories

The following accessories for constructing a complete RFID read/write station are not included in the scope of delivery. They must be ordered separately as required:

- External antenna(s) with suitable brackets and connecting cables (required depending on the device type)
- Read cycle trigger sensor, e.g. photoelectric retro-reflective sensor for object-specific triggering
- CDB or CDM connection module or CDF fieldbus module
- Suitable number of transponders depending on the application

3.2.4 Product features and functions (overview)



NOTE

In addition to the existing operating instructions, the use of the RFU parameter description is recommended. This document explains the UHF-RFID-specific parameters of all device variants of the RFU6xx product family at the "Service" user level.

The parameter description supports the user in configuring applications with the SOPAS ET configuration software.

The parameter description is available in English (part no. 8023085) and German (part no. 8023084) as well as other languages if required.

The RFU parameter description can be found on the online product page at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

Table 6: Overview of product features and functions of the device

Product feature/function	Characteristic
Security and ease of use	<ul style="list-style-type: none"> • Rugged, compact metal housing, CE marking (Europe) • Automatic self-test at system start • Diagnostic tools for device setup and (remote) device monitoring • Configurable output of the read results including read diagnostics data in two output formats • Operating data polling and, in the event of an error, output of codified error messages on request • Activatable test string function (heartbeat) to signal that the device is ready for operation • Future-proof due to firmware update via data interface • Future-proof SOPAS ET configuration software with password-protected configuration mode • SICK AppSpace ready: The device already includes sensor apps for integrating it into existing communication networks • Low power consumption • Wide supply voltage range • Large ambient temperature range. For details, see "Technical data", page 87 • Parameter cloning (to back up the configuration data in the internal device memory): <ul style="list-style-type: none"> ◦ Externally by inserting a microSD memory card ¹⁾ into the device ◦ Externally via the CMC600 parameter cloning module¹⁾ in the CDB ¹⁾ or CDM ¹⁾ connection module
Convenient operation/configuration	<ul style="list-style-type: none"> • Configuration (online/offline) using the SOPAS ET configuration software • Single Tag ID Wizard (assistant) to help with initial configuration • Configuration and starting of device functions via a web server or command strings • Optional function blocks for easier integration into PLC programs • PROFINET single port : Configuration via GSD parameterization • Application-specific programming using the SICK AppStudio development environment. Further information on this is available online at: www.sick.com/SICK_AppStudio • Status and process feedback indicators via LEDs • Two buttons on the device for executing preset functions without connecting a PC • Deactivatable beeper for confirming device functioning
Reading Operation Mode	<ul style="list-style-type: none"> • Start/stop operation: For reading one or more transponders during a read cycle.
Read cycle	<ul style="list-style-type: none"> • Read cycle start condition is configurable in the object trigger control settings: switching inputs etc. • Read cycle stop condition is configurable in the object trigger control settings: switching inputs etc.
Radio interface(s)	<ul style="list-style-type: none"> • RFU63x-131xx: Internal antenna, up to 3 additional external antennas can be connected • RFU63x-041xx: No internal antenna, up to 4 external antennas can be connected • RFU65x: Internal antenna

Product feature/function	Characteristic
Transponder Processing	<ul style="list-style-type: none"> • Base model RFU630/RFU650 supports all standard passive transponders that are compatible with EPCglobal UHF Class 1 Generation 2 or ISO/IEC-18000-6C • Reading, writing, and multiple overwriting of the data on the transponders, depending on the application • The data-supplying device is a component of a system for complete visualization of the data within the process chain
Transponder Management	<ul style="list-style-type: none"> • Decoding of the Ull in HEX, BIN and ASCII. Supports GS1 TDS and other industry-specific standards such as VDA55xx. • RFU65x: Additional recognition of the passage and direction of moving transponders
Data processing	<ul style="list-style-type: none"> • Variable read data output based on event-dependent evaluation conditions • Influencing the output string by filtering and output sorting • Implementation of application-specific data output protocols using the SICK AppStudio development environment (flexible back-end integration)
Data communication	<ul style="list-style-type: none"> • Host interface: two configurable data output formats. Switchable to different physical or logical interfaces. Parallel operation possible. For outputting data to a further-processing computer. • Aux interface: fixed data output format. Switchable to different physical or logical interfaces. For device configuration and diagnostics as well as transponder access.
Electrical Interfaces	<ul style="list-style-type: none"> • Host interface <ul style="list-style-type: none"> ◦ RS-232, RS-422/485 (configurable data format and protocol), CAN ◦ Ethernet (supported protocols include, amongst others, PROFINET single port) • Aux interface <ul style="list-style-type: none"> ◦ RS-232 (fixed data format, data transmission rate and protocol). ◦ Ethernet, USB ²⁾ • CAN interface for integrating the device into the SICK-specific CAN-SENSOR network. • 2 digital switching inputs • 2 digital switching outputs • Expandable with 2 software-controlled digital switching inputs and outputs respectively via the CMC600 parameter cloning module¹⁾ in the CDB ¹⁾ or CDM ¹⁾ connection module
Connectivity (Design)	<ul style="list-style-type: none"> • RFU63x-131xx: 2 x M12-male circular connector, 3 x TNC, 1 x USB (type Micro-B) • RFU63x-041xx: 2 x M12-male circular connector, 4 x TNC, 1 x USB (type Micro-B) • RFU65x-101xx: 2 x M12-male circular connector, 1 x USB (type Micro-B)

1) Optional accessories.

2) Interface for temporary use only as a servicing interface.

3.2.5 Memory card



NOTE

The memory card is an optional accessory and is not included in the scope of delivery.

Functions

The device can execute the following functions on the plug-in microSD memory card:

- **Saving the parameter set (cloning function)**
Semi-automatic, additional storage of the internal parameter set (device configuration data) on an external memory medium. This takes place in the framework of the recommended backup concept for the 4Dpro device parameter sets.
 - This function is initiated by using the “permanent” option to save the internal parameter set, e.g. via the SOPAS ET configuration software.
 - The function is used, among other things, to conveniently transfer the parameter set to a replacement device of the same type in the event of a fault.
 - Optional external media include a microSD memory card that can be inserted into the device, or the CMC600 parameter storage module in the CDB or CDM connection module.
- **Recording of diagnostic read data**
Continuous recording of diagnostic read data after the first manual start, e.g., via SOPAS ET. Recording is resumed after a device restart if the function has been permanently set.
- Other functions on request.

We recommend using an empty memory card when storing a parameter set for the first time (if necessary, use a PC and card reader to check and delete the contents of the card).



NOTE

Only use types approved by SICK to ensure reliable function of the memory card. You can find these as accessories online at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

The memory cards have no write protection that can be activated.

Indication of operational readiness

The “microSD” optical indicator shows the status of the memory card after installation in the device. It lights up in different colors according to the status, [see "Optical status indicators on the display panel", page 76](#).



NOTICE

Possible data loss!

When the indicator is green (operational), this does not mean that the device is actually accessing the memory card for reading or writing.

- ▶ Do not remove the memory card or switch off the supply voltage while the device is performing the following actions via the SOPAS ET configuration software:
 - Changing the parameter values by saving using the “permanent” option.
 - Starting functions that access the memory card (e.g. concurrent logging of data)

Inserting the memory card in the device:



NOTICE

Risk of damage to the memory card!

- ▶ To safely install the memory card, make sure there is no power to the device before you insert it.

Ensure the IP67 enclosure rating of the device is maintained, [see "Conditions for specified enclosure rating", page 11](#).

The card slot on the device is located on the side behind the aluminum cover.

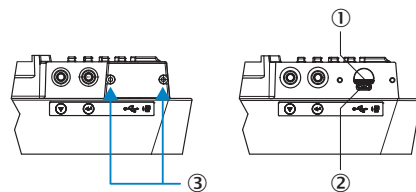


Figure 11: USB connection and slot for microSD memory card

- ① Slot for microSD memory card
- ② USB port (female connector, Micro-B, 5-pin)
- ③ 2 x screw, (Allen screw, A/F 2 mm)

1. Switch off the supply voltage to the device.
2. To remove the cover, unscrew both Allen screws.
3. Making sure it is in the correct position, insert the memory card into the slot until it locks into place. When doing so, orient the contacts so that they are facing towards the device and downwards as per the symbol on the device.
4. Screw the cover back on. Recommended tightening torque for the cover screws: $40 \text{ Ncm} \pm 5 \text{ Ncm}$.
5. Switch on the supply voltage for the device.

Interpretation of the stored parameter set

The device automatically detects that a memory card has been inserted and, depending on the card's content, behaves as follows:

- If the card is empty or if it contains a parameter set that cannot be interpreted by the device, the device saves its currently valid internal parameter set to the card (provided there is sufficient storage space) and starts with the internal parameter set.
- If the card contains a parameter set that can be interpreted by the device, the device overwrites the currently valid, permanently saved internal parameter set with this external parameter set.
- The goal is for the internal parameter set and the parameter set saved externally to always be identical.

Removing the memory card from the device:



NOTICE

Risk of damage to the memory card!

- ▶ To safely remove the memory card while the device is in operation:
 - In SOPAS ET, execute the **Remove SD card** command under **Analysis/SD card** and wait for SOPAS ET to provide confirmation.
 - If this command is not accessible, the memory card can also be removed when there is no power to the device.

4 Transport and storage

4.1 Transport

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



NOTICE

Damage to the product due to improper transport.

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

4.2 Unpacking

- Before unpacking, it may be necessary to equalize the temperature to protect the device from condensation.
- Handle the device with care and protect it from mechanical damage.
- Remove the protective caps or protective plugs on the electrical connections immediately before connecting the connecting cable to prevent dirt and moisture from entering.

4.3 Transport inspection

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

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



NOTE

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

4.4 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Electrical connections are provided with protective caps and plugs (as they are on delivery).
- 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 87.

- Relative humidity: [see "Technical data", page 87.](#)
- 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

RFU63x-131xx (with internal antenna):

The procedure for mounting the device and, if applicable, external antennas is divided into the following steps:

1. Select a suitable mounting location for the device and, if applicable, external antennas.
The mounting location and position depend on the following factors:
 - Identification task
 - Working range of the device (see "[Working range of the antenna \(sensing range of the reading and writing field\)](#)", page 20) and, if applicable, external antennas
 - Transponder used
 - Environmental influences
2. Mount the device at the intended reading location and at a suitable distance from the object with the transponder, then approximately align the device with the object.
3. If applicable, mount the additional external antenna(s) as required for the identification task and approximately align them also with the object.
4. If required, mount the trigger sensor for object-specific triggering.

After the electrical installation is complete and while adjusting the device parameters to suit the application:

5. **Finely** align the device and external antennas to the object and adjust them.
6. Test for successful reading and writing in actual operation.

RFU63x-041xx (without internal antenna):

The procedure for mounting the device and external antennas is divided into the following steps:

1. Select a suitable mounting location for the device and external antennas.
The mounting location and position depend on the following factors:
 - Identification task
 - Working range of the device (see "[Working range of the antenna \(sensing range of the reading and writing field\)](#)", page 20) and external antennas
 - Transponder used
 - Environmental influences
2. Depending on the selected cable lengths for the external antennas, mount the device in the vicinity of the intended reading location.
3. Mount the additional external antenna(s) as required for the identification task and approximately align them with the object with the transponder.
4. If required, mount the read-cycle sensor for object-specific triggering.

After the electrical installation is complete and while adjusting the device parameters to suit the application:

5. **Finely** align the external antennas to the object and adjust them.
6. Test for successful reading and writing in actual operation.

RFU65x:

The procedure for mounting the device is divided into the following steps:

1. Select a suitable mounting location for the device.
The mounting location and position depend on the following factors:
 - Identification task
 - Working range of the device (see "[Working range of the antenna \(sensing range of the reading and writing field\)](#)", page 20)
 - Transponder used
 - Environmental influences
2. Mount the device at the intended reading location and at a suitable distance from the object with the transponder, then approximately align the device with the object.
3. If required, mount the read-cycle sensor for object-specific triggering.

After the electrical installation is complete and while adjusting the device parameters to suit the application:

4. **Finely** align the device to the object and adjust it.
5. Test for successful reading and writing in actual operation.

5.2 Preparation for mounting

5.2.1 Installation requirements

Space requirements

- For the typical space requirements, see the:
 - RFU63x: Type-specific dimensional drawing for the device variant see "[Device view](#)", page 17 and sensing range of the antenna(s) see "[Working range of the antenna \(sensing range of the reading and writing field\)](#)", page 20.
 - RFU65x: Dimensional drawing for the device see "[Device view](#)", page 17 and sensing range of the internal antenna see "[Working range of the antenna \(sensing range of the reading and writing field\)](#)", page 20.

The device and antennas do not require any physical or visual contact with the transponders. They do, however, need to be aligned with the reading space.

Environmental influences

- Comply with technical data, such as the permitted ambient conditions for operation (e.g. approved region, ambient temperature range, ground potential),
- To prevent condensation, avoid exposing the device and external antennas to rapid changes in temperature.
- To prevent additional external heating of the device, protect the device against direct sunlight.
- For outdoor applications, use suitable weather protection to protect the device from additional heating by direct sunlight.
Suitable weather hoods can be found online at:
 - www.sick.com/RFU63x
 - www.sick.com/RFU65x
- To avoid reflection of the UHF waves and the resultant possibility of overreaches or "holes" (destructive interferences) in the UHF field, try to ensure that there are no metal surfaces located to the side of the device and external antennas in the direction of the transponder.
- To avoid damping of the UHF field due to absorption, do not allow any electrically conductive material such as liquids (water) or persons to come between the device/external antennas and the transponder.

Mounting

- The device must be mounted using all of the blind tapped holes of the selected thread size provided.
- Mount the device in a shock and vibration insulated manner.

5.2.2 Instructions for mounting the device when the ambient temperature can fall below 0 °C



NOTE

For the electrical installation procedure, see ["Instructions for electrical installation when the ambient temperature can fall below 0 °C"](#), page 54

All device variants can also be operated at low ambient temperatures. For details, see ["Technical data"](#), page 87



NOTICE

Operating the device at the lower limit of the permissible ambient temperature range

To ensure the device can produce the required heating power, do not expose the device to strong air flows (e.g. from a ventilation system).

- ▶ If necessary, take appropriate measures to shield the device from air flows.



NOTICE

If the ambient temperature is below 0 °C, please note:

- **Do not** move the connecting cables to the device and optional CDB or CDM connection module or CDF600 fieldbus module
- **Do not** operate the configuration switch on the optional connection module or fieldbus module

5.2.3 Auxiliary equipment required

- Mounting device (bracket) with sufficient load-bearing capacity, see ["Technical data"](#), page 87 and suitable dimensions see ["Device view"](#), page 17.
- 3 x M5 or 4 x M6 screws for mounting the device.



NOTE

The screws are for mounting the device on mounting equipment (bracket) supplied by the user. The screw length required depends on the mounting base (wall thickness of the bracket).

When using an optional SICK bracket, the screws for mounting the device on the bracket are included in the scope of delivery of the bracket.



NOTICE

Risk of damage to the device!

- M5 blind tapped holes: Do not exceed the maximum screw-in depth of 8 mm!
 - M6 blind tapped holes: Do not exceed the maximum screw-in depth of 11 mm!
- Tool and tape measure

5.2.4 Mounting device

Optional SICK brackets

The device is mounted with the help of a minimum of three blind tapped holes, depending on their diameter. The blind tapped holes come in 2 different thread sizes, and vary in number. The blind tapped holes are located on the rear of the device, see ["Device view"](#), page 17.

The device can be mounted using an optional SICK bracket, a combination of SICK brackets and elements, or a customer-specific bracket.

- www.sick.com/RFU62x

SICK offers prefabricated brackets which are optimally suited for mounting the device in a wide range of applications.

Also see on Internet at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

Example 1: The pivoting bracket enables, for example, the device to be aligned in two axes.

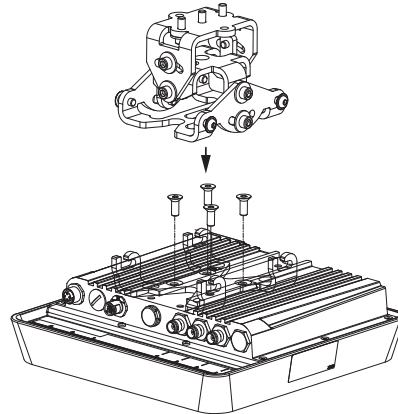


Figure 12: Pivoting bracket, shown here with the RFU63x-131xx

Example 2: A combination of VESA adapter plate, tube elements, and clamps enables the device to be aligned in three axes.

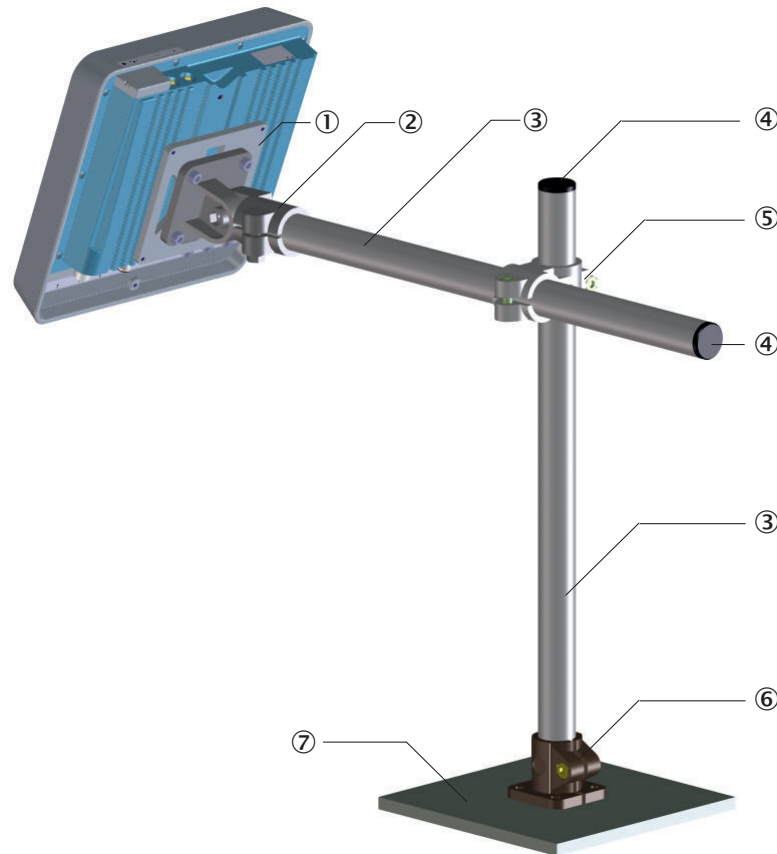


Figure 13: Bracket made from tube elements and clamps in combination with a VESA adapter plate, adjustment in 3 axes possible. Shown here mounted on the RFU630-131xx.

- ① VESA adapter plate part no. 2071862 with 2 x M6 x 12 countersunk head screws, hexagon socket (WAF 4)
- ② Hinged clamp part no. 2068919 with 4 x M6 x 12 cylinder head screws, hexagon socket (WAF 5)
- ③ Tube, external diameter 30 mm, length 1 m, part no. 5327610
- ④ Sealing plug, external diameter 30 mm, part no. 5327613
- ⑤ Cross clamp, part no. 5327612
- ⑥ Base clamp, part no. 5327611
- ⑦ Base (e.g. plate, supplied by the user)



NOTE

Dimensional drawings for SICK brackets and, if applicable, mounting instructions can be found online at: www.sick.com

- To do so, enter the 7-digit part number of the bracket in the search field.

User-supplied brackets

A user-supplied bracket should meet the following requirements:

- Stable mounting device
 - Allow the device to be aligned in the x and y axes.
 - The mounting device must be able to bear the weight of the device, including connecting cables, in a shock-proof manner, see "Technical data", page 87.
 - In mounting situations with strong vibrations, it may be necessary to provide shock mounts.

- Suitable drill holes for mounting the device as per the dimensional drawing: four for M6 screws or three for M5 screws.

5.3 Mounting location

When selecting the mounting location, the following factors are significant:

- Spatial working range of the antenna
- Distance to objects with a transponder
- Influence of the environment on the UHF field produced, for example:
 - Metal surfaces located to the side of and in the vicinity of the device
 - Electrically conductive liquids between the antenna and transponder
 - Persons between the antenna and transponder

5.4 Mounting the device



WARNING

Risk of injury due to damage to the device

For reasons of safety, if a device shows visible signs of damage do not put it into operation, or take it out of operation immediately. Damage includes, for example:

- Housing: Cracked or broken
 - Electrical connections: cracks or detachment from the housing
 - Device with fixed cable: Damage to the cable outlet or cable itself
-



NOTICE

Risk of damaging the device!

Observe the maximum screw-in depth of the blind tapped holes on the device. Longer screws than specified damage the device.

- ▶ Use screws of suitable length.
-

Basic arrangement of the device and external antennas to the transponders

UHF transponders have dipole antennas and therefore preferential directions when transmitting or receiving within the radiation field of the antenna. The transmitting and receiving performance will be higher or lower depending on the orientation of the dipole antenna of the transponder to the axis perpendicular to the antenna surface. The reading and writing rate and sensing range can therefore be subject to fluctuations.



NOTE

If the dipole antenna of the transponder is oriented lengthwise along the axis perpendicular to the antenna surface, no reading or writing of the transponder will be possible.

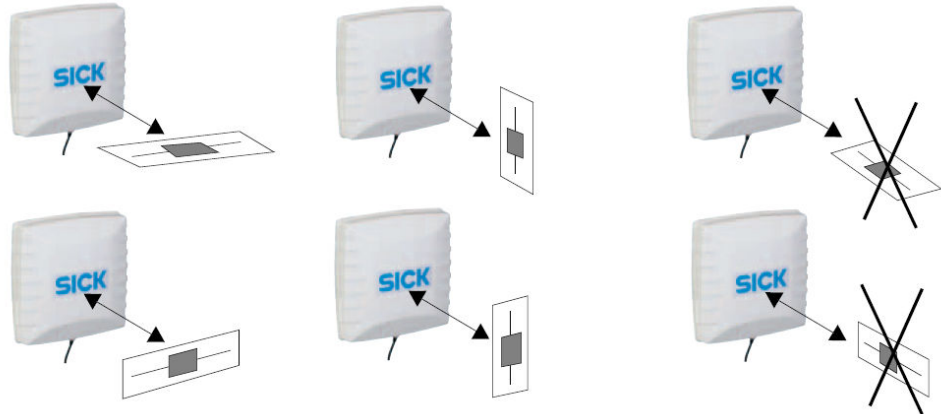


Figure 14: The optimal orientation of the transponder for good writing and reading results is demonstrated here for an external UHF antenna

Mounting and aligning the device and external antennas



NOTICE

Avoid mutual interference when operating several devices

When the reading ranges of several independently operated devices overlap, this can lead to mutual impairment of the system performance of the devices.

To avoid these situations, the devices offer the user the following options:

1. When using external antennas on a device:
When a device is operated with multiple antennas (externally connected antennas or, in the case of RFU630-131xx, integrated antennas), only one of the antennas at a time will communicate on the air interface.
2. Synchronizing several devices:
SyncMode enables several devices connected to the same Ethernet network to synchronize their reading responses. SyncMode ensures that only one device at a time is performing a read operation and therefore communicating over the air interface.
SyncMode is available for all devices in the RFU6xx product family that have an Ethernet interface.

RFU63x-131xx (with internal antenna) and RFU63x-041xx (without internal antenna):

1. Prepare the base for mounting the bracket of the device, see ["Preparation for mounting", page 32](#).
Recommendation: Depending on the application it may be possible to use one of the optional SICK brackets. If necessary, perhaps also in combination with other SICK brackets.
2. At the intended reading location, place an object with transponder within the working range of the device or external antennas (static object only).
3. Mount the device bracket onto the base.
4. Tighten screws through the bracket into the blind tapped holes of the device and slightly tighten.
5. If necessary, mount the external antennas in the same manner.
6. Orient the front side of the device or external antennas towards the object.

- Ensure, where possible, that there are no large metal surfaces located in front of the device.
- If this is unavoidable, do not mount the device or external antennas in the same plane as the surface but rather at an angle of inclination of approx. 10°.

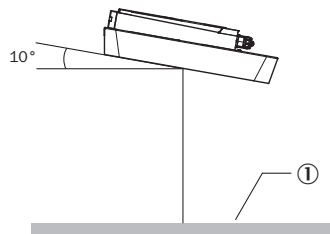


Figure 15: Selected angle of inclination of the device or external antennas when there is a large metal surface in front, e. g. 10°

① Metal surface

7. Tighten the screws.
- ✓ The device or external antennas are approximately aligned with the object to be detected.
8. Check the general suitability of the alignment for objects of different sizes and varying positions of the transponder in actual operation.

RFU65x:

1. Prepare the base for mounting the bracket of the device, [see "Preparation for mounting", page 32](#).
Recommendation: Depending on the application it may be possible to use one of the optional SICK brackets. If necessary, perhaps also in combination with other SICK brackets.
2. At the intended reading location, place an object with transponder within the working range of the device (static object only).
3. Mount the device bracket onto the base.
4. Tighten screws through the bracket into the blind tapped holes of the device and slightly tighten.
5. Orient the front side of the device towards the object.
 - Ensure, where possible, that there are no large metal surfaces located in front of the device.
 - If this is unavoidable, do not mount the device in the same plane as the surface but rather at an angle of inclination of approx. 10°.

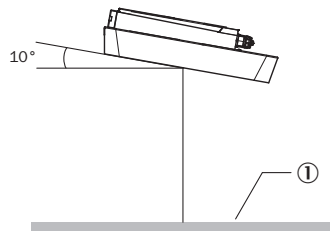


Figure 16: Selected angle of inclination of the device when there is a large metal surface in front, e. g. 10°

① Metal surface

6. Tighten the screws.
- ✓ The device is approximately aligned with the object to be detected.
7. Check the general suitability of the alignment for objects of different sizes and varying positions of the transponder in actual operation.

5.5 Mounting external components

5.5.1 Mounting the connection module or fieldbus module

If the device is controlled via a CDB or CDM connection module or CDF fieldbus module, mount the module in the vicinity of the device .



NOTE

If the PC with the SOPAS ET configuration software accesses the Aux interface (RS-232; 57.6 kBd) of the device via the connection module or fieldbus module, do not locate the connection module more than a 5 m cable length from the device.

1. Mount the connection module or fieldbus module in the vicinity of the device.
2. Mount the modules in such a way that the fieldbus module or open connection module are accessible at all times.



NOTE

For detailed information on mounting and electrical installation, please refer to the respective operating instructions for the connection module and fieldbus module. These are available online at:

- www.sick.com/CDB
- www.sick.com/CDM
- www.sick.com/CDF600
- www.sick.com/CDF600-2

5.5.2 Mounting the external read cycle trigger sensor

Conveying line

If the detection of objects with transponders by the device is triggered via an external trigger sensor (e.g. photoelectric retro-reflective sensor), mount the trigger sensor at a suitably close distance to the device.



NOTE

A large selection of photoelectric sensors and accessories (brackets, connecting cables) can be found online at: www.sick.com

6 Electrical installation

6.1 Safety

6.1.1 Notes on electrical installation

- **Electrical installation must only be performed by electrically qualified personnel.**
- **Standard safety requirements must be observed when working on electrical systems!**
- Electrical connections between the device and other devices may only be made or separated in a voltage-free state. Otherwise, there is a risk of damaging the devices.
- All connection work must be performed at ambient temperatures above 0 °C, see ["Ambient data", page 92](#)
- Connect the device to the permissible supply voltage only, see ["Connecting the supply voltage", page 61](#).
- Only switch on the supply voltage to the device (or optional connection module or fieldbus module depending on the type), after first:
 - Completing the connection work
 - Carefully checking the wiring work
- Where connecting cables with one end open are concerned, make sure that bare wire ends are not touching (risk of short circuit when the supply voltage is switched on). Wires must be appropriately insulated from each other. This also applies to unused wires.
- The wire cross-sections in the supply cable from the user's power system must be selected in accordance with the applicable national 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).
- The wire cross-sections of the data and, if applicable, switching signal cables must also be selected in accordance with the applicable national standards.
- Circuits connected to the device must be designed as SELV circuits (SELV = Safety Extra Low Voltage). The voltage supply must meet SELV requirements in accordance with the currently applicable standards, see ["Mechanics and electronics", page 91](#).



NOTE

For additional instructions on operating the device at ambient temperatures below 0 °C, see ["Prerequisites", page 54](#)

Data cables



NOTE

Layout of data cables

- Use shielded data cables with twisted-pair wires.
 - The possible cable length between the device and host computer depends on:
 - the chosen physical version of the host interface
 - the data transmission rate set in the deviceFor further information, see ["Wiring data interfaces", page 65](#).
 - Implement the shielding design correctly and completely.
 - To avoid interference, always use EMC-compliant cables and layouts. This applies, for example, to cables for switched-mode power supplies, motors, clocked drives, and contactors.
 - Do not lay cables in parallel with voltage supply cables or motor cables in cable channels over longer distances.
-

Antenna connection cables (optional accessory)**RFU63x****NOTE****Length of connecting cables**

- To avoid a significant attenuation in the UHF output power of the device due to the cables, use the shortest possible cable lengths for the external antennas.
- Details of the length-dependent losses in SICK cables can be found in the “Accessories” section online at: www.sick.com/RFU63x

Conditions for specified enclosure rating

To maintain the specified enclosure rating of the device (IP67) during operation, the following requirements must be met. If these requirements are not met, the device does not fulfill any specified enclosure rating.

- The side cover for the USB socket and the microSD card slot must be screwed tight to the device. Recommended tightening torque for the cover screws: 40 Ncm \pm 5 Nm.
- The cables plugged into the electrical M12 connections must be clamped.
- Unused M12 connections must be fitted with screw-on protective caps (for male connectors) or plugs (for female connectors) as supplied.
- RFU63x: Unused electrical connections for external antennas (female connector, TNC reverse) must be fitted with metal screw-on protective caps as supplied.
- The same also applies to the EMC requirement (ESD) according to CE.

**NOTICE**

The device can, if necessary, be operated for a short time **without the side cover** to perform the following tasks:

- Inserting or removing the optional memory card
- Temporary use of the USB interface as a servicing interface

During this time, protect the device against moisture and dust.

6.1.2 Prerequisites for safe operation of the device**WARNING****Risk of injury and damage caused by electrical current!**

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

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

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

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

This is achieved by complying with the following conditions:

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

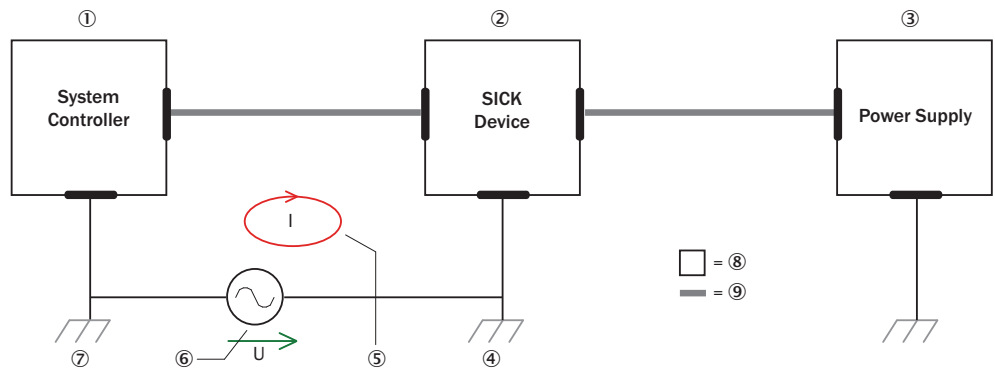


Figure 17: Example: Occurrence of equipotential bonding currents in the system configuration

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

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

Remedial measures

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



NOTICE

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

Measures for widely distributed system installations

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

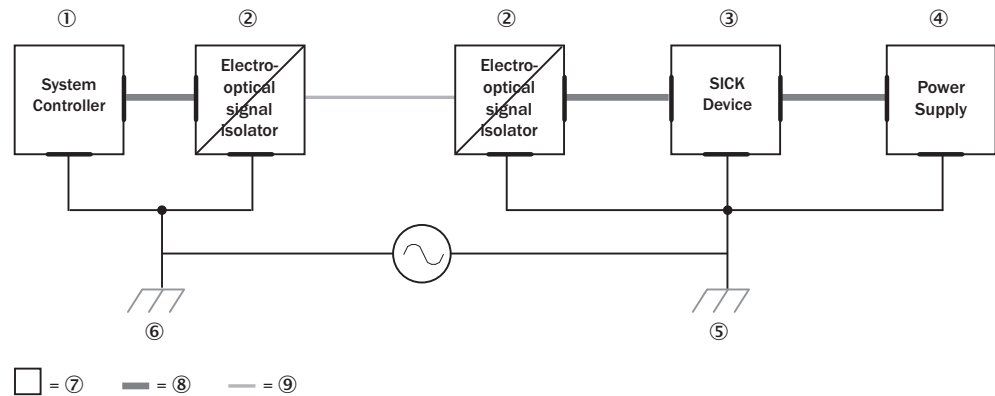


Figure 18: Example: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators

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

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

Measures for small system installations

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

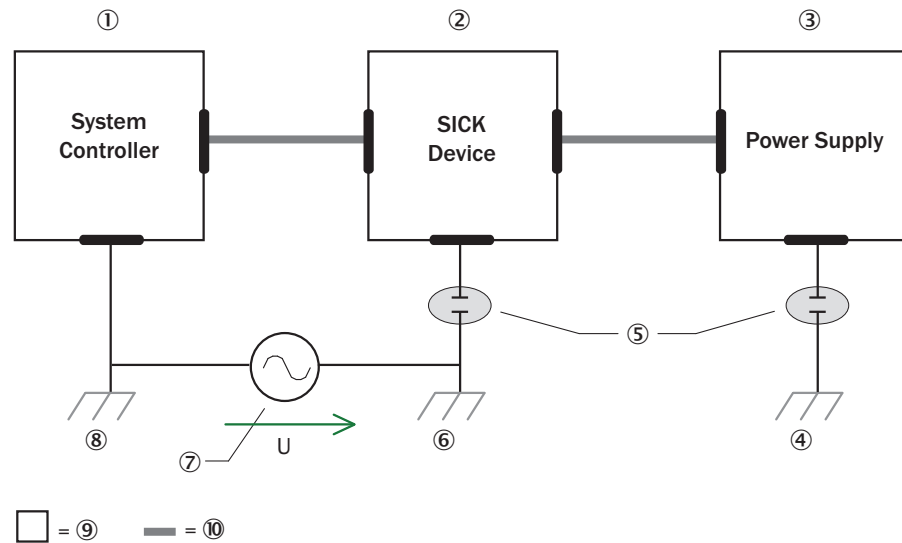


Figure 19: Example: Prevention of equipotential bonding currents in the system configuration by the insulated mounting of the device

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

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

NOTICE
 The voltage supply for the device and the connected peripheral devices must also guarantee the required level of insulation.
 Under certain circumstances, a tangible potential can develop between the insulated metal housings and the local ground potential.

6.2 Wiring instructions

NOTICE
Faults due to incorrect wiring!
 Incorrect wiring may result in operational faults.

- Follow the wiring instructions closely.

Pre-assembled cables

**NOTE**

Pre-assembled cables can be found online at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

Pre-assembled cables with open cable end at one end**NOTE**

For information on the pin, signal and wire color assignments for the RFU63x and RFU65x, see "Signal assignment of cables with open cable end at one end", page 98 in the appendix.

6.3 Overview of all interfaces and connection options

**NOTE**

The USB interface of the device is used in industrial environments only as a service interface for temporary use (e.g. for configuration, troubleshooting). Permanent use in real operation of the system as a host interface is not intended.

6.3.1 RFU63x-131xx with internal antenna

Service operation

The following functions in the device, among others, can be performed by the user using one of five data interfaces (Aux 1, Aux 2, Aux 3, Host 1 or Host 2):

- Configuration
- Representation of the reading result (detected transponders)
- Transponder access (reading and writing data)
- Reading diagnostics (read result in fixed output format)

For a detailed overview, see "Use of the data interfaces", page 51.

Shown here for the Aux interface is the Aux port of the Ethernet interface and, as alternatives, the serial data interface and the USB interface. The USB interface is only for temporary use as a service interface.

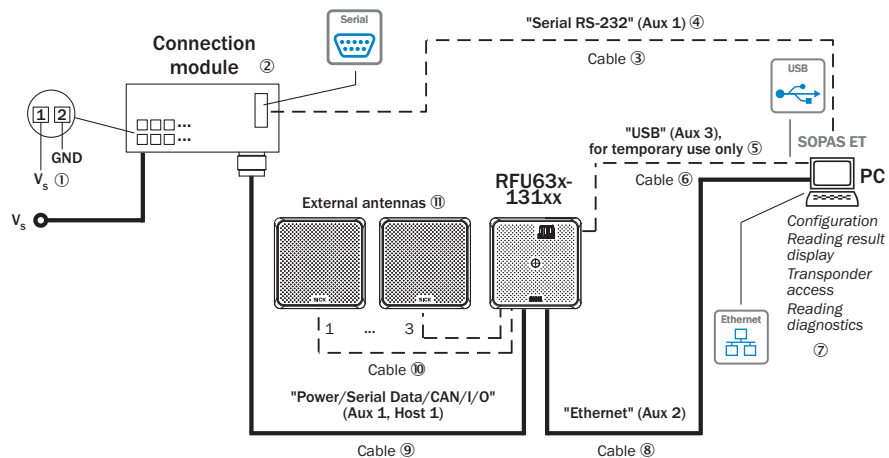


Figure 20: Service operation, e.g. representation of the read result: RFU63x-131xx block diagram with optional connection module

- ① Supply voltage V_S ($V_S = U_V$)
- ② Connection module CDB650-204 or CDM420-0006

- ③ Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD
- ④ Serial RS-232, alternative to USB or Ethernet Aux port
- ⑤ USB, alternative to serial RS-232 or Ethernet Aux port
- ⑥ Adapter cable (male connector, USB, Micro-B type / male connector, USB, type A)
- ⑦ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
- ⑧ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑨ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- ⑩ Cable (male connector, TNC reverse/male connector, TNC reverse)
- ⑪ External antennas (optional), e.g. RFA630-000 ⁷⁾

Read operation

In real operation, the device outputs the read result to the processing computer via one of the two physical host interfaces. One of two configurable output formats can be selected for this purpose. The device can also output the same or the second output format via the second host interface and/or both Aux interfaces at the same time.

For a detailed overview, see "Use of the data interfaces", page 51.

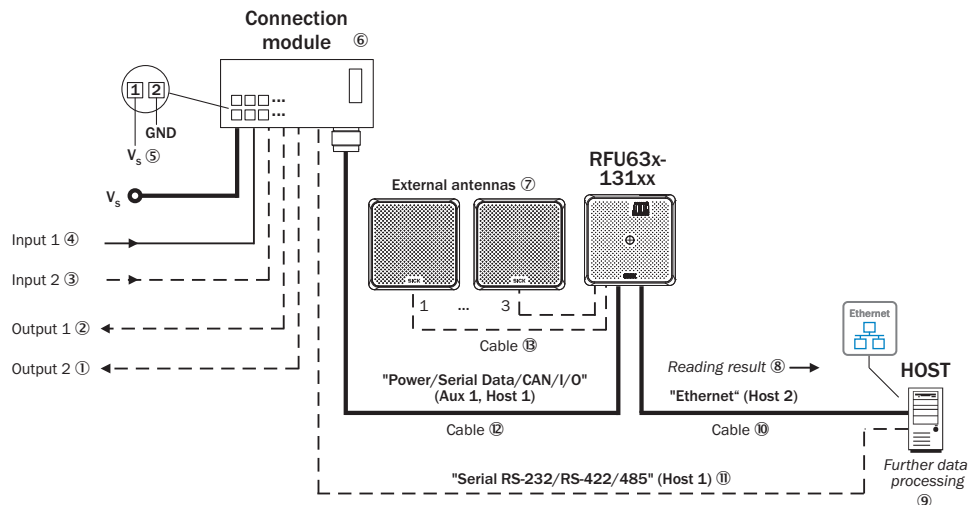


Figure 21: Read operation: RFU63x-131xx with optional connection module

- ① Digital switching output 2, for example for connecting an LED
- ② Digital switching output 1, for example for connecting an LED
- ③ Digital switching input 2, for example for connecting an incremental encoder
- ④ Digital switching input 1, e.g. for connecting a read cycle sensor
- ⑤ Supply voltage V_s ($V_s = U_V$)
- ⑥ Connection module CDB650-204 or CDM420-0006
- ⑦ External antennas (optional), e.g. RFA630-000 ⁷⁾
- ⑧ Read result (configurable output format 1 or 2)
- ⑨ Data further processing
- ⑩ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑪ Alternative to Ethernet host port
- ⑫ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)

⁷⁾ For regional assignment, see online data sheet at: www.sick.com/RFU63x

For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)

- ③ Cable (male connector, TNC reverse/male connector, TNC reverse)



NOTE

As an option, two additional external digital switching inputs and output are available for the device. Parameter cloning module CMC600, installed in the CDB or CDM connection module, is required for this purpose.

The modules can be delivered as optional accessories.

For the properties of the external digital switching inputs and outputs see ["Wiring the digital switching inputs", page 67](#) and see ["Wiring the digital switching outputs", page 69](#).

6.3.2 RFU63x-041xx without internal antenna

Service operation

The following functions in the device, among others, can be performed by the user using one of five data interfaces (Aux 1, Aux 2, Aux 3, Host 1 or Host 2):

- Configuration
- Representation of the reading result (detected transponders)
- Transponder access (reading and writing data)
- Reading diagnostics (read result in fixed output format)

For a detailed overview, see ["Use of the data interfaces", page 51](#).

Shown here for the Aux interface is the Aux port of the Ethernet interface and, as alternatives, the serial data interface and the USB interface. The USB interface is only for temporary use as a service interface.

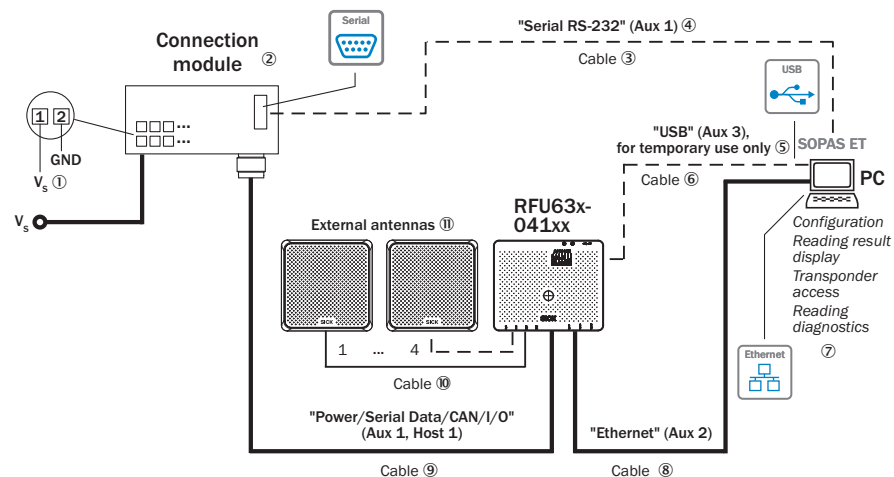


Figure 22: Service operation, e.g. representation of the read result: RFU63x-041xx block diagram with optional connection module

- ① Supply voltage V_s ($V_s = U_V$)
- ② Connection module CDB650-204 or CDM420-0006
- ③ Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD
- ④ Serial RS-232, alternative to USB or Ethernet Aux port
- ⑤ USB, alternative to serial RS-232 or Ethernet Aux port
- ⑥ Adapter cable (male connector, USB, Micro-B type / male connector, USB, type A)
- ⑦ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics

- ⑧ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑨ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- ⑩ Cable (male connector, TNC reverse/male connector, TNC reverse)
- ⑪ External antennas (optional), e.g. RFA630-000 ⁸⁾

Read operation

In real operation, the device outputs the read result to the processing computer via one of the two physical host interfaces. One of two configurable output formats can be selected for this purpose. The device can also output the same or the second output format via the second host interface and/or both Aux interfaces at the same time.

For a detailed overview, see "Use of the data interfaces", page 51.

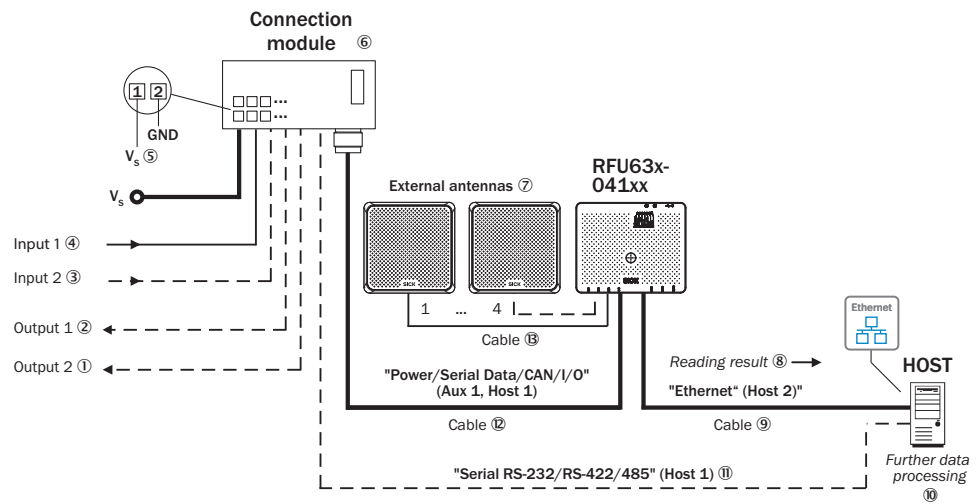


Figure 23: Read operation: RFU63x-041xx with optional connection module

- ① Digital switching output 2, for example for connecting an LED
- ② Digital switching output 1, for example for connecting an LED
- ③ Digital switching input 2, for example for connecting an incremental encoder
- ④ Digital switching input 1, e.g. for connecting a read cycle trigger sensor
- ⑤ Supply voltage V_s ($V_s = U_V$)
- ⑥ Connection module CDB650-204 or CDM420-0006
- ⑦ External antennas (optional), e.g. RFA630-000 ⁸⁾
- ⑧ Read result (configurable output format 1 or 2)
- ⑨ Data further processing
- ⑩ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑪ Alternative to Ethernet host port
- ⑫ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- ⑬ Cable (male connector, TNC reverse/male connector, TNC reverse)

⁸⁾ For regional assignment, see online data sheet at: www.sick.com/RFU63x

**NOTE**

As an option, two additional external digital switching inputs and output are available for the device. Parameter cloning module CMC600, installed in the CDB or CDM connection module, is required for this purpose.

The modules can be delivered as optional accessories.

For the properties of the external digital switching inputs and outputs see ["Wiring the digital switching inputs", page 67](#) and see ["Wiring the digital switching outputs", page 69](#).

6.3.3 RFU65x-101xx with internal antenna

Service operation

The following functions in the device, among others, can be performed by the user using one of five data interfaces (Aux 1, Aux 2, Aux 3, Host 1 or Host 2):

- Configuration
- Representation of the reading result (detected transponders)
- Transponder access (reading and writing data)
- Reading diagnostics (read result in fixed output format)

For a detailed overview, see ["Use of the data interfaces", page 51](#).

Shown here for the Aux interface is the Aux port of the Ethernet interface and, as alternatives, the serial data interface and the USB interface. The USB interface is only for temporary use as a service interface.

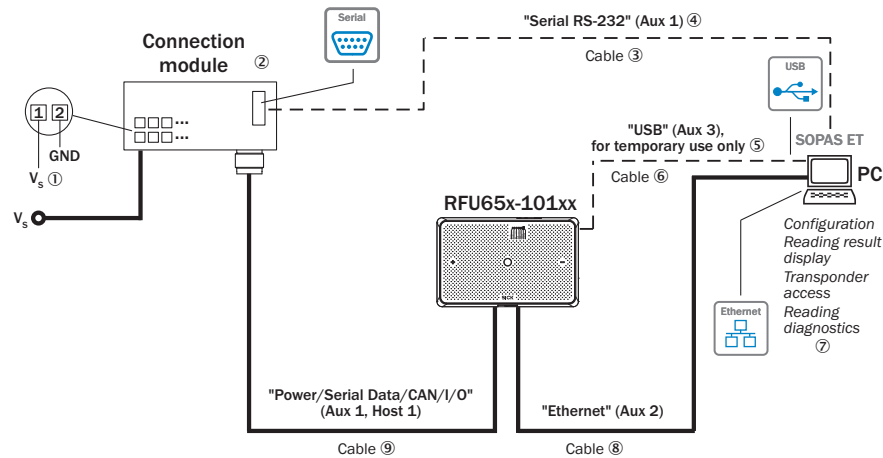


Figure 24: Service operation, e.g. representation of the read result: RFU65x-101xx block diagram with optional connection module

- ① Supply voltage V_s ($V_s = U_V$)
- ② Connection module CDB650-204 or CDM420-0006
- ③ Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD
- ④ Serial RS-232, alternative to USB or Ethernet Aux port
- ⑤ USB, alternative to serial RS-232 or Ethernet Aux port
- ⑥ Adapter cable (male connector, USB, Micro-B type / male connector, USB, type A)
- ⑦ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
- ⑧ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑨ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)

For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)

Read operation

In real operation, the device outputs the read result to the processing computer via one of the two physical host interfaces. One of two configurable output formats can be selected for this purpose. The device can also output the same or the second output format via the second host interface and/or both Aux interfaces at the same time.

For a detailed overview, see "Use of the data interfaces", page 51.

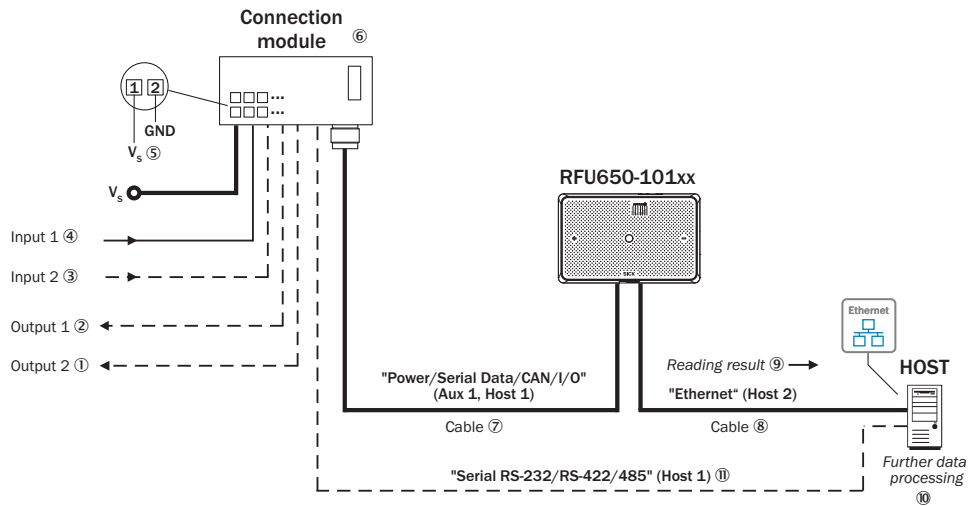


Figure 25: Read operation: RFU65x-101xx with optional connection module

- ① Digital switching output 2, for example for connecting an LED
- ② Digital switching output 1, for example for connecting an LED
- ③ Digital switching input 2, for example for connecting an incremental encoder
- ④ Digital switching input 1, e.g. for connecting a read cycle sensor
- ⑤ Supply voltage V_s ($V_s = U_V$)
- ⑥ Connection module CDB650-204 or CDM420-0006
- ⑦ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- ⑧ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑨ Read result
- ⑩ Data further processing
- ⑪ Alternative to Ethernet host port



NOTE

As an option, two additional external digital switching inputs and output are available for the device. Parameter cloning module CMC600, installed in the CDB or CDM connection module, is required for this purpose.

The modules can be delivered as optional accessories.

For the properties of the external digital switching inputs and outputs see "Wiring the digital switching inputs ", page 67 and see "Wiring the digital switching outputs ", page 69.

6.3.4 Use of the data interfaces

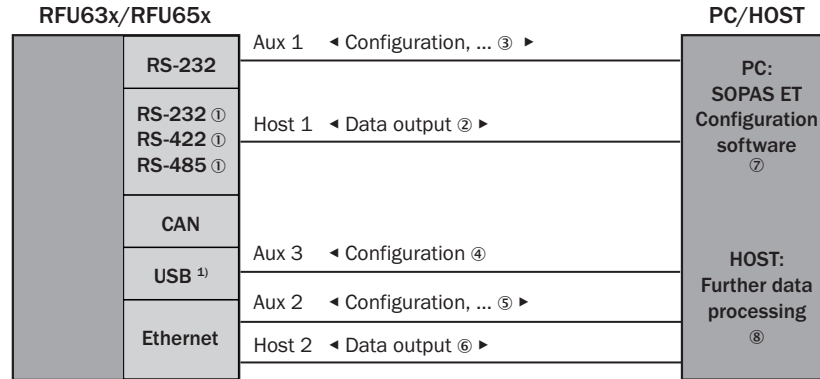


Figure 26: Data interfaces of the device and their use

- ① One of the three options can be selected
- ② Read operation: Data output of the read result (configurable output format 1 or 2)
- ③ Service operation: Configuration with SOPAS ET, prepared representation of the read result, transponder access, reading diagnostics or monitoring of the serial host interface
- ④ Service operation: Configuration with SOPAS ET, interface only for temporary use
- ⑤ Service operation: Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
- ⑥ Read operation: Data output of the read result (configurable output format 1 or 2), recommended for high data volume
- ⑦ SOPAS ET configuration software
- ⑧ Data further processing

Table 7: Functions relating to data interfaces

Interface option →	Host 1	Aux 1	Host 2	Aux 2	Aux 3
Assignable function ↓	Serial RS-232 or RS-422/485	Serial RS-232	Ethernet	Ethernet	USB ¹⁾
Read result output (configurable format 1 or 2)	●	●	●	●	
Read result output (customer out- put format)	●				
Read diagnostics (fixed output for- mat)		●		●	● ²⁾
Monitoring of serial host interface traffic		●			
With SOPAS ET: Configuration, dis- play of read result in the Quick- start window, transponder access	○	○	○	○	○
Configuration using commands	○	○	○	○	○
Configuration (web server)			○	○	
● = Output of the same function via the parallel interfaces is possible ○ = Access only makes sense via one of the interfaces (risk of collision!)					

- ¹⁾ USB interface only for temporary use.
- ²⁾ Output using the terminal in SOPAS ET (from version 3.3.0) or other USB-capable terminal programs.
- ³⁾ Input using the terminal in SOPAS ET (from version 3.3.0) or other USB-capable terminal programs.



NOTE

- Only one of several available functions can be assigned to each interface.
- The host interface has a higher priority than the Aux interface.
- The Aux interface of the device is designated as a “Auxiliary interface” in the user interface of the SOPAS ET configuration software.

The logical Aux interface of the device can operate the serial data interface, the USB interface and the Aux port of the Ethernet interface at the same time.

In a similar manner, the logical host interface of the device can operate the serial data interface and the host port of the Ethernet interface at the same time. The physical RS-232 and RS-422/485 Host interfaces cannot be used simultaneously. For output in real time, one of the two ports of the Ethernet interface must be selected.

However, the data released by means of a command string is only output on the interface on which the request was received.

6.4 Pin assignments of electrical connections

6.4.1 “Power/Serial data/CAN/I/O” connection

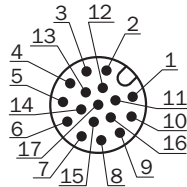


Figure 27: Male connector, M12, 17-pin, A-coding

Table 8: Pin assignment of the “Power/Serial data/CAN/I/O” connection (M12)

Pin	Signal	Function
1	GND	Ground
2	V _S	Supply voltage
3	CAN L	CAN bus (IN/OUT)
4	CAN H	CAN bus (IN/OUT)
5	TD+ (RS-422/485), Host	Host interface (sender+)
6	TD- (RS-422/485), Host TxD (RS-232), Host	Host interface (sender-)
7	TxD (RS-232), Aux	Aux interface (sender)
8	RxD (RS-232), Aux	Aux interface (receiver)
9	SensGND	Switching input ground
10	Sensor 1	Digital switching input 1
11	RD+ (RS-422/485), Host	Host interface (receiver+)
12	RD- (RS-422/485), Host RxD (RS-232), Host	Host interface (receiver-)
13	Result 1	Digital switching output 1
14	Result 2	Digital switching output 2
15	Sensor 2	Digital switching input 2
16	N.c.	-
17	N.c.	-
-	-	Screen

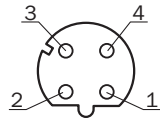
“Ethernet” connection

Figure 28: M12 female connector, 4-pin, D-coded

Table 9: Pin assignment of the “Ethernet” connection

Pin	Signal	Function
1	TD+	Sender+
2	RD+	Receiver+
3	TD-	Sender-
4	RD-	Receiver-

6.4.3 M12 to D-Sub adapter cable

Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)

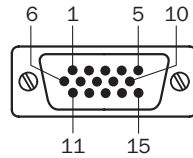


Figure 29: Male connector, D-Sub-HD, 15-pin

Table 10: Pin assignment of the “Power/Serial data/CAN/I/O” connection (D-Sub-HD)

Pin	Signal	Function
1	V _s	Supply voltage
2	RxD (RS-232), Aux	Aux interface (receiver)
3	TxD (RS-232), Aux	Aux interface (sender)
4	Sensor 2	Digital switching input 2
5	GND	Ground
6	RD+ (RS-422/485), Host	Host interface (receiver+)
7	RD- (RS-422/485), Host RxD (RS-232), Host	Host interface (receiver-)
8	TD+ (RS-422/485), Host	Host interface (sender+)
9	TD- (RS-422/485), Host TxD (RS-232), Host	Host interface (sender-)
10	CAN H	CAN bus (IN/OUT)
11	CAN L	CAN bus (IN/OUT)
12	Result 1	Digital switching output 1
13	Result 2	Digital switching output 2
14	Sensor 1	Digital switching input 1
15	SensGND	Switching input ground

6.5 Instructions for electrical installation when the ambient temperature can fall below 0 °C



NOTE

For mounting instructions, see "Instructions for mounting the device when the ambient temperature can fall below 0 °C", page 33

All device variants can also be operated at low ambient temperatures. For details, see "Technical data", page 87

6.5.1 Prerequisites

- Required supply voltage: see "Supply voltage", page 63
- Use SICK standard cables for the specified ambient temperature range, see
 - www.sick.com/RFU63x
 - www.sick.com/RFU65x
- Do not operate the device at ambient temperatures below 0 °C when mounting or connection work is being carried out.
- Only carry out connection work at ambient temperatures between 0 °C and +50 °C. Secure the connecting cables.
- The side cover for the USB interface and the microSD card slot must be screwed tight to the device.
- All cables connected to the device must be clamped. Unused M12 electrical connections must be fitted with screw-on protective caps (for male connectors) or sealed with plugs (for female connectors) as supplied.
- RFU63x: Unused connections for external antennas must be fitted with metal screw-on protective caps (as supplied).
- When operating the device at the lower limit of the permissible ambient temperature range (see "Technical data", page 87), do not expose the device to strong air flows (e.g. ventilation system, wind).

6.5.2 Behavior of the device when switched on

After application of the supply voltage and initialization, the device can immediately be addressed by the SOPAS ET configuration software.

Table 11: Behavior of the device when switched on at low temperatures

Internal temperature of housing	Behavior
Below -25 °C	"Ready" LED continuously flashes yellow. Device is not operational because the temperature is below the specified minimum limit value of -25 °C (-30 °C ¹⁾).
-25 °C (-30 °C ¹⁾ ... -20 °C	"Ready" LED continuously flashes green (warm-up phase). Device is not operational (communication channel still disabled) until the internal temperature has increased to -20 °C as a result of the heat generated by the electronics. Duration approx. 2 min.
From -20 °C	"Ready" LED permanently lights up green. The device has started regular operation.

¹⁾ For Firmware Version V2.02

Once the supply voltage has been applied, the device uses integrated temperature sensors to measure its internal temperature. This is performed by the device while booting.

6.6 Installation steps

6.6.1 Wiring of the device for Quickstart

RFU63x-131xx (with internal antenna)

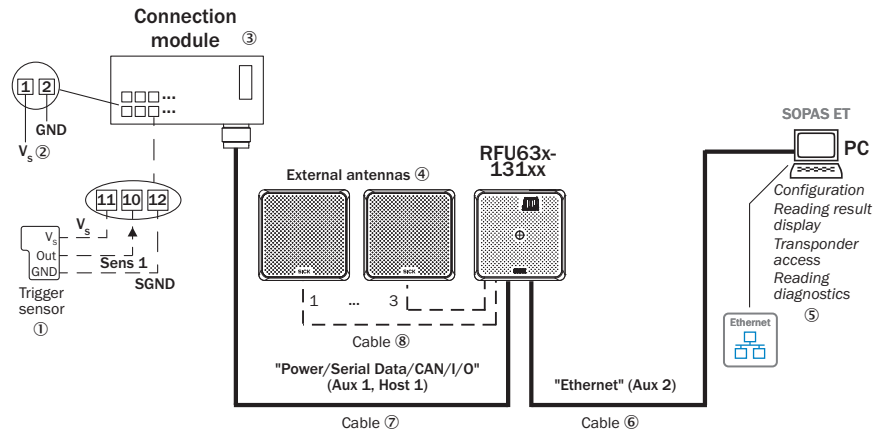


Figure 30: Commissioning: Electrical connection block diagram of the RFU630-131 xx with optional connection module

- ① Reading pulse trigger
 - ② Supply voltage V_s
 - ③ CDB650-204 or CDM420-0006 connection module
 - ④ External antennas (optional), e.g. RFA630-000 for Europe/Saudi Arabia/South Africa region
 - ⑤ Configuration or diagnostics
 - ⑥ Adapter cable (male connector, M12, 4-pin, D-coded / male connector, RJ-45, 8-pin)
 - ⑦ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)
 - ⑧ Cable (female connector TNC / female connector, TNC)
- ① Trigger sensor for read cycle
 - ② Supply voltage V_s ($V_s = U_V$)
 - ③ Connection module CDB650-204 or CDM420-0006
 - ④ External antennas (optional), e.g. RFA630-000 ⁹⁾
 - ⑤ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
 - ⑥ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
 - ⑦ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)
 - ⑧ Cable (male connector, TNC reverse/male connector, TNC reverse)

Procedure:

1. Connect the communication interface (e.g., Ethernet) of the device directly to the PC using the suitable cable ⑥.
2. If additional external antennas are used (maximum 3, e.g., RFA630-000), these must be connected to the antenna inputs of the device by means of suitable connecting cables ⑧.

⁹⁾ For regional assignment, see online data sheet at: www.sick.com/RFU63x

3. Connect "Power/Serial Data/CAN/I/O" connection (male connector, M12, 17-pin, A-coded) to the corresponding female connector on the connection module using the suitable cable ⑦.
4. If necessary, connect a read cycle trigger sensor, such as a photoelectric retro-reflective sensor, to the "Sens/IN 1" (CDB650-204) or "Sensor 1" (CDM420-0006) digital switching input of the connection module. For CDB650-204: see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDB650-204", page 109. For CDM420-0006 see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDM420-0006", page 122.
5. Supply the device with the required voltage depending on the length of the connecting cable ⑦.see "Supply voltage", page 63 .
- ✓ After successful initialization, the "Device Ready" LED lights up green.
6. Turn on the PC and start Windows.

RFU63x-041xx (without internal antenna)

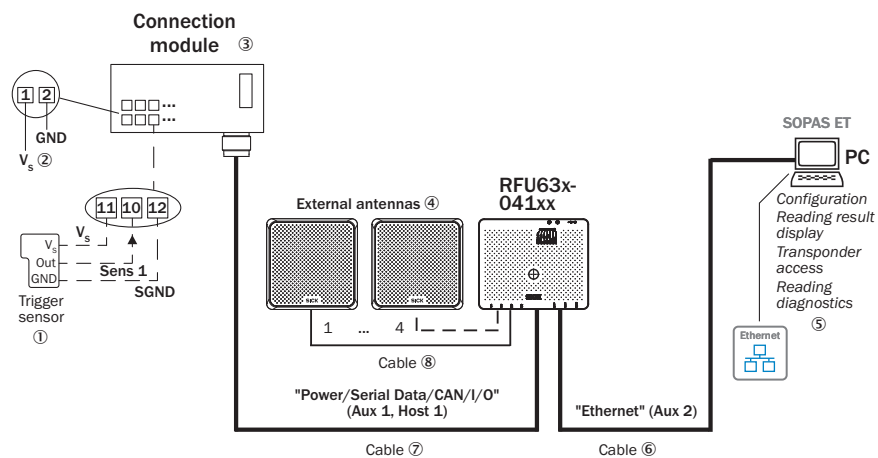


Figure 31: Commissioning: Electrical connection block diagram of the RFU630-041 xx with optional connection module

- ① Reading pulse trigger
 - ② Supply voltage V_S
 - ③ CDB650-204 or CDM420-0006 connection module
 - ④ External antennas (minimum number 1), e.g. RFA630-000 for Europe/Saudi Arabia/South Africa region
 - ⑤ Configuration or diagnostics
 - ⑥ Adapter cable (male connector, M12, 4-pin, D-coded / male connector, RJ-45, 8-pin)
 - ⑦ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)
 - ⑧ Cable (female connector TNC / female connector, TNC)
-
- ① Trigger sensor for read cycle
 - ② Supply voltage V_S ($V_S = U_V$)
 - ③ Connection module CDB650-204 or CDM420-0006
 - ④ External antennas (optional), e.g. RFA630-000 ¹⁰⁾
 - ⑤ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
 - ⑥ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)

10) For regional assignment, see online data sheet at: www.sick.com/RFU63x

- ⑦ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)
- ⑧ Cable (male connector, TNC reverse/male connector, TNC reverse)

Procedure:

1. Connect the communication interface (e.g., Ethernet) of the device directly to the PC using the suitable cable ⑥.
2. Connect external antennas (maximum 4, e.g. RFA630-000) to the antenna inputs of the device by means of suitable connecting cables ⑧. At least one external antenna is required!
3. Connect "Power/Serial Data/CAN/I/O" connection (male connector, M12, 17-pin, A-coded) to the corresponding female connector on the connection module using the suitable cable ⑦.
4. If necessary, connect a read cycle trigger sensor, such as a photoelectric retro-reflective sensor, to the "Sens/IN 1" (CDB650-204) or "Sensor 1" (CDM420-0006) digital switching input of the connection module. For CDB650-204: see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDB650-204", page 109. For CDM420-0006 see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDM420-0006", page 122.
5. Supply the device with required voltage depending on the length of the connecting cable ⑦. see "Supply voltage", page 63.
- ✓ After successful initialization, the "Device Ready" LED lights up green.
6. Turn on the PC and start Windows.

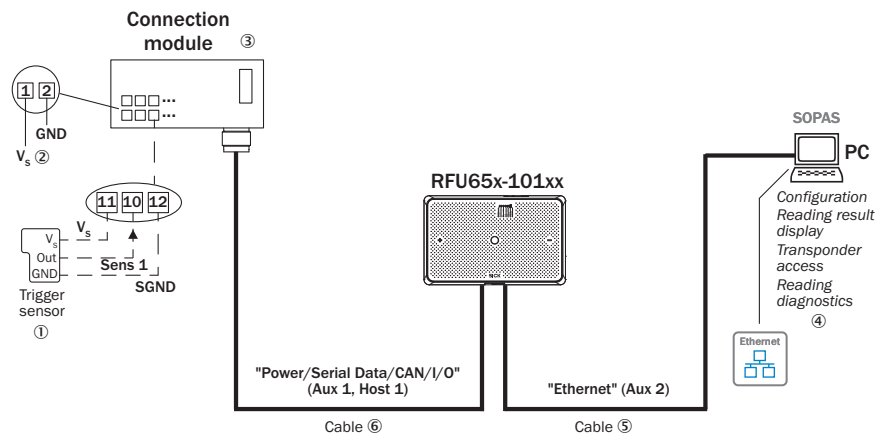
RFU65x-101xx

Figure 32: Commissioning: Electrical connection block diagram of the RFU65x-101xx with optional connection module

- ① Reading pulse trigger
- ② Supply voltage V_s
- ③ CDB650-204 or CDM420-0006 connection module
- ④ Configuration, diagnosis, transponder access or display of read results
- ⑤ Adapter cable (male connector, M12, 4-pin, D-coded / male connector, RJ-45, 8-pin)
- ⑥ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)

- ① Trigger sensor for read cycle
- ② Supply voltage V_S ($V_S = U_V$)
- ③ Connection module CDB650-204 or CDM420-0006
- ④ Configuration with SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
- ⑤ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑥ For CDB650-204: Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)
For CDM420-0006: Adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin)

Procedure:

1. Connect the communication interface (e.g., Ethernet) of the device directly to the PC using the suitable cable ⑤.
2. Connect "Power/Serial Data/CAN/I/O" connection (male connector, M12, 17-pin, A-coded) to the corresponding female connector on the connection module using the suitable cable ⑥.
3. If necessary, connect a read cycle trigger sensor, such as a photoelectric retro-reflective sensor, to the "Sens/IN 1" (CDB650-204) or "Sensor 1" (CDM420-0006) digital switching input of the connection module. For CDB650-204: see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDB650-204", page 109. For CDM420-0006 see "Wiring digital switching inputs "Sensor 1" and "Sensor 2" of the device in the CDM420-0006", page 122.
4. Supply the device with the required voltage depending on the length of the connecting cable ⑦. see "Supply voltage", page 63.
- ✓ After successful initialization, the "Device Ready" LED lights up green.
5. Turn on the PC and start Windows.

6.6.2 Block diagram: wiring the optional connection module

Device = RFU63x, RFU65x



NOTE

For possible combinations of the device and various connection modules, see table 12, page 59

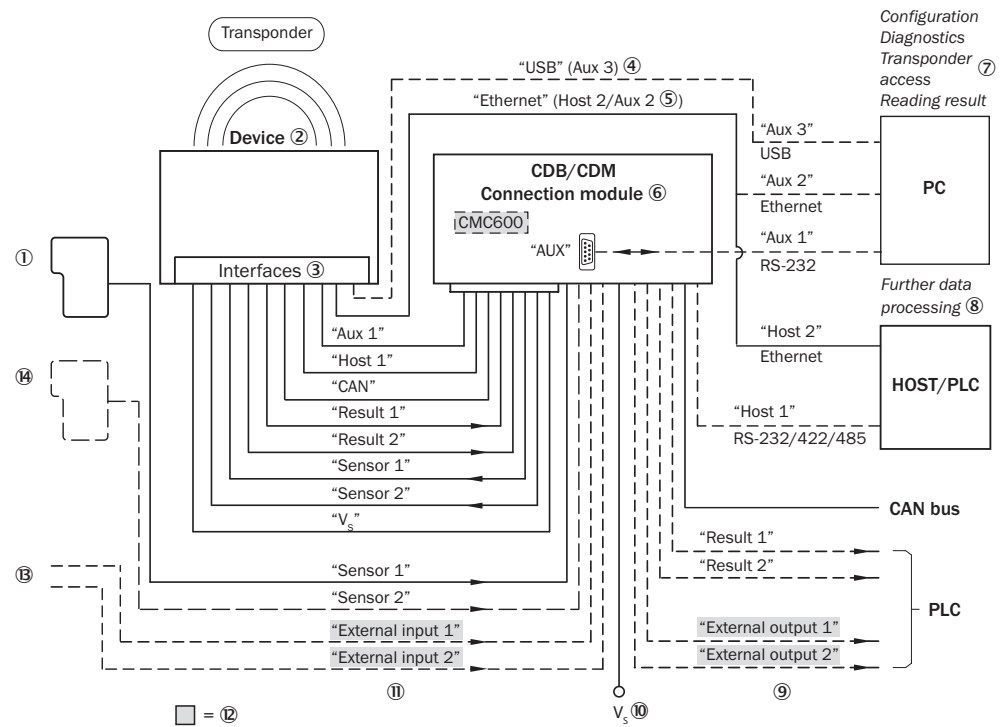


Figure 33: Connecting the device to peripherals via the optional connection module (overview)

- ① Trigger sensor for start/stop read cycle (for example a photoelectric retro-reflective sensor)
- ② Device
- ③ Interfaces
- ④ USB interface for temporary use only as a servicing interface
- ⑤ RFU63x or RFU65x
- ⑥ Connection module
- ⑦ Configuration using SOPAS ET, prepared representation of the read result, transponder access or reading diagnostics
- ⑧ Data further processing
- ⑨ External digital switching outputs
- ⑩ Supply voltage V_s ($V_s = U_V$)
- ⑪ External digital switching inputs
- ⑫ The optional CMC600 parameter cloning module is required in order to be able to use the additional external digital switching inputs and outputs of the device (highlighted in gray)
- ⑬ Other functions
- ⑭ Application-dependent alternative stop reading cycle (e.g. photoelectric sensor) or travel increment (incremental encoder)

Using the optional connection modules CDB and CDM

Table 12: Possible combinations of device and connection modules

Device/variant	Connection on the device	Connection module	Connection cable
RFU63x RFU65x	Male connector, M12, 17-pin, A-coded	CDB650-204	Cable 1:1 ¹⁾
		CDM420-0006, CDM420-0007 ³⁾	Adapter cable ²⁾

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

²⁾ Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)

³⁾ CDM420-0007: for connecting 2 devices

The supply voltage for the device is protected as follows in the connection modules:

Connection module	Number of connectable devices	Fuse rating
CDB650-204	1	1 x 2 A
CDM420-0006	1	1 x 2 A
CDM420-0007	2	2 x 2 A

The fuse is located in the “secondary” circuit after the switch S1.



NOTE

Connection diagrams for the connection modules

The connection diagrams can be found in the appendix of these operating instructions.

- see "Connection diagrams of connection module CDB650-204", page 102
- see "Connection diagrams of connection module CDM420-0006", page 115



NOTE

Connection modules

For detailed information about mounting and electrical installation, please refer to the operating instructions for the connection module in question. These are available online at.

- www.sick.com/CDB
- www.sick.com/CDM



NOTE

Wiring the signals without a SICK connection module

- ▶ When using a customer-specific connection unit, refer to the relevant connection diagrams and descriptions for the basic methods for wiring the signals.
 - see "Connecting the supply voltage", page 61
 - see "Wiring data interfaces", page 65
 - see "Wiring the CAN interface", page 67
 - see "Wiring the digital switching inputs ", page 67
 - see "Wiring the digital switching outputs ", page 69
- An alternative adapter cable for free wiring (female connector, M12, 17-pin, A-coded/open end) is available.

Also see on Internet at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

6.7 Connecting external antennas

The RFU63x-131xx allows for the connection of up to three external antennas.

The RFU63x-041xx does not have an internal antennae and requires the connection of at least one external antenna. Up to four external antennas can be connected.



NOTE

Pre-assembled connecting cable for UHF antennas can be found online in the “Optional accessories” section at:

- www.sick.com/RFU63x

The length-dependent attenuation (losses) of the cables must also be specified here.

Use the shortest possible lengths of cable for the external antennas to prevent greater attenuation of the UHF output power of the device through the connecting cables.

- 1 Connect every antenna to one of the external antenna connections using its own cable with a suitable length. When doing so, note the respective attenuation values of the cables.
- 2 Optimize the external antenna connection used on the device. To do so, using the SOPAS ET configuration software, enter the following data in the respective **External antenna X** tab per antenna connection:
 - The attenuation value of the connecting cable under **cable loss**
 - The gain of the antenna used identified according to the specifications under **antenna gain**
- 3 Other information as needed.
- 4 Activate the external antenna connections used in the respective tabs.



NOTE

Open antenna connection

If the external antenna connection is activated, undefined completion results in a mismatch. The device registers this irregularity in its fault memory.

The “RF” display turns red.

Possible reasons for this:

- Antenna not connected
- Connecting cable not correctly connected or defective
- Antenna is defective

6.8 Connecting the supply voltage

6.8.1 Note on the reverse voltage protection for the supply voltage of the device



NOTICE

Risk of damage to the device due to possible short-circuit!

Reversing the polarity of the supply voltage may, under certain circumstances, damage the device due to short circuit currents!

The supply voltage input terminal of the RFID device has been designed to provide reverse polarity protection by means of an internal circuit protection (blocking diode) on the positive pole (see figure).

The internal ground corresponds to the negative pole of the supply voltage for the device. It has a direct galvanic connection to the metal housing of the device for RF-related technical reasons.

Depending on the mounting location of the RFID device and the reference potential of the supply voltage, a reversal of the polarity of the applied supply voltage can lead to the following two situations:

Situation 1

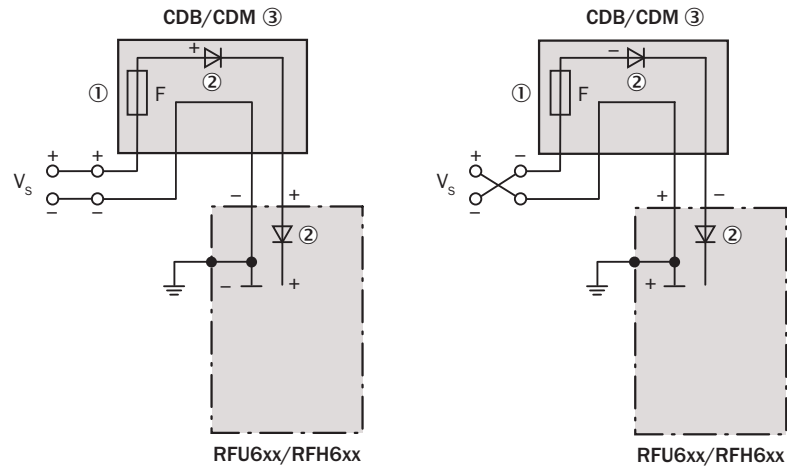


Figure 34: Reversal of the polarity of the supply voltage: no effect on the RFID device (see requirements)

- ① Fuse in the connection module: 2 A (CDB650-204, CDM420-0006)
- ② Blocking diode
- ③ Connection module

The housing of the RFID device is connected to functional earth. In the optional CDB or CDM connection module, a fuse acts as an overload protection against too high current when the supply voltage is applied correctly. A further blocking diode also serves as a reverse polarity protection.

If the polarity of the supply voltage is reversed, the blocking diodes block the negative voltage on the positive pole of the RFID device.

**NOTICE**

The polarity reversal will not cause any damage provided the following two requirements are met for the device:

- The negative pole of the applied supply voltage is not connected to functional earth as a common reference potential
- The device is not connected in an electrically conductive manner to any other peripheral devices that use the same reference potential. Neither through its metal housing or over other cables (signal relative to GND, shielding).

Situation 2

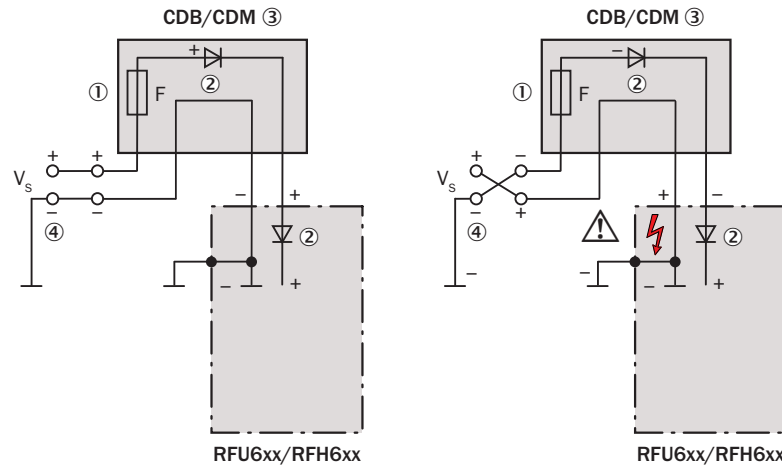


Figure 35: Reversal of the polarity of the supply voltage with common system GND: Risk of damage to the RFID device!

- ① Fuse in the connection module: 2 A (CDB650-204, CDM420-0006)
- ② Blocking diode
- ③ Connection module
- ④ Battery

The housing of the RFID device is connected (see figure) in an electrically conductive manner to the reference potential (system GND), which is also connected to the negative pole of the applied supply voltage. Typical mounting location: Vehicle with chassis as a common reference potential.

If the polarity of the supply voltage is reversed, this can lead to short-circuit currents between the reversed positive and negative poles!

The fuse in the connection module is not located in the active circuit.

6.8.2 Supply voltage

The voltage supply or power supply unit must satisfy SELV requirements in accordance with the currently applicable EN 60950-1. (SELV = Safety Extra Low Voltage).



NOTE

UL-certified devices (see type label) require a SELV/LPS-compliant supply voltage in accordance with UL/IEC/EN60950-1 or Class 2 according to NEC, UL1310.



NOTE

Required input voltage on connection module

Voltage drops in the supply circuit affect the connection cable from the connection module to the device (decrease dependent on the length) as well as – to a certain extent – the connection module itself.

To compensate for this loss when operating the device at the lower end of the supply range (18 V DC), apply a higher input voltage to the connection module as per the following table:

The voltage drops for a customer-specific connection or connection module have also been taken into account.

Table 13: RFUG3x/65x: required supply voltage V_S

Supply voltage V_S for the device	Connection module	Part no. Cable (length)	Wire cross-section Supply voltage V_S	Voltage drop across the cable at DC 18 V/1 = max. 1.35 A	Required minimum supply voltage V_S to the connection module	Fuse rating for supply voltage V_S
DC 18 V ... 30 V P = max. 26 W	CDB650-204	6052286 (2 m)	0.14 mm ²	1.0 V	DC 19.0 V	CDB650-204 (2 A)
		6051194 (3 m)	0.14 mm ²	1.5 V	DC 19.5 V	
		6051195 (5 m)	0.14 mm ²	2.3 V	DC 20.3 V	
	CDM420-0006	2056184 (0.35 m)	0.10 mm ²	0.2 V	DC 18.2 V	CDM420-0006 (2 A)
		2049764 (0.9 m)	0.10 mm ²	0.5 V	DC 18.5 V	
		2055419 (2 m)	0.10 mm ²	1.0 V	DC 19.0 V	
		2055420 (3 m)	0.10 mm ²	1.5 V	DC 19.5 V	
		2055859 (5 m)	0.10 mm ²	2.5 V	DC 20.5 V	
		2061480 (2 m)	0.14 mm ²	1.0 V	DC 19.0 V	
		2061605 (3 m)	0.14 mm ²	1.5 V	DC 19.5 V	
2061481 (5 m)		0.14 mm ²	2.3 V	DC 20.3 V		
Customer-specific wiring	6042772 (3 m)	0.14 mm ²	1.5 V	DC 19.5 V	2 A at the start of the cable	
	6042773 (5 m)	0.14 mm ²	2.3 V	DC 20.3 V		
	6048817 (10 m)	0.14 mm ²	4.6 V	DC 22.6 V		
	2070425 (3 m)	0.14 mm ²	1.5 V	DC 19.5 V		
	2070426 (5 m)	0.14 mm ²	2.3 V	DC 20.3 V		
	2070427 (10 m)	0.14 mm ²	4.6 V	DC 22.6 V		
	6045141 (5 m)	0.14 mm ²	2.3 V	DC 20.3 V		
	6048319 (10 m)	0.25 mm ²	2.0 V	DC 20.0 V		
DC 12 V ... 30 V P = max. 26 W		6048319 (10 m)	0.25 mm ²	3.0 V at DC 12 V/ 1.9 A	DC 15.0 V	2.5 A at the start of the cable

- When operating the device via the optional SICK CDB650-204 or CDM420-0006 connection module and using a SICK connecting cable. When operating the device below 0 °C and using a cold-resistant connecting cable from SICK.
- When operating the device without a SICK connection module and using a SICK connecting cable. When operating the device below 0 °C and using the cold-resistant connecting cable from SICK, part no. 6048319 (2 x 2.5 mm², 10 m).

- The power source must be able to deliver at least 26 W of power or at least 1.5 A at 18 V DC.
- The voltage supply via a power supply unit must be capable of bridging a brief power failure of 20 ms.
- In the case of connection via the optional connection module CDB/CDM: additionally required output power 0.5 W when using the optional parameter cloning module CMC600 in the connection module.

Protecting the supply cables

To ensure protection against short-circuits and overload in the customer-supplied cables, the wire cross-sections used must be selected and protected in accordance with national regulations.

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)

Wiring without SICK connection module

For a supply voltage between 18 V and 30 V DC, protect the device with a separate 2 A slow-blow fuse.

For a supply voltage between 12 V and 30 V DC and when operating the device with the SICK supply cable part no. 6048319 (2 x 2.5 mm², length 10 m), protect the device with a separate 2.5 A slow-blow fuse.

- Install the fuse in the supply circuit at the start of the supply cable.

Wiring with SICK connection module

Deliver the supply voltage via a connection module:

Connection module	Interface	Reference
CDB650-204	Supply voltage	see "Connecting supply voltage for the device in CDB650-204", page 104
CDM420-0006	Supply voltage	see "Connecting supply voltage for the device in CDM420-0006", page 117

6.9 Wiring data interfaces

Wiring the Internet interface

1. Connect the device to the Ethernet interface of the PC via an adapter cable.
2. Set up communication via SOPAS ET configuration software.



NOTE

The Ethernet interface of the device 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 length of cable and on the type of interface. Observe the following recommendations:

Table 14: Serial interfaces: data transmission rates

Interface	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. 5 m < 2 m
RS-422/485 ¹⁾	Up to 38.4 kBd 38.4 kBd ... 57.6 kBd 57.6 kBd ... 500 kBd	Max. 1,200 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 device could get damaged.

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

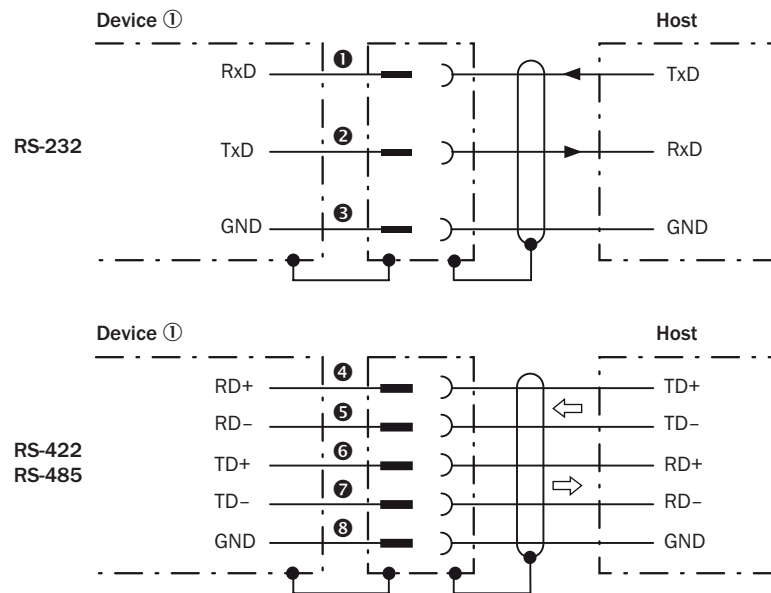


Figure 36: Wiring of the serial data interfaces RS-232 and RS-422/485

- ① Device
- ①...③ Pin assignment: see RS-232 pin assignment for the respective device
- ④...⑧ Pin assignment: See RS-422/485 pin assignment for the respective device



NOTE

Activate the serial data interface type in the device using a configuration tool, e.g. the SOPAS ET configuration software.

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

Connection module	Data interface	Reference
CDB650-204	RS-232	see "Wiring serial host interface RS-232 of the device in CDB650-204", page 104
	RS-422	see "Wiring serial host interface RS-422 of the device in CDB650-204", page 105
	RS-485	see "Wiring serial host interface RS-485 of the device in CDB650-204", page 106
CDM420-0006	RS-232	see "Connecting serial host interface RS-232 of the device in CDM420-0006", page 117
	RS-422	see "Connecting serial host interface RS-422 of the device in CDM420-0006", page 118
	RS-485	see "Wiring serial host interface RS-485 of the device in CDM420-0006", page 119

Termination of the RS-422/485 data interface

Termination can be implemented in the connection module via switches.

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

6.10 Wiring the CAN interface



NOTE

Activate the CAN data interface in the device with a configuration tool, e.g. the configuration software SOPAS ET.

Make further settings in the device corresponding to the function of the device in the system configuration.

Wiring the CAN interface of the device via a connection module:

Connection module	Interface	Reference
CDB650-204	CAN	see "Wiring the CAN interface in the CDB650-204", page 107
CDM420-0006	CAN	see "Wiring the CAN interface in the CDM420-0006", page 120

6.11 Wiring the digital switching inputs

Physical switching inputs on the device

The two physical digital switching inputs "Sensor 1" and "Sensor 2" can, for example, be used for starting and/or ending the read cycle, or for feeding an incremental signal.

The full complement of digital switching inputs is available in each case:

- at the male connector of the device (M12, 17-pin, A-coded)
- at the adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- at the open end of the adapter cable (female connector, M12, 17-pin, A-coded / open end)

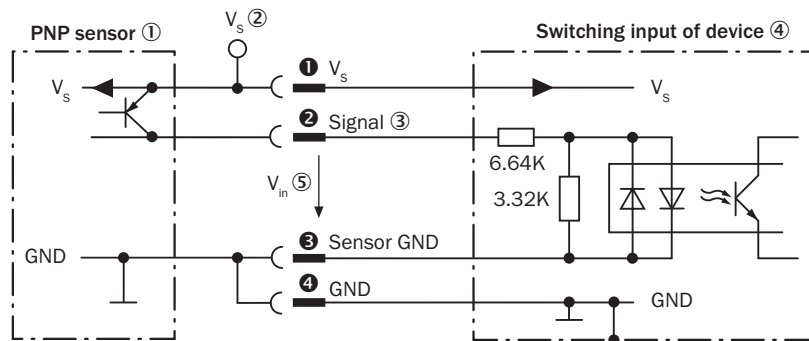


Figure 37: Wiring a digital switching input

- ① Trigger sensor (PNP sensor)
- ② Supply voltage V_s ($V_s = U_V$)
- ③ Input signal
- ④ Switching input of the device ("Sensor 1" or "Sensor 2")
- ⑤ Input voltage V_{in} ($V_{in} = U_e$)
- ①... ④ For pin assignment, see respective device

Table 15: Characteristic data of the digital switching inputs "Sensor 1" and "Sensor 2"

Switching behavior	Power to the input starts the assigned function, e.g. start of the internal reading interval of the device Default: active high, debounce time: 10 ms (standard)
--------------------	--

Properties	<ul style="list-style-type: none"> • Opto-decoupled, reverse polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	The electrical values are identical for all digital switching inputs. Low: $V_{in} \leq 2 \text{ V}$; $I_{in} \leq 0.3 \text{ mA}$ High: $6 \text{ V} \leq U_e \leq 32 \text{ V}$; $0.7 \text{ mA} \leq I_e \leq 5 \text{ mA}$

Extension: additional logical switching inputs in the device for physical “external” digital switching inputs on the optional connection module

Thanks to the optional CMC600 parameter cloning module in combination with the CDB or CDM connection module, the two digital switching inputs “External input 1” and “External input 2” are additionally available at the relevant terminals of the connection module.



NOTE

The external digital switching inputs are software-defined. This results in a delay of maximum 15 ms when transmitting the signal input at the CMC600 to the device.

Function assignment



NOTE

Assign the functions for the digital switching inputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

For electrical characteristic data of the two external digital switching inputs, see connection diagrams for the respective connection modules in these operating instructions.

Wiring the digital switching inputs of the device via a connection module:

Connection module	Digital switching inputs	Reference
CDB650-204	“SENS/IN 1” “SENS/IN 2”	see “Wiring digital switching inputs “Sensor 1” and “Sensor 2” of the device in the CDB650-204”, page 109
	External input 1 (“EXT. IN 1”) External input 2 (“EXT. IN 2”)	see “Wiring digital switching inputs “External input 1” and “External input 2” of the device in the CDB650-204”, page 111
CMD420-0006	“Sensor 1” “Sensor 2”	see “Wiring digital switching inputs “Sensor 1” and “Sensor 2” of the device in the CDM420-0006”, page 122
	External input 1 (“Aux In 1”) External input 2 (“Aux In 2”)	see “Wiring digital switching inputs “External input 1” and “External input 2” of the device in the CDM420-0006”, page 124

6.12 Wiring the digital switching outputs

Physical switching outputs on the device

The two physical digital switching outputs “Result 1” and “Result 2” are used to signal events in the read operation. Different functions can be assigned to them independently of each other for this purpose. If the assigned event occurs, then the corresponding switching output becomes live after the end of the read cycle for the selected pulse duration, for example (default).

The full complement of digital switching outputs is available in each case:

- at the male connector of the device (M12, 17-pin, A-coded)
- at the adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- at the open end of the adapter cable (female connector, M12, 17-pin, A-coded / open end)

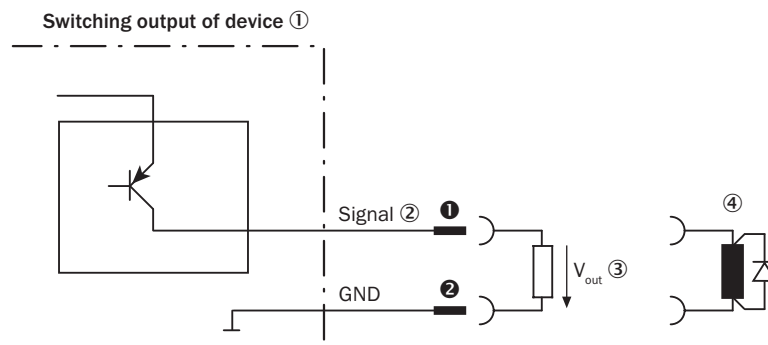


Figure 38: Wiring a digital switching output

- ① Switching output of the device (“Result 1” or “Result 2”)
- ② Output signal
- ③ Output voltage V_{out} ($V_{out} = U_a$)
- ④ With inductive load: see note
- ①... ② For pin assignment, see respective device

Table 16: Characteristic data of the “Result 1” and “Result 2” digital switching outputs

Switching behavior	PNP switching to supply voltage V_S Default: no function, logic: not inverted (active high)
Properties	<ul style="list-style-type: none"> • Short-circuit protected + temperature protected • Not electrically isolated from V_S
Electrical values	$0 \text{ V} \leq V_{out} \leq V_S$ $(V_S - 1.5 \text{ V}) \leq V_{out} \leq V_S$ for $I_{out} \leq 100 \text{ mA}$



NOTE

Provide an arc-suppression circuit at the digital switching output if an inductive load is present.

- Attach a freewheeling diode directly to the load for this purpose.

Extension: additional logical switching outputs in the device for physical “external” digital switching outputs on the optional connection module

Thanks to the optional CMC600 parameter cloning module in combination with the CDB or CDM connection module, the two digital switching outputs “External output 1” and “External output 2” are additionally available at the relevant terminals of the connection module.

Function assignment



NOTE

Assign the functions for the digital switching outputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

For electrical characteristic data of the two external digital switching outputs, see connection diagrams for the respective connection modules in these operating instructions.

Wiring the digital switching outputs of the device via a connection module:

Connection module	Digital switching outputs	Reference
CDB650-204	“RES/OUT 1” “RES/OUT 2”	see "Wiring the “Result 1” and “Result 2” digital switching outputs of the device in the CDB650-204 ", page 113
	External output 1 (“EXT. OUT 1”) External output 2 (“EXT. OUT 2”)	see "Wiring digital switching outputs “External output 1” and “External output 2” of the device in the CDB650-204”, page 114
CDM420-0006	“Result 1” “Result 2”	see "Wiring digital switching outputs “Result 1” and “Result 2” of the device in CDM420-0006", page 126
	External output 1 (“Aux Out 1”) External output 2 (“Aux Out 2”)	see "Wiring digital switching outputs “External output 1” and “External output 2” of the device in the CDM420-0006", page 127

7 Commissioning

7.1 Overview of the Commissioning Steps

The device is configured using a configuration tool. During initial commissioning, this is normally done using the SOPAS ET configuration software.

Other configuration tools are also available, for example a web server or command strings, depending on the task. For more information, see ["Operating options and configuration tools"](#), page 79.

Procedure

- Install the SOPAS ET configuration software and the required device description file on a PC or laptop.
- Electrically connect the device to the PC or laptop.
- Commission the device with the help of the "Quickstart" function in SOPAS ET using the default factory settings and the similarly named Quick Start Guide, a printed copy of which is enclosed with the device.
- Perform a manual fine adjustment and configuration of the device to optimize the functionality for the specific reading and writing situation on site.
- Test the device for correct functioning in real reading and writing operation.

7.2 SOPAS ET configuration software

The SOPAS ET configuration software is the standard tool used to configure the device for the specific reading and writing situation on site. The optimal configuration data for the device are permanently saved to the device by the user. The data can also be stored on the PC as a parameter set (project file) for archiving purposes.

The device can also permanently access the parameter set from an optional external storage medium. This makes it easier to replace the device if necessary. microSD memory cards, or the CMC600 parameter cloning module in the CDB or CDM connection module are available for this purpose. For more information, see ["Initial commissioning"](#), page 73.

7.2.1 Device-related functions of the SOPAS-ET configuration software (overview)



NOTE

The general functions of the software and its user interface are described in the SOPAS ET manual in the SOPAS ET configuration software.

- Selecting the menu language
- Setting up communication with the device
- Password-protected configuration for different operating levels
- ...

The SOPAS ET configuration software provides the following functions, amongst others, relating to the device:

- Quickstart function with continuous read cycle triggering to demonstrate the transponder recognition and data display
- Access to the transponder content (reading and writing)
- Management of device apps (log levels)
- Assistant for targeted configuration of the transponder read operation (Single Tag ID Wizard)
- Recording of device and communication data during operation via the diagnostics log file output
- System diagnostics

7.2.2 Installing SOPAS ET and the device description file

**NOTE**

Depending on the situation on site, administrator rights may be required on the PC to install the software. The PC must provide a functioning Internet connection.

**NOTE**

The SOPAS ET configuration software, the current system prerequisites for installing the software on the PC, and downloading instructions can be found online at:

www.sick.com/SOPAS_ET

1. Electrically connect one of the data interfaces of the device to the PC.
Recommended: Ethernet or USB interface
2. Switch on the supply voltage for the device.
3. Start the PC.
4. Download and install the following components as per the instructions on the product page of the software:
 - a) Current version of the SOPAS ET configuration software.
In this case, select the “Complete” option as suggested by the installation wizard.
 - b) Required current device description file (*.sdd) for the device
5. If the installation of the configuration software does not start automatically, run setup.exe in the download folder.
6. Follow the operating instructions to complete the installation.

7.3 Starting the SOPAS ET configuration software and connecting it to the device

1. Start the “SOPAS ET” program option after completing the installation.
Path: Start > Programs > SICK > SOPAS ET Engineering Tool > SOPAS.
By default, the software automatically searches for connected devices via the Ethernet, USB, and IO-Link interface.
2. Establish a connection between SOPAS ET and the device using the automatically launched wizard. Access via the Ethernet interface.
To do so, select the relevant device in the list of available devices (default Ethernet address: IP address: 192.168.0.1, subnet mask: 255.255.255.0).
- ✓ SOPAS ET establishes communication with the device and loads the associated device description file. The **Quickstart** tab opens.

7.3.1 Quickstart with default settings

The purpose of the “Quickstart” function in the SOPAS ET configuration software is to make it simple and easy to obtain first transponder read results using the device. This mode displays all compatible transponders within the sensing range of the read/write device based on the current device settings.

**NOTICE**

Quickstart mode is not intended to be used during normal operation. It requires read cycle triggering to be configured in the object trigger control settings in SOPAS ET.

To use Quickstart, all mounting and electrical installation work must be complete (see the relevant chapters in these operating instructions).



NOTE

The procedure for using the Quickstart function in the SOPAS ET configuration software is described in the device-specific Quick Start Guide. A printed copy of this guide is enclosed with the device. The Quick Start Guide can also be found online at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

RFU63x

The procedure described in the Quick Start Guide is based on the RFU63x-13100 or RFU63x-04100 device variant (region assignment of both: Europe) and the default settings. The permissible ambient temperature range is 0 °C to +60 °C.

For temperatures below 0 °C, see the relevant instructions in the “Mounting” and “Electrical installation” chapters of these operating instructions.

RFU65x

The procedure described in the Quick Start Guide is based on the RFU65x-10100 device variant (region assignment: Europe) and the default settings. The permissible ambient temperature range is 0 °C to +60 °C.

For temperatures below 0 °C, see the relevant instructions in the “Mounting” and “Electrical installation” chapters of these operating instructions.

7.4 Initial commissioning

The device is adjusted to the application situation on site using the SOPAS ET configuration software on the PC. The default factory settings of the device are the starting point for this. Their parameter values (configuration data) can be adapted in the working memory of the device for optimization purposes. To do so, the user creates an application-specific parameter set using the SOPAS ET configuration software, or modifies the parameter set at a later time as required. He then loads the current parameter set to the permanent parameter memory of the device.

Memory organization for parameter set

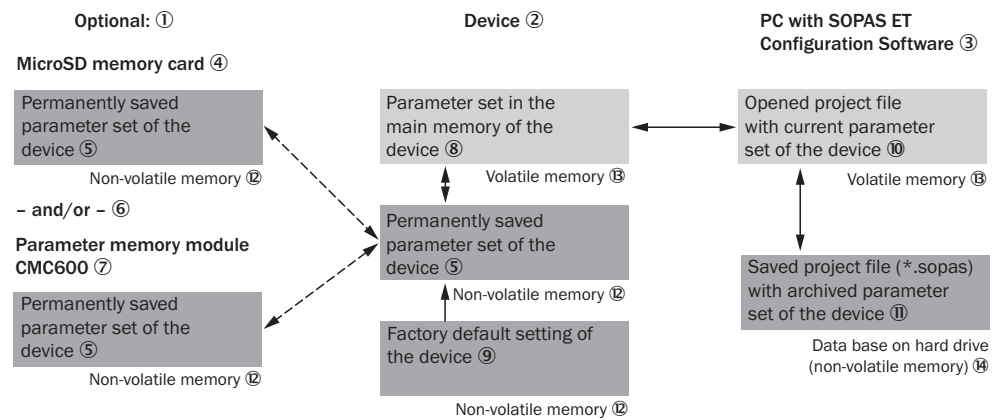


Figure 39: Saving the parameter set and configuration using SOPAS ET

- ① Optional
- ② Device
- ③ PC with SOPAS ET configuration software
- ④ MicroSD memory card
- ⑤ Permanently saved device parameter set
- ⑥ and/or

- ⑦ CMC600 parameter cloning module
- ⑧ Parameter set in the working memory of the device
- ⑨ Factory-set defaults for the device
- ⑩ Opened project file with current device parameter set
- ⑪ Saved project file (*.sopas) with archived device parameter set
- ⑫ Nonvolatile memory
- ⑬ Volatile memory
- ⑭ Data base on the hard drive (non-volatile memory)



NOTE

As part of a data backup plan, we recommend also saving the current parameter set outside the device memory. This makes it easier, if necessary (device failure, etc.), to restore, to a replacement device of the same type, the current parameter set used to date.

External data backup: option 1

To back up the data outside the device memory, the current parameter set can be **manually** saved to the PC as a project file (*.sopas file with configuration data) thereby archiving the data. This is the generally recommended procedure!

External data backup: option 2

The prerequisite for automatically backing up the current parameter set data outside the device memory is to have an additional, external storage medium. The device can optionally be permanently connected to an external parameter memory for this purpose.

This can be achieved in one of the following ways:

- a) By inserting a microSD memory card with sufficient storage capacity into the device
- b) By connecting a CDB or CDM connection module to the device. The connection module is equipped with a CMC600 parameter cloning module. The CMC600 can be used in a CDB650-204 or CDM420-0006 connection module.
- c) By connecting the device to a CDF600 fieldbus module and operating it in proxy mode.
- d) If necessary, by using a combination of a) plus b) or c)

Operating principle

The user saves the current parameter set to the permanent parameter memory of the device using the “permanent” option. The device then **automatically** also saves the parameter set to an external, permanent parameter memory. Depending on the configuration, this could be either to a memory card, in the CMC600, in the CDF600 or, when using one of the supported combinations, in both storage media (see above).

At each restart after being switched on, the device automatically loads the compatible parameter set from the external storage medium into its working memory and into its internal, permanent parameter memory. The parameter set is loaded either from a memory card or, depending on the configuration, from the CMC600 or CDF600.



NOTE

When using both a memory card and CMC600 or CDF600, the device will preferentially load the parameter set from the CMC600 or CDF600.

In the event of device failure, for example, this approach enables the device to be quickly and easily replaced with another device of the same type provided the above prerequisites have been met. This is achieved without any loss of configuration data, and without having to connect the PC to the SOPAS ET configuration software.

Memory card



NOTE

Only use types approved by SICK to ensure reliable function of the memory card. You can find these as accessories online at:

- www.sick.com/RFU63x
 - www.sick.com/RFU65x
-

8 Operation

8.1 Operating and status indicators

8.1.1 Optical status indicators on the display panel

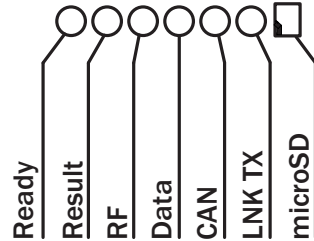


Table 17: RFU63x/RFU65x: Function of the status indicators

Display	LED	Color	Status
Ready	Flashing	Yellow	Flash frequency 1 Hz. The device is not ready for use: Interior temperature of the device below -25 °C (-30 °C).
	Flashing	Green	Flash frequency 1 Hz. The device is in the warm-up phase and is not yet operational. For ambient temperatures below -20 °C: Interior temperature of the device between -30 °C and -20 °C. After an approx. 2 min warm-up phase, the device starts regular operation.
	Lights up	Green	Device ready
	Lights up	Red	Hardware fault
	Flashing	Green	PROFINET operation (single port): LEDs flash cyclically 4 x red, 1 x green: Trying to establish a connection to a PLC (I/O controller) or loss of connection during operation.
	Flashing	Red	
Result	Lights up	Green	Read or write successful
RF	Lights up	Green	UHF field activated
	Lights up	Red	RFU63x: External antenna(s) faulty. Possible causes: All antennas deactivated, or reflected, received power too high. When additional external antenna(s) used: Activated in the device, but not connected or cable defective. RFU65x: Internal antenna or HF part faulty. Error, for example reflected, received power too high.
Data	Lights up	Green	Data output via host interface
CAN	Lights up	Yellow	Data traffic via CAN bus (CAN RX)
LNK TX	Lights up	Green	Data traffic via Ethernet

Display	LED	Color	Status
microSD	Lights up	Green	microSD card inserted and ready for operation. In this state, the device can either write data to the card or read data from the card. If the LED lights up, however, this does not indicate that the device is actually accessing the card.
	Lights up	Red	microSD card inserted, but cannot be read or is defective.
	Lights up	Yellow	The use of the microSD card in connection with a device function has been manually configured via the “SD card required” tab in SOPAS ET. The card is not operational, however.

1) For firmware version V2.02 or higher.

8.1.2 Optical “process feedback” status indicator

The process feedback status indicator uses a single LED that is located in the middle of the antenna cover.

The behavior of the indicator (color, brightness, activation condition) can be configured by the user.

The user can select from the following activation conditions:

- Successful transponder handling process. The process consists of: trigger and subsequent read, if applicable also writing of transponder data.
- External SOPAS ET command, script
- A pre-defined or user-defined evaluation condition has occurred.



NOTE

Select the activation condition and brightness using a configuration tool, for example the SOPAS ET configuration software. This indicator can also be deactivated.

Operating mode: Quickstart

This operating mode for detecting transponders in the UHF field is intended for demonstration purposes and for getting familiar with the operation of the device. In this mode, the device automatically generates continuous read cycles. Contrary to normal read operation (targeted read cycle triggering), the status indicator provides continuous feedback on the success of the transponder detection.

Table 18: Function of the “process feedback” status indicator in Quickstart mode

Color	Behavior	Status
Blue	Lights up at half brightness	UHF field present
Blue	Flashes at full brightness: Flashing slowly (f = 1.25 Hz)	1 transponder in field
	Flashing quickly (f = 2.5 Hz)	2 transponders in field
	Flashing faster (f = 5 Hz)	More than 2 transponders in field

The color of the indicator, and the brightness of the status indicator in Quickstart mode cannot be modified.

**NOTICE**

Quickstart mode is not intended to be used during normal operation. It requires read cycle triggering to be configured in the object trigger control settings in SOPAS ET.

Operating mode: Read mode

Table 19: Function of the “process feedback” status indicator in read mode

Color	Behavior	Status
Blue	Lights up for the duration of the in-progress reading interval	Read operation was started by an external or internal trigger source, device has started an internal reading interval (event)
Green	Lights up briefly	Device has ended the internal reading interval. Transponder detected and optionally selected condition(s) met -> Good Read (event)
Red	Lights up briefly	Device has ended the internal reading interval. Transponder not detected or optionally selected condition(s) not met -> No Read (event)
RFU65x only: Direction of movement of the transponder in the UHF field		
Cyanogen	Lights up briefly	Direction of passage: from plus (+) to minus (-)
Pink	Lights up briefly	Direction of passage: from minus (-) to plus (+)

Indicator trigger source during read mode: combination of “Reading Interval/Good Read/No Read” (default)

8.1.3 Audible status indicator (beeper)

The beeper (buzzer) can be activated with the SOPAS ET configuration software and its reporting behavior can be configured.

Depending on the operating mode of the device, the beeper uses different tone sequences (melodies), lengths or individual sounds to indicate the following results:

- Fulfillment/non-fulfillment of a configured condition in read operation
- The completion of device functions started by the user using operating keys or ended by quitting (confirmation of operation steps)
- Completion of the processing of received commands (positive or negative confirmation)

Beeper default settings:

Volume: Off, quiet (default), loud.

Read operation: “Good read” output result (device has detected the transponder in the UHF field and read out the UHF).

The sound outlet of the beeper is located under the cover film to the right next to the label of the display field, [see "Device view", page 17](#) .

8.1.4 Function buttons

The two Step ▼ and Enter function keys ◀ currently have no function.

8.1.5 Operating options and configuration tools



NOTE

In addition to the existing operating instructions, the use of the RFU parameter description is recommended. This document explains the UHF-RFID-specific parameters of all device variants of the RFU6xx product family at the "Service" user level.

The parameter description supports the user in configuring applications with the SOPAS ET configuration software.

The parameter description is available in English (part no. 8023085) and German (part no. 8023084) as well as other languages if required.

The RFU parameter description can be found on the online product page at:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

The device can be operated and configured in the following ways depending on the task:

1. SOPAS ET configuration software

- Standard configuration tool for the device
- The configuration software and appropriate device description file need to be installed on the PC or laptop. These are available online at: www.sick.com/SOPAS_ET
- Password-protected configuration at four different operating levels (user levels):
 - 1 Run (no entry of password required), no configuration possible
 - 2 Maintenance (entry of password required)
 - 3 AuthorizedClient (entry of password required)
 - 4 Service employee (entry of password required)

The two user levels "Run" and "Maintenance" are only password protected if the "Parameterization is password-protected" parameter in SOPAS ET is activated. By default, logging into the device accesses the "AuthorizedClient" user level and entry of a password is not required in this case.
- Type-dependent access via a local data interface on the device or via the Ethernet network.
- Backup of the parameter set to a location outside the device memory:
 - Manually to a configuration file on the PC, or
 - Semi-automatically to optional external storage media (microSD memory card or CMC parameter cloning module).
- Access to the device via the Aux or host interface
- Organization of the device constellation into projects (stand-alone device or group of devices via a CAN network)
- The SOPAS ET configuration software is used for device diagnostics in case of a fault.
- Supported firmware updates for the device

2. Integrated SOPASair web server

- No installation of configuration software required, an Internet-capable HTML browser is sufficient. Access to the device by entering an IP address.
- No administrator rights required, no firewall restrictions.
- Web server runs directly on the device being contacted (embedded in the firmware).
- Access only via the Ethernet interface and by entering the IP address of the device.
- Access locally on the device or via the network.
- Used to configure a stand-alone device.
- Password-protected configuration at four different operating levels (user levels):
 - 1 Run (no entry of password required), no configuration possible
 - 2 Maintenance (entry of password required)

- 3 AuthorizedClient (entry of password required)
- 4 Service (entry of password required)
- Has limited functionality compared to the SOPAS ET configuration software. The functionality of the web server depends on the firmware version of the device.

3. Command strings (telegrams)

- Command strings (CoLa) are used to configure device parameters and trigger device functions (e.g. reading).
- Command strings can be inputted in telegram style at one of the available data interfaces (Aux or host interface) of the device. The telegram response of the device to the command is always sent to the interface on which the telegram was received. In contrast to this, the read result data can be outputted to all data interfaces except for the USB interface.
- The communication between the SOPAS ET configuration software and the device can be monitored and recorded via the terminal emulator in SOPAS ET. Commands can also be sent to the device. For more details on using the terminal, see the SOPAS ET manual.
- Documents listing and describing the available commands strings can be obtained from SICK on request.



NOTICE

Both the command strings and the SOPAS ET configuration software are based on a command language that has direct access to the command interpreter of the device. The command language must be used with care, as the commands received by the device are executed immediately.

Parameter values modified by means of commands are initially only active in the current parameter set in the volatile working memory of the device. To permanently save the modified parameter set, it needs to be copied to the non-volatile parameter memory using the relevant command. This ensures the changes are not lost when the supply voltage to the device is switched off.

Any changes to the parameter values in the device made using command strings will only appear in the SOPAS ET configuration software after the following actions:

- An upload of the current parameter set from the device, or
- A synchronization between the device and SOPAS ET

4. Control software of a PLC controller

- The controller of a fieldbus (e.g. PLC) configures the device. For a PROFINET controller, for example, this is done via PROFINET by means of GSD parameterization. Backup of the parameter set as a configuration file in the PROFINET controller. The controller reconfigures the device at every PROFINET restart.
- Integrating the device into the most important fieldbus systems is made simpler with SICK function blocks for the relevant bus controller. See the “Downloads / Software” section online at:
 - www.sick.com/RFU63x
 - www.sick.com/RFU65x
- Function blocks based on command strings (CoLa).

5. SICK AppStudio development environment

- Used, for example, to implement user-specific data output protocols for the device. Based on functionality already pre-installed in the programmable device.
- The app programmed using SICK AppStudio is loaded onto the device as a sensor app.
- More information is available online at: www.sick.com/SICK_AppStudio

9 Maintenance

9.1 Maintenance

During operation, the device works maintenance-free.

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

Table 20: Maintenance schedule

Maintenance work	Interval	To be carried out by
Clean the front plates of the device and external antennas, e.g., of metal dust	Cleaning interval depends on ambient conditions and climate.	Specialist
Check screw connections and plug connectors	Interval depends on the place of use, ambient conditions, or operational regulations. Recommended: At least every 6 months.	Specialist
Check that the unused connections are sealed with protective caps or plugs	Interval depends on ambient conditions and climate. Recommended: At least every 6 months.	Specialist

9.2 Cleaning



NOTICE

Equipment damage due to improper cleaning.

Improper cleaning may result in equipment damage.

- Only use recommended cleaning agents.
 - Never use sharp objects for cleaning.
-
- ▶ In case of contamination (e.g., by metal dust), carefully clean the front panel of the device and, if applicable, the front panels of any external antennas using a soft, damp cloth (with a mild cleaning agent) to ensure the full read and write speed is maintained.
 - ▶ The device must be cleaned regularly from the outside to guarantee heat dissipation and therefore operation. Particular attention must be paid to ensure that the cooling fins are free from dust and dirt. Clean using a dry towel or an industrial vacuum cleaner. Do not use cleaning agents.

10 Troubleshooting

10.1 Overview of Potential Errors and Faults



WARNING

Risk of injury due to damage to the device

For reasons of safety, if a device shows visible signs of damage do not put it into operation, or take it out of operation immediately.

Damage includes, for example:

- Housing: Cracked or broken
- Electrical connections: cracks or detachment from the housing
- Device with fixed cable: Damage to the cable outlet or cable itself

Table 21: Errors and faults

Situation	Error/ fault
Mounting	<ul style="list-style-type: none"> ■ Device poorly aligned to the objects with transponders (e.g. faults due to metal surfaces located next to the device) ■ Damping materials between the device and transponders, e.g. liquids ■ Trigger sensor for read cycle generation incorrectly positioned (e.g. the internal reading interval of the device is started too early or ended too late).
Electrical installation	<ul style="list-style-type: none"> ■ Supply voltage too low or incorrect polarity ■ Data interfaces of the device wired incorrectly ■ Switching inputs or outputs wired incorrectly
Configuration	<ul style="list-style-type: none"> ■ Functions not adapted to local conditions, e.g. parameters for the data interface not set correctly ■ Device limits not observed, e.g. working range of the antenna ■ Settings for the filter or Tag Select not suitably selected ■ Trigger source for read-cycle not selected correctly
Operation	<ul style="list-style-type: none"> ■ Ambient temperature too low or high ■ Read pulse control not suitably configured for the object(s) in the working range. ■ Device faults (hardware/ software)

10.2 Detailed fault analysis

10.2.1 LEDs on the device

The status indicators of the device can alert you to possible errors or faults, see "[Optical status indicators on the display panel](#)", page 76. Further information on this can be found in the "System Information" section.

10.2.2 System information

The device reports any errors that occur in a number of ways. Fault output is staggered, allowing for an increasingly detailed level of analysis:

- Communication errors can occur when transmitting telegrams (e.g. commands) to the data interface of the device. The device then returns a fault code on the same data interface.
- For faults that occur during reading, the device writes fault codes in the status log (see "[Status log](#)", page 83).

10.3 Status log

**NOTE**

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

The device distinguishes between four types of fault:

- Information
- Warning
- Fault
- Critical fault

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

10.3.1 Displaying the Status Log

To display the status log, the SOPAS ET configuration software must be connected with the device online.

1. Connect the SOPAS ET configuration software to the device.
2. In the RFU6xx project tree open: Service > System Status.

10.4 SICK service

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

The device may not be repaired by the user. Interference with or modification of 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 agency, see the final page of this document.

**NOTE**

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

10.5 Repairs

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

10.6 Returns

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

**NOTE**

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

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

10.7 Replacing the device

10.7.1 Reusing the current configuration data

The configuration data of the device is combined as a parameter set. The replacement device saves the parameter set to the permanent parameter memory.

The current configuration data of the device to be replaced can be transferred to a replacement device in four ways.

Prerequisites:

- The replacement device is a device of the same type
- The current configuration data for the device to be replaced is accessible in a storage medium outside the device memory

The available options depend on the backup plan chosen by the user back at the time of installation, and the configuration of the device now needing to be replaced.

The first three methods are performed semi-automatically by the device depending on the setup. The fourth method is performed manually by the user.

1 **Transfer of the current configuration data using the optional memory card removed from the device to be replaced.**

It is not necessary to connect a PC or laptop with the SOPAS ET configuration software for transfer to the replacement device.

Prerequisite:

If there is sufficient memory capacity on the memory card, the configuration data from the last permanent save operation in the device using the “Permanent” option was automatically saved on the card.

2 **Transfer of the current configuration data using the optional CMC600 parameter cloning module in the optional CDB or CDM connection module.**

It is not necessary to connect a PC or laptop with the SOPAS ET configuration software for transfer to the replacement device.

Prerequisite:

The device to be replaced was continuously operated in conjunction with a CMC600 parameter cloning module in the connection module. If both a memory card and a CM600 parameter cloning module are present, the configuration data in the CMC600 parameter cloning module have higher priority.

3 **Transfer of the current configuration data using the parameter memory in the optional CDF600 bus connection module.**

It is not necessary to connect a PC or laptop with the SOPAS ET configuration software for transfer to the replacement device.

Prerequisite:

The device to be replaced was continuously operated in proxy mode on the CDF bus connection module. If a memory card and a bus connection module are present, the configuration data in the CDF bus connection module has higher priority.

4 **Transfer of the current configuration data by means of a download from the PC or laptop.**

Prerequisite:

The configuration data of the device was stored on the PC or laptop. This took place on completion of configuration of the device that is now to be replaced with the SOPAS ET configuration software after confirmation by the user.



NOTE

Further information [see "Initial commissioning", page 73](#)

10.7.2 Removing the device to be replaced



NOTICE

Risk of damage to the memory card

To avoid damaging an optional memory card that may be present in the device, make sure there is no power to the device when you remove or insert it.

1. Switch off the supply voltage to the device that is to be replaced.
2. Mark the position and alignment of the device on the bracket or surroundings.
3. Disconnect and remove all connecting cables from the device.
4. Detach the device and remove from the bracket.
5. Backed-up configuration data: if an optional memory card was installed in the device, remove the memory card with the backed-up parameter set. The memory card is located behind the side cover, see ["Device view"](#), page 17

10.7.3 Putting the replacement device into operation

1. Backed-up configuration data: take the optional memory card from the device being replaced and install it in the replacement device of the same type.
2. Mount and align the replacement device (see ["Mounting"](#), page 31). When doing so, note the previously applied markings on the bracket or surroundings.
3. Reconnect the connecting cables to the replacement device (see ["Electrical installation"](#), page 40).
4. Switch on the supply voltage for the replacement device.
The device starts with the default setting and searches for external memory media with a valid parameter set. If the device detects storage media with a valid parameter set, it does the following:
 - Memory card in the device only:
the replacement device loads the parameter set on the memory card
 - Memory card in the device and CM600 parameter cloning module in the CDB/CDM connection module: the replacement device loads the parameter set from the CM600 parameter cloning module
 - Memory card in the device and CDF bus connection module: the replacement device loads the parameter set from the CDF bus connection module
 The replacement device loads the parameter set into its permanent memory and operates according to the configuration data in the parameter set.
5. If the replacement device does not detect any external storage media, it will start with its last permanently stored parameter set. In the case of devices that have not been used before, this corresponds to the factory default setting.
 - ▷ Establish a connection to the replacement device using the SOPAS ET configuration software. Transfer the configuration data of the device to be replaced, which was previously saved to the PC, by downloading it to the replacement device and permanently storing it there.

11 Decommissioning

11.1 Disposal

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



NOTICE

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

Disposing of devices improperly may cause damage to the environment.

Therefore, observe the following information:

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

12 Technical data



NOTE

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

- www.sick.com/RFU63x
- www.sick.com/RFU65x

These operating instructions provides additional technical data if required.

12.1 Technical data RFU63x

12.1.1 Features

Table 22: Technical data for RFU63x-131xx: Features

	RFU63x-131xx
Version (Working area)	Long range
Product category	RFID read/write device (UHF) with internal antenna
Frequency band	UHF (860 MHz ... 960 MHz)
Radio equipment approval (Regional assignment)	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU63x
Carrier frequency	
Transmission output power	
RFID standard (air interface)	EPCglobal UHF Class 1 Generation 2, ISO/IEC 18000-6C Labeling in type code: RFU6x0-xxxx
Modulation	PR-ASK, DSB-ASK
Connection type	Ethernet
MTBF	14 years ¹⁾
Scanning range	≤ 10 m ^{2) 3)}
Antenna	Internal antenna <ul style="list-style-type: none"> • Circularly polarized • Maximum 9 dBic gain • Axis behavior typically < 2 dB • Aperture angle 72° • Front-to-back ratio, typically > 17 dB External antennas <ul style="list-style-type: none"> • Maximum 3 external antennas, mono-static, up to +30 dBm, adjustable Transmitting power of all antennas can be set separately
Service functions	Optional, semi-automated saving of parameter data (parameter cloning) outside the device memory: <ul style="list-style-type: none"> • Using insertable microSD memory card ⁴⁾ in the device • Using parameter cloning module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module⁴⁾ • Externally in CDF fieldbus module⁴⁾
Clock	Network time protocol (NTP), no internal clock
Conformities	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU63x

	RFU63x-131xx
Certificates	Type-dependent. See “Downloads” section online at: www.sick.com/RFU63x UL: RFU630-13101 (USA and Canada) ⁵⁾

- 1) Continuous operation at an ambient operating temperature of +50 °C.
- 2) Depending on transponder used and ambient conditions
- 3) Also depending on the any additionally used external antenna(s).
- 4) Optional accessories.
- 5) UL-certified if the type label contains the UL logo and the UL conditions are met during device operation. For further information, see "Certification according to UL61010-1", page 98.

Table 23: Technical data for RFU63x-041xx: Features

	RFU63x-041xx
Version (Working area)	Long range
Product category	RFID read/write device (UHF) without internal antenna
Frequency band	UHF (860 MHz ... 960 MHz)
Radio equipment approval (Regional assignment)	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU63x
Carrier frequency	
Transmission output power	
RFID standard (air interface)	EPCglobal UHF Class 1 Generation 2, ISO/IEC 18000-6C Labeling in type code: RFU6x0-xxxx
Modulation	PR-ASK, DSB-ASK
Connection type	Ethernet
MTBF	14 years ¹⁾
Scanning range	≤ 10 m ²⁾
Antenna	Only external antennas <ul style="list-style-type: none"> • Maximum 4 external antennas, mono-static, each up to +30 dBm, adjustable • Transmitting power of all antennas can be set separately
Service functions	Optional, semi-automated saving of parameter data (parameter cloning) outside the device memory: <ul style="list-style-type: none"> • Using insertable microSD memory card ³⁾ in the device • Using parameter cloning module CMC600 ³⁾ in the CDB ³⁾ or CDM connection module³⁾ • Externally in CDF fieldbus module³⁾
Clock	Network time protocol (NTP), no internal clock
Conformities	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU63x
Certificates	Type-dependent. See “Downloads” section online at: www.sick.com/RFU63x

- 1) Continuous operation at an ambient operating temperature of +50 °C.
- 2) Depending on the transponders used, the external antenna(s) and the ambient conditions.
- 3) Optional accessories.

12.1.2 Interfaces

Table 24: Technical data for RFU63x-131xx: Interfaces

	RFU63x-131xx
Ethernet	Host for data output (read result) Aux for service ¹⁾ Protocol: TCP/IP Data transmission rate 10/100 Mbit/s Supported services and protocols (e.g. DHCP, HTTP/HTTPS ...), see type-specific online data sheet at: www.sick.com/RFU63x
PROFINET ²⁾	PROFINET single port PROFINET dual port: Via external fieldbus module CDF600-22xx ⁴⁾ to PROFINET (2-port Ethernet) for data output (read result). Data transmission rate 10/100 Mbit/s
EtherNet/IP™	Data transmission rate 10/100 Mbit/s
EtherCAT® ²⁾	Via external fieldbus module CDF600-0300 ⁴⁾ (gateway mode) to EtherCAT® (Ethernet) for data output (read result)
Serial	RS-232, RS-422/485 Host for data output (read result) Aux (only RS-232) for service ¹⁾ Data transmission rate: 0.3 kBd ... 115.2 kBd, Aux: 57.6 kBd
CAN	Host, data transmission rate: 20 kBit/s ... 1 MBit/s. Bus length depends on data transmission rate and length of cable. Typical: 250 m at 250 kBit/s and wire cross-section $\geq 0.34 \text{ mm}^2$ Protocols: <ul style="list-style-type: none"> • CSN (SICK CAN sensor network) • CANopen®
PROFIBUS ²⁾	Via external fieldbus module CDF600-21xx ⁴⁾ to PROFIBUS (RS-485) for data output (read result)
USB ³⁾	Aux (USB 2.0) for service ¹⁾
Digital switching inputs	2 x physical. Optional 2 x additional external logical inputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{in} = \text{max. } 30 \text{ V}$, $I_{in} = \text{max. } 5 \text{ mA}$ Opto-decoupled, reverse polarity protected, adjustable debounce time
Digital switching outputs	2 x physical. Optional 2 x additional external logical outputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{out} = V_S - 1.5 \text{ V}$, $I_{out} \leq 100 \text{ mA}$ (typical) Short-circuit protected, temperature protected, not electrically isolated from the supply voltage
Antenna	Sending and receiving 1 x internal, 3 x external
Optical indicators	7 x RGB LEDs (status indicators) on front top 1 x RGB LED (process feedback) in front center Display function can be set with pre-defined color assignment ⁵⁾ .
Acoustic indicator	Beeper (buzzer), can be deactivated. Function for event signaling and volume adjustable ⁵⁾
Operating elements	2 x pushbuttons (select and start/stop functions)
Configuration	SOPAS ET configuration software, CoLa commands (telegrams), web server, fieldbus controller (PLC) with additional support by SICK function blocks

	RFU63x-131xx
Programming	Application-specific programming with SICK AppStudio ⁶⁾ development environment. You can find further information on the Internet at: www.sick.com/SICK_AppStudio

- 1) For example: Configuration, diagnosis, transponder access or display of the read results.
- 2) Function blocks for various PLC manufacturers are available online at: www.sick.com/RFU63x.
- 3) USB interface only for temporary use (service)
- 4) Optional accessories.
- 5) e.g. with SOPAS ET configuration software.
- 6) Functions can be enabled with the SDK6U SD card. Available at: www.sick.com

Table 25: Technical data for RFU63x-041xx: Interfaces

	RFU63x-041xx
Ethernet	Host for data output (read result) Aux for service ¹⁾ Protocol: TCP/IP Data transmission rate 10/100 Mbit/s Supported services and protocols (e.g. DHCP, HTTP/HTTPS ...), see type-specific online data sheet at: www.sick.com/RFU63x
PROFINET ²⁾	PROFINET single port PROFINET dual port: Via external CDF600-22xx ⁴⁾ fieldbus module to PROFINET (2-port Ethernet) for data output (read result). Data transmission rate 10/100 Mbit/s
EtherNet/IP™	Data transmission rate 10/100 Mbit/s
EtherCAT® ²⁾	Via external fieldbus module CDF600-0300 ⁴⁾ (gateway mode) to EtherCAT® (Ethernet) for data output (read result).
Serial	RS-232, RS-422/485 Host for data output (read result) Aux (only RS-232) for service ¹⁾ Data transmission rate: 0.3 kBd ... 115.2 kBd, Aux: 57.6 kBd
CAN	Host, data transmission rate: 20 kBit/s ... 1 MBit/s. Bus length depends on data transmission rate and length of cable. Typical: 250 m at 250 kBit/s and wire cross-section $\geq 0.34 \text{ mm}^2$ Protocols: <ul style="list-style-type: none"> • CSN (SICK CAN sensor network) • CANopen®
PROFIBUS ²⁾	Via external fieldbus module CDF600-21xx ⁴⁾ to PROFIBUS (RS-485) for data output (read result)
USB ³⁾	Aux (USB 2.0) for service ¹⁾
Digital switching inputs	2 x physical. Optional 2 x additional external logical inputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{in} = \text{max. } 30 \text{ V}$, $I_{in} = \text{max. } 5 \text{ mA}$ Opto-decoupled, reverse polarity protected, adjustable debounce time
Digital switching outputs	2 x physical. Optional 2 x additional external logical outputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{out} = V_S - 1.5 \text{ V}$, $I_{out} \leq 100 \text{ mA}$ (typical) Short-circuit protected, temperature protected, not electrically isolated from the supply voltage
Antenna	Sending and receiving 4 x external

	RFU63x-041xx
Optical indicators	7 x RGB LEDs (status indicators) on front top 1 x RGB LED (process feedback) in front center Display function can be set with pre-defined color assignment ⁵⁾ .
Acoustic indicator	Beeper (buzzer), can be deactivated. Function for event signaling and volume adjustable ⁵⁾
Operating elements	2 x pushbuttons (select and start/stop functions)
Configuration	SOPAS ET configuration software, CoLa commands (telegrams), web server, fieldbus controller (PLC) with additional support by SICK function blocks
Programming	Application-specific programming with SICK AppStudio ⁶⁾ development environment. You can find further information on the Internet at: www.sick.com/SICK_AppStudio

- 1) For example: configuration, diagnosis, transponder access or display of the read results.
 2) Function blocks for various PLC manufacturers are available online at: www.sick.com/RFU63x.
 3) USB interface only for temporary use (service)
 4) Optional accessories.
 5) e.g. with SOPAS ET configuration software.
 6) Functions can be enabled with the SDK6U SD card. Available at: www.sick.com

12.1.3 Mechanics and electronics

Table 26: Technical data for RFU63x-131xx: Mechanics/electronics

	RFU63x-131xx
Electrical connection	1 x male connector, M12, 17-pin, A-coded 1 x female connector, M12, 4-pin, D-coded 1 x female connector, USB, 5-pin, Micro-B type 3 x female connector, TNC reverse, mono-static, impedance 50 ohm
Supply voltage V_S	DC 18 V ... 30 V ^{1) 2)} DC 12 ... 30 V ³⁾ optional SELV in accordance with currently applicable standard EN 60950-1. UL-certified devices require a supply voltage in accordance with SELV - LPS according to UL/IEC/EN60950-1 or class 2 according to NEC, UL1310.
Power consumption	temperature: <ul style="list-style-type: none"> • < 20 W typical ⁴⁾ • Maximal 26 W ⁵⁾ Standby: 6 W typical
Housing	Aluminum die cast, polycarbonate
Housing color	Blue, black, silver
Cover for USB interface and SD memory card slot	Aluminum Can be removed for temporary access to USB interface and memory card slot. Recommended tightening torque for the cover screws: 40 Ncm ± 5 Nm.
Enclosure rating	IP67 (EN 60529:1991-10/A2:2000-02)
Protection class	III (EN 61140:2006-08)
Safety	EN 60950-1:2006-04/A11: 2009-03/A1: 2010-03/A12: 2011-02
Weight	Approx. 2.6 kg

	RFU63x-131xx
Dimensions (L x W x H)	239 mm x 239 mm x 64 mm ⁶⁾

- 1) When connected to the optional SICK CDB650-204 or CDM420-0006 connection module using a SICK cable.
- 2) When operated without a connection module using a SICK cable. 2 A fuse protection at the start of the feeding supply circuit.
- 3) When operated without a connection module using a SICK supply cable part no. 6048319 (2 x 2.5 mm², 10 m). 2.5 A fuse protection at the start of the feeding supply circuit.
- 4) At full transmitting power and unloaded switching outputs.
- 5) With a typical loading of the 2 switching outputs of 100 mA each and a 30 V DC supply voltage.
- 6) see "Device view", page 17.

Table 27: Technical data for RFU63x-041xx: Mechanics/electronics

	RFU63x-041xx
Electrical connection	1 x male connector, M12, 17-pin, A-coded 1 x female connector, M12, 4-pin, D-coded 1 x female connector, USB, 5-pin, Micro-B type 4 x female connector, TNC reverse, mono-static, impedance 50 ohm
Supply voltage V_s	DC 18 V ... 30 V ^{1) 2)} DC 12 ... 30 V ³⁾ optional SELV in accordance with currently applicable standard EN 60950-1. UL-certified devices require a supply voltage in accordance with SELV - LPS according to UL/IEC/EN60950-1 or class 2 according to NEC, UL1310.
Power consumption	temperature: <ul style="list-style-type: none"> • < 20 W typical ⁴⁾ • Maximal 26 W ⁵⁾ Standby: 6 W typical
Housing	Aluminum die cast, polycarbonate
Housing color	Blue, black, silver
Cover for USB interface	Aluminum Can be removed for temporary access to USB interface and memory card slot. Recommended tightening torque for the cover screws: 40 Ncm ± 5 Nm.
Enclosure rating	IP67 (EN 60529:1991-10/A2:2000-02)
Protection class	III (EN 61140:2006-08)
Safety	EN 60950-1:2006-04/A11: 2009-03/A1: 2010-03/A12: 2011-02
Weight	Approx. 2.1 kg
Dimensions (L x W x H)	239 mm x 197 mm x 40 mm ⁶⁾

- 1) When connected to the optional SICK CDB650-204 or CDM420-0006 connection module using a SICK cable.
- 2) When operated without a connection module using a SICK cable. 2 A fuse protection at the start of the feeding supply circuit.
- 3) When operated without a connection module using a SICK supply cable part no. 6048319 (2 x 2.5 mm², 10 m). 2.5 A fuse protection at the start of the feeding supply circuit.
- 4) At full transmitting power and unloaded switching outputs.
- 5) With a typical loading of the 2 switching outputs of 100 mA each and a 30 V DC supply voltage.
- 6) see "Device view", page 17.

12.1.4 Ambient data

Table 28: Technical data for RFU63x-131xx: Ambient data

	RFU63x-131xx
Electromagnetic compatibility (EMC)	EN 301489-3

	RFU63x-131xx
Vibration resistance	EN 60068-2-6:2008-02
Shock resistance	EN 60068-2-27:2009-05
Ambient operating temperature	-25 °C (-30 °C) ... +60 °C
Storage temperature	-30 °C ... +70 °C
Permissible relative humidity	0% ... 90%, non-condensing

1) For Firmware Version V2.02

Table 29: Technical data for RFU63x-041xx: Ambient data

	RFU63x-041xx
Electromagnetic compatibility (EMC)	EN 301489-3, EN 50121-4:2017
Vibration resistance	EN 60068-2-64:2008-02
Shock resistance	EN 60068-2-27:2009-05
Ambient operating temperature	-25 °C (-30 °C ¹⁾) ... +60 °C
Storage temperature	-30 °C ... +70 °C
Permissible relative humidity	0% ... 90%, non-condensing
Standards	EN 50125-3:2003 (railway applications)

1) For Firmware Version V2.02

12.2 Technical data RFU65x

12.2.1 Features

Table 30: Technical data for RFU65x: Features

	RFU65x-101xx
Version (Working area)	Long range
Product category	RFID read/write device (UHF) with internal antenna
Frequency band	UHF (860 MHz ... 960 MHz)
Radio equipment approval (Regional assignment)	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU65x
Carrier frequency	
Transmission output power	
RFID standard (air interface)	EPCglobal UHF Class 1 Generation 2, ISO/IEC 18000-6C Labeling in type code: RFU6x0-xxxxx
Modulation	PR-ASK, DSB-ASK
Connection type	Ethernet
MTBF	25 years ¹⁾
Scanning range	≤ 10 m ²⁾

	RFU65x-101xx
Antenna	Internal antenna <ul style="list-style-type: none"> • Transmitting power adjustable • Circularly polarized • Axis behavior typically 2 dB • Aperture angle vertical 80° / horizontal 55° • Front-to-back ratio, > 15 dB typical
Service functions	Optional, automated saving of parameter data (parameter cloning) outside the device memory: <ul style="list-style-type: none"> • Using insertable microSD memory card ³⁾ in the device • Using parameter cloning module CMC600 ³⁾ in the CDB ³⁾ or CDM connection module³⁾ • Externally in CDF fieldbus module³⁾
Clock	Network time protocol (NTP), no internal clock
Conformities	Type-dependent. See type-specific online data sheet at: www.sick.com/RFU65x
Certificates	Type-dependent. See "Downloads" section online at: www.sick.com/RFU65x UL: RFU650-10101 (USA and Canada) ⁴⁾

- 1) Continuous operation at an ambient operating temperature of +50 °C.
- 2) Depending on transponder used and ambient conditions
- 3) Optional accessories.
- 4) UL-certified if the type label contains the UL logo and the UL conditions are met during device operation. For further information, see "Certification according to UL61010-1", page 98.

12.2.2 Interfaces

Table 31: Technical data for RFU65x: Interfaces

	RFU65x-101xx
Ethernet	Host for data output (read result) Aux for service ¹⁾ Protocol: TCP/IP Data transmission rate 10/100 Mbit/s Supported services and protocols (e.g. DHCP, HTTP/HTTPS ...), see type-specific online data sheet at: www.sick.com/RFU65x
PROFINET ²⁾	PROFINET single port PROFINET dual port: Via external fieldbus module CDF600-22xx ⁴⁾ to PROFINET (2-port Ethernet) for data output (read result) Data transmission rate 10/100 Mbit/s
EtherNet/IP™	Data transmission rate 10/100 Mbit/s
EtherCAT® ²⁾	Via external fieldbus module CDF600-0300 ⁴⁾ (gateway mode) to EtherCAT® (Ethernet) for data output (read result)
Serial	RS-232, RS-422/485 Host for data output (read result) Aux (only RS-232) for service ¹⁾ Data transmission rate: 0.3 kBd ... 115.2 kBd, Aux: 57.6 kBd
CAN	Host, data transmission rate: 20 kBit/s ... 1 MBit/s. Bus length depends on data transmission rate and length of cable. Typical: 250 m at 250 kBit/s and wire cross-section ≥ 0.34 mm ² Protocols: <ul style="list-style-type: none"> • CSN (SICK CAN sensor network) • CANopen®

	RFU65x-101xx
PROFIBUS ²⁾	Via external fieldbus module CDF600-21xx ⁴⁾ to PROFIBUS (RS-485) for data output (read result)
USB ³⁾	Aux (USB 2.0) for service ¹⁾
Digital switching inputs	2 x physical. Optional 2 x additional external logical inputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{in} = \text{max. } 30 \text{ V}$, $I_{in} = \text{max. } 5 \text{ mA}$ Opto-decoupled, reverse polarity protected, adjustable debounce time
Digital switching outputs	2 x physical. Optional 2 x additional external logical outputs (software-controlled) via module CMC600 ⁴⁾ in the CDB ⁴⁾ or CDM connection module ⁴⁾ $V_{out} = V_S - 1.5 \text{ V}$, $I_{out} \leq 100 \text{ mA}$ (typical) Short-circuit protected, temperature protected, not electrically isolated from the supply voltage
Antenna	Sending/Receiving 1 x internal
Optical indicators	7 x RGB LEDs (status indicators) on front top 1 x RGB LED (process feedback) in front center Display function can be set with pre-defined color assignment ⁵⁾ .
Acoustic indicator	Beeper (buzzer), can be deactivated Function for event signaling and volume adjustable ⁵⁾
Operating elements	2 x pushbuttons (select and start/stop functions)
Configuration	SOPAS ET configuration software, CoLa commands (telegrams), web server, fieldbus controller (PLC) with additional support by SICK function blocks
Programming	Application-specific programming with SICK AppStudio ⁶⁾ development environment. You can find further information on the Internet at: www.sick.com/SICK_AppStudio

- 1) For example: Configuration, diagnosis, transponder access or display of the read results.
- 2) Function blocks for various PLC manufacturers are available online at: www.sick.com/RFU65x.
- 3) USB interface only for temporary use (service)
- 4) Optional accessories.
- 5) e.g. with SOPAS ET configuration software.
- 6) Functions can be enabled with the SDK6U SD card. Available at: www.sick.com.

12.2.3 Mechanics and electronics

Table 32: Technical data for RFU65x: Mechanics/electronics

	RFU65x-101xx
Electrical connection	1 x male connector, M12, 17-pin, A-coded 1 x female connector, M12, 4-pin, D-coded 1 female connector, USB, 5-pin, Micro B type
Supply voltage V_S	SELV in accordance with currently applicable standard EN 60950-1. DC 18 V ... 30 V ^{1) 2)} DC 12 ... 30 V optional ³⁾ UL-certified devices require a supply voltage in accordance with SELV - LPS according to UL/IEC/EN60950-1 or class 2 according to NEC, UL1310.
Power consumption	Operation: 20 W typical ⁴⁾ Maximum 26 W ⁵⁾ Standby: 6 W typical

	RFU65x-101xx
Housing	Aluminum die cast, polycarbonate
Housing color	Blue, black, silver
Cover for USB interface	Aluminum Can be removed for temporary access to USB interface and memory card slot. Recommended tightening torque for the cover screws: 40 Ncm ± 5 Nm.
Enclosure rating	IP67 (EN 60529:1991-10/A2:2000-02)
Protection class	III (EN 61140:2006-08)
Safety	EN 60950-1:2006-04/A11: 2009-03/A1: 2010-03/A12: 2011-02
Weight	Approx. 5.2 kg
Dimensions (L x W x H)	400 mm x 252 mm x 70 mm ⁶⁾

- 1) When connected to the optional SICK CDB650-204 or CDM420-0006 connection module using a SICK cable.
- 2) When operated without a connection module using a SICK cable. 2 A fuse protection at the start of the feeding supply circuit.
- 3) When operated without a connection module using a SICK supply cable part no. 6048319 (2 x 2.5 mm², 10 m). 2.5 A fuse protection at the start of the feeding supply circuit.
- 4) At full transmitting power and unloaded switching outputs.
- 5) With a typical loading of the 2 switching outputs of 100 mA each and a 30 V DC supply voltage.
- 6) see "Device view", page 17.

12.2.4 Ambient data

Table 33: Technical data for RFU65x: Ambient data

	RFU65x-101xx
Electromagnetic compatibility (EMC)	EN 301489-3
Vibration resistance	EN 60068-2-6:2008-02
Shock resistance	EN 60068-2-27:2009-05
Ambient operating temperature	-25 °C (-30 °C ¹⁾) ... +60 °C
Storage temperature	-30 °C ... +70 °C
Permissible relative humidity	0% ... 90%, non-condensing

1) For Firmware Version V2.02

12.3 Working range diagram

RFU63x: see "Working range of the antenna (sensing range of the reading and writing field)", page 20.

RFU65x: see "Working range of the antenna (sensing range of the reading and writing field)", page 20.

12.4 Dimensional drawing

RFU63x-131xx: Dimensions see "Device view", page 17.

RFU63x-041xx: Dimensions see "Device view", page 17.

RFU65x-101xx: Dimensions see "Device view", page 17.

13 Accessories



NOTE

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

- www.sick.com/RFU63x
 - www.sick.com/RFU65x
-



NOTE

The RFU63x-041xx does not have any internal antennae and requires at least one external antenna for operation.

14 Annex

14.1 EU declaration of conformity / Certificates

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

- www.sick.com/RFU63x
- www.sick.com/RFU65x

14.2 Certification according to UL61010-1



Several devices in the RFU62x, RFU63x and RFU65x product families are certified to UL 61010-1; the UL file number is E336916.

The certification is only valid for specific type descriptions on the type label of the respective device, see "Type label", page 15.

Device type RFU63x: see "Features", page 87

Device type RFU65x: see "Features", page 93

UL-certified devices require a SELV/LPS-compliant supply voltage in accordance with UL/IEC/EN60950-1 or Class 2 according to NEC, UL1310.

The IP67 enclosure rating of the devices is not checked by UL.

14.3 Dimensional drawings (electronic)

Current dimensional drawings in various electronic formats can be downloaded online:

- www.sick.com/RFU63x
- www.sick.com/RFU65x

14.4 Signal assignment of cables with open cable end at one end

14.4.1 RFU630/650: "Power/SerialData/CAN/I/O" connection to customer-specific connection equipment (voltage supply or control cabinet)

14.4.1.1 "Power/SerialData/CAN/I/O" connection to customer-specific connection equipment or control cabinet

Adapter cable suitable for drag chain

Part no. 2070425 (3 m), part no. 2070426 (5 m), part no. 2070427 (10 m), shielded, suitable for drag chain, suitable for 2 A

For RFU63x, RFU65x

Ambient temperature range:

For mobile installation: -25 °C to +80 °C, for fixed installation: -40 °C to +80 °C

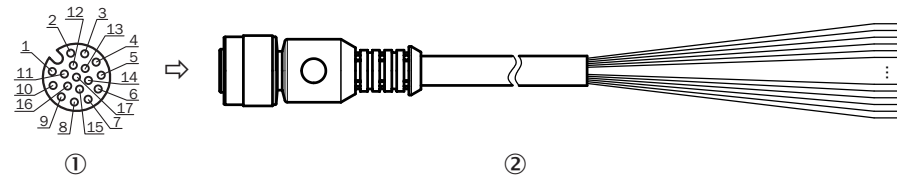


Figure 40: Adapter cable, e.g. part no. 2070425 (3 m)

- ① Female connector, M12, 17-pin, A-coded (view from front)
 ② Illustration may differ

Table 34: Signal assignment of adapter cable with open end

Pin	Signal	Function	Wire color
1	GND	Ground	Blue
2	V _s	Supply voltage	Brown
3	CAN L	CAN bus (IN/OUT)	Green
4	CAN H	CAN bus (IN/OUT)	White
5	TD+ (RS-422/485), host	Host interface (sender+)	Pink
6	TD- (RS-422/485), host TxD (RS-232), host	Host interface (sender-)	Yellow
7	TxD (RS-232), Aux	Aux interface (sender)	Black
8	RxD (RS-232), AUX	Aux interface (receiver+)	Gray
9	SensGND	Switching input ground	White-black
10	Sensor 1	Digital switching input 1	Violet
11	RD+ (RS-422/485), host	Host interface (receiver)	Gray-pink
12	RD- (RS-422/485), host RxD (RS-232), host	Host interface (receiver-)	Red-blue
13	Result 1	Digital switching output 1	White-green
14	Result 2	Digital switching output 2	Brown-green
15	Sensor 2	Digital switching input 2	White-yellow
16	N. c.	-	Yellow-brown
17	N. c.	-	White-gray

14.4.1.2 “Power/SerialData/CAN/I/O” connection to customer-specific connection equipment or control cabinet

Adapter cable suitable for drag chain, deep-freeze compatible

Part no. 2075220 (5 m), shielded, suitable for drag chain, deep-freeze compatible, suitable for 2 A

For RFU63x, RFU65x

Permitted currents for ambient temperature +40 °C:

- Contact 1 (blue) and contact 2 (brown): 2 A
- All other contacts: 1.5 A

Ambient temperature range:

For mobile installation: -25 °C to +80 °C, for fixed installation: -40 °C to +85 °C

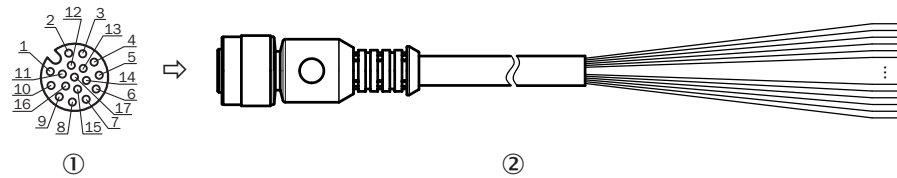


Figure 41: Adapter cable, part no. 2075220 (5 m)

- ① Female connector, M12, 17-pin, A-coded (view from front)
- ② Illustration may differ

Table 35: Signal assignment of adapter cable with open end

Pin	Signal	Function	Wire color
1	GND	Ground	Blue
2	V _s	Supply voltage	Brown
3	CAN L	CAN bus (IN/OUT)	Green
4	CAN H	CAN bus (IN/OUT)	White
5	TD+ (RS-422/485), host	Host interface (sender+)	Pink
6	TD- (RS-422/485), host TxD (RS-232), host	Host interface (sender-)	Yellow
7	TxD (RS-232), Aux	Aux interface (sender)	Black
8	RxD (RS-232), AUX	Aux interface (receiver+)	Gray
9	SensGND	Sensor 1 switching input ground	Gray-brown
10	Sensor 1	Digital switching input 1	Violet
11	RD+ (RS-422/485), host	Host interface (receiver)	Gray-pink
12	RD- (RS-422/485), host RxD (RS-232), host	Host interface (receiver-)	Red-blue
13	Result 1	Digital switching output 1	White-green
14	Result 2	Digital switching output 2	Brown-green
15	Sensor 2	Digital switching input 2	White-yellow
16	N. c.	-	Yellow-brown
17	N. c.	-	White-gray

14.4.2 “POWER” connection to customer-specific connection equipment (voltage supply) or control cabinet

Adapter cable

Part no. 6048319 (10 m), 2-wire, unshielded

For RFU630, RFU65x

Ambient temperature range:

With fixed installation: -25 °C to +80 °C

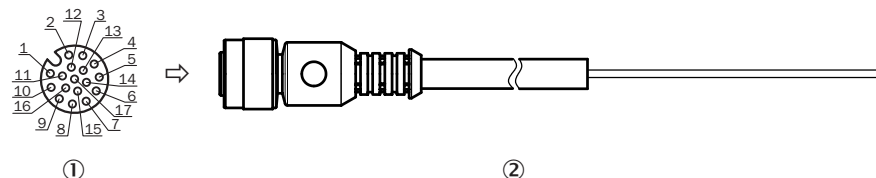


Figure 42: Adapter cable, part no. 6048319 (10 m)

- ① Female connector, M12, 17-pin, A-coded (view from front)
- ② Illustration may differ

Table 36: Signal assignment of adapter cable with open end

Pin	Signal	Function	Wire color / characters
1	-	Shield	Gray
2	V _S	Supply voltage	Red +
3	GND	Ground	Blue -
4	-	-	-
5	-	-	-

14.4.3 CDB650-204 or CDM420-0006 to CAN network connection module

Adapter cable

Part no. 6021166 (5 m), unshielded

Ambient temperature range:

For fixed installation: -40 °C to +70 °C, for mobile installation: -20 °C to +70 °C

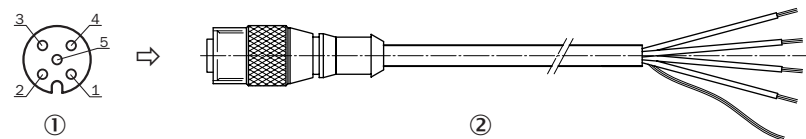


Figure 43: Adapter cable, part no. 6021166 (5 m) for connecting the connection module to the CAN network

- ① Female connector, M12, 5-pin, A-coded (view from front)
- ② Illustration may differ

Table 37: Pin, signal and wire color assignments for the adapter cable with open end

Pin	Signal	Function	Wire color
1	-	Shield	-
2	V _S	Supply voltage	Red
3	GND	Ground	Black
4	CAN H	CAN bus (IN/OUT)	White
5	CAN L	CAN bus (IN/OUT)	Blue

14.4.4 Host interface RS-232 via CDB/CDM connection module to host (PC)

Device	Connection module
RFU63x	CDB650-204, CDM420-0006, -0007
RFU65x	CDB650-204, CDM420-0006, -0007

Adapter cable

Part no. 2020319 (3 m), unshielded

Ambient temperature range:

For mobile installation: -5 °C to +90 °C, for fixed installation: -30 °C to +90 °C

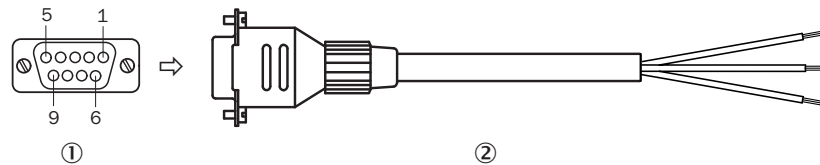


Figure 44: Adapter cable, part no. 2020319 (3 m)

- ① Female connector, D-Sub, 9-pin (view from front)
- ② Illustration may differ

Table 38: Signal assignment of adapter cable with open end

Pin	Signal at PC	Function	Wire color
1	-	-	-
2	RxD (RS-232), host	Host interface (receiver)	Brown ¹⁾
3	TxD (RS-232), host	Host interface (sender)	Blue ²⁾
4	-	-	-
5	GND	Ground	Black
6 ... 9	-	-	-

1) Connect to the terminal "TxD Host" in the CDB/CDM connection module
 2) Connect to the terminal "RxD Host" in the CDB/CDM connection module

14.5 Connection diagrams of connection module CDB650-204

14.5.1 Wiring overview of the CDB650-204

Device = RFU63x-131xx or RFU63x-041xx, 1 switching input used

Device = RFU65x-101xx, 1 switching input used

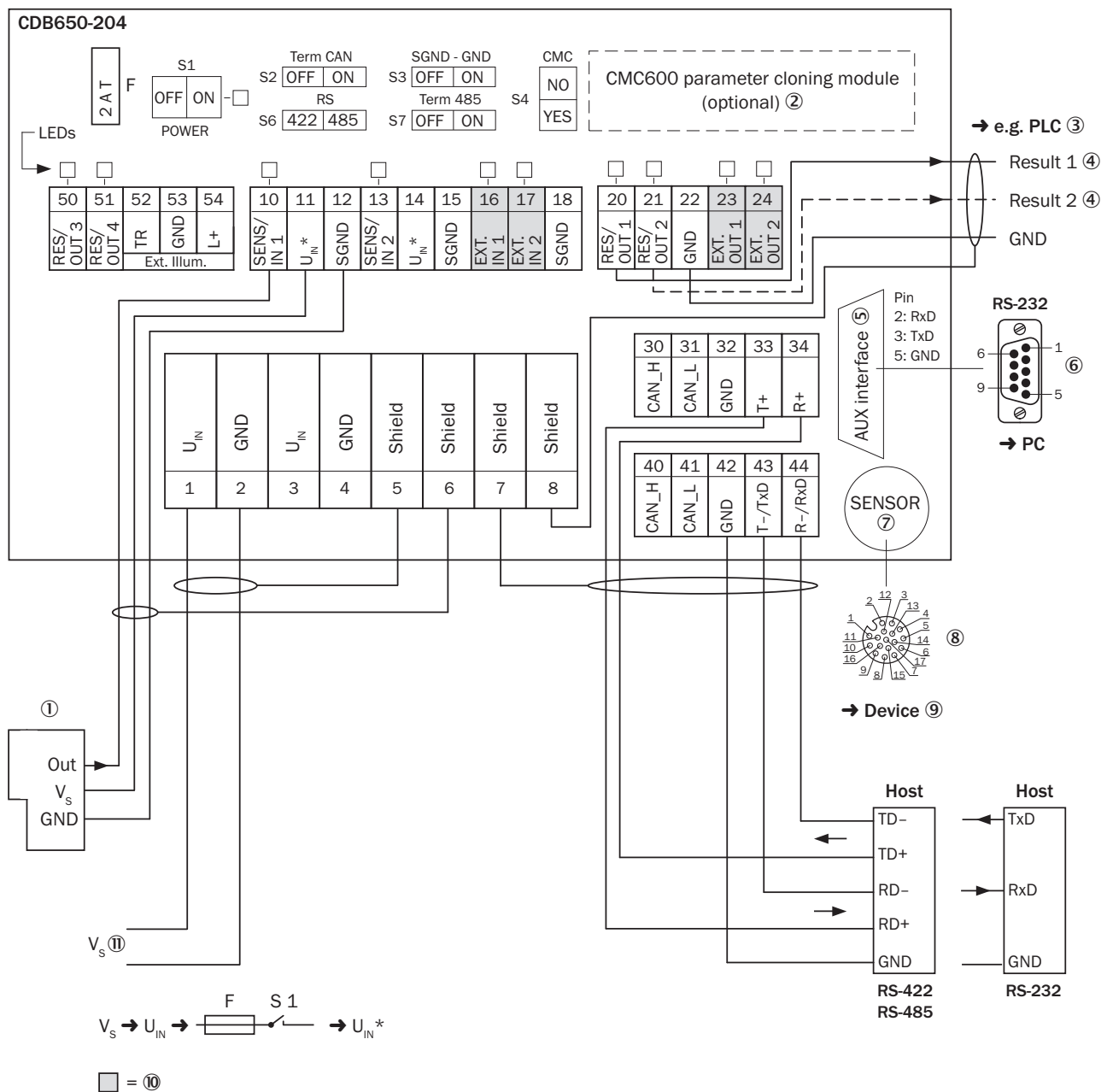


Figure 45: Overview: connection of device and peripherals to the CDB650-204 connection module

- ① External trigger sensor, e.g. for read cycle generation
- ② CMC600 parameter cloning module (optional)
- ③ e.g. PLC (programmable logic controller)
- ④ Name of digital switching output
- ⑤ Auxiliary interface "Aux"
- ⑥ Male connector, D-Sub, 9-pin
- ⑦ SENSOR = Device
- ⑧ Female connector, M12, 17-pin, A-coded
- ⑨ Device to be connected
- ⑩ The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device (highlighted in gray)
- ⑪ Supply voltage V_S

14.5.2 Connecting supply voltage for the device in CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

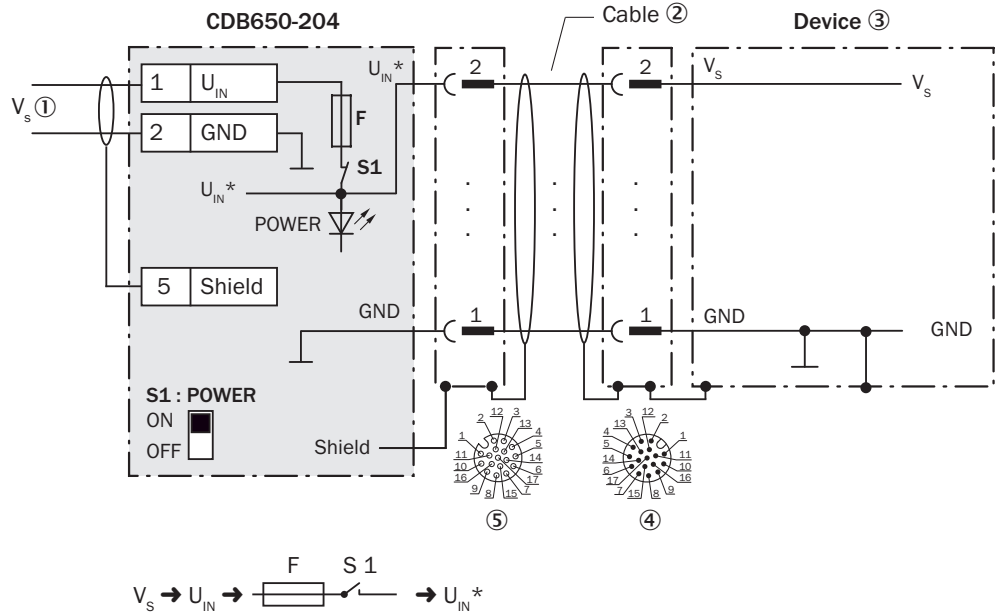


Figure 46: Connecting supply voltage for the device in CDB650-204 connection module

- ① Supply voltage V_s
- ② Connection cable 1:1 (male connector, M12, 17-pin, A-coded / female connector, M12, 17-pin, A-coded).
- ③ Device
- ④ Device: male connector, M12, 17-pin, A-coded
- ⑤ Connection module: female connector, M12, 17-pin, A-coded

Function of switch S1

Table 39: Switch S1: Power

Switch setting	Function
ON	Supply voltage U_{IN} connected to CDB650-204 and device via fuse and switch S1 as U_{IN}^* . Voltage U_{IN}^* can be additionally tapped at terminals 11 and 14.
OFF	CDB650-204 and device disconnected from supply voltage. Recommended setting for all connection work.

14.5.3 Wiring serial host interface RS-232 of the device in CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

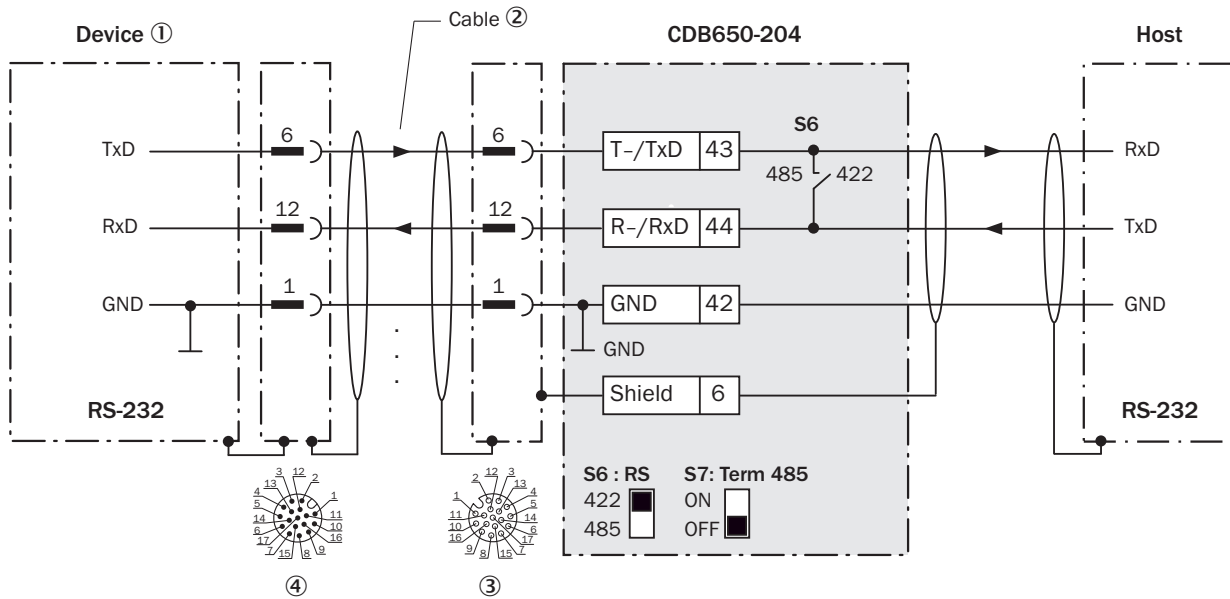


Figure 47: Wiring data interface RS-232 of the device in the connection module CDB650-204

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



NOTE

Activate the RS-232 data interface in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.5.4 Wiring serial host interface RS-422 of the device in CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

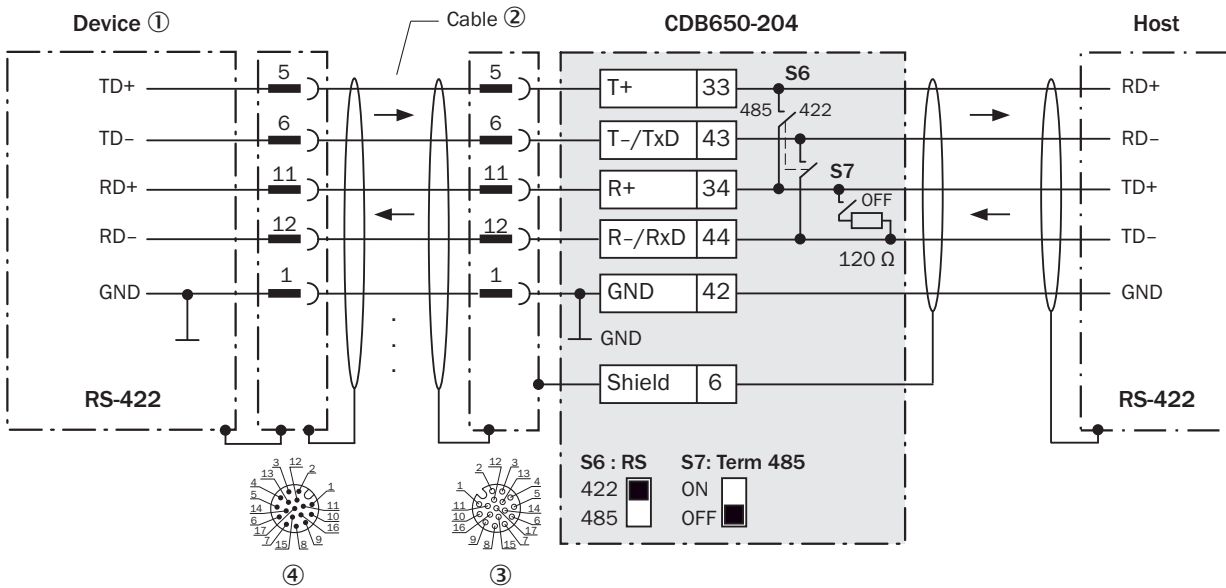


Figure 48: Wiring data interface RS-422 of the device in the connection module CDB650-204

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

Function of switch S7

Table 40: Switch S7: Term 485

Switch setting	Function
ON	Terminates the RS-422 receiver in the device to improve the noise ratio on the line.
OFF	No termination



NOTE

User of the RS-422 data interface:

- The relevant interface drivers for the device comply with the standard in accordance with RS-422 and RS-485.
- The connection shown above is configured for operation of the host with permanently activated drivers (often described as “RS-422 operation”), i.e. not RS-485 operation.
- Activate the RS-422 data interface (“Point-to-Point” option) in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.5.5 Wiring serial host interface RS-485 of the device in CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

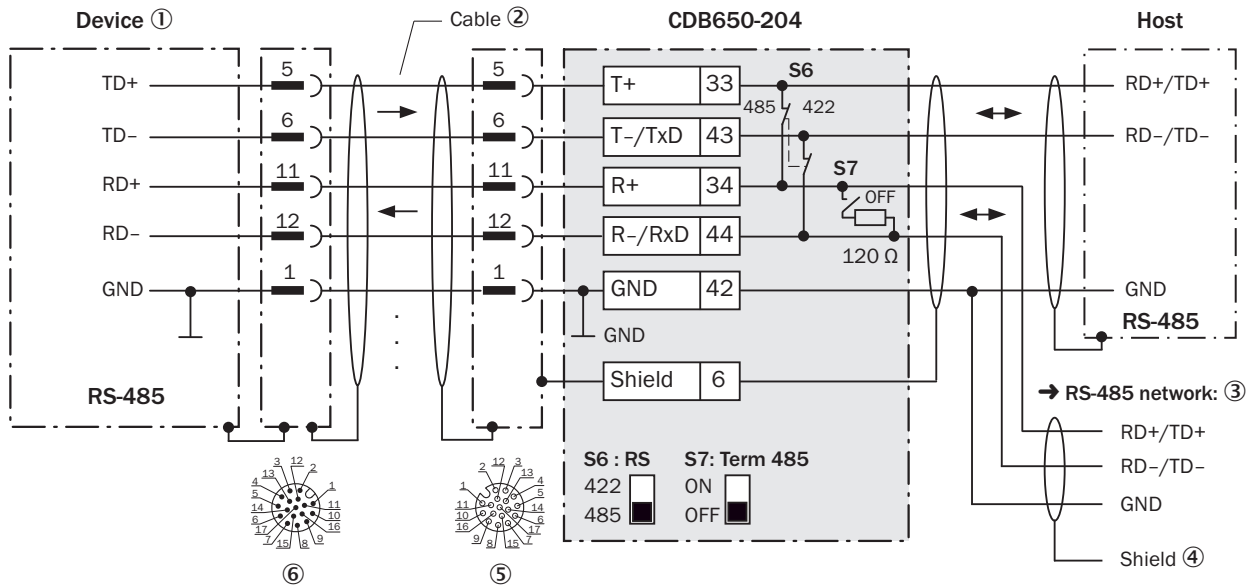


Figure 49: Wiring data interface RS-485 of the device in the connection module CDB650-204

- ① Device
- ② Connection cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
- ③ RS-485 network
- ④ Shielding
- ⑤ Connection module: female connector, M12, 17-pin, A-coded
- ⑥ Device: male connector, M12, 17-pin, A-coded

Function of switch S7

Table 41: Switch S7: Term 485

Switch setting	Function
ON	Terminates the device. Required if the device is located at the end of the RS-485 bus cable.
OFF	No termination



NOTE

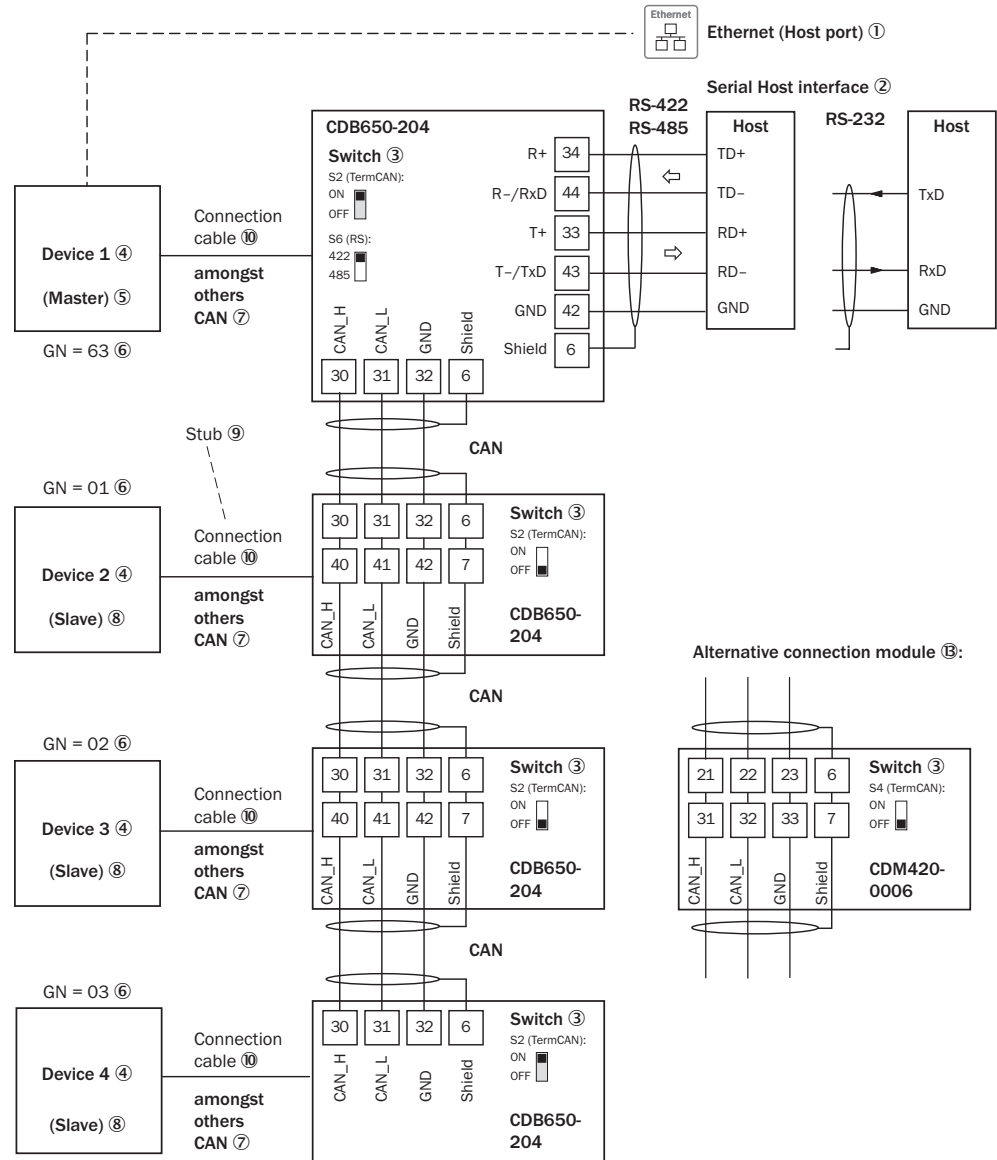
User of the RS-485 data interface:

- The relevant interface drivers for the device comply with the standard in accordance with RS-422 and RS-485.
- This operating mode is only permitted if all connected devices use a corresponding RS-485 protocol.
- This configuration is not permitted when using the standard data output and protocol of the device. In case of doubt, contact SICK Service.
- Activate the RS-485 data interface ("Bus" option) in the device using a configuration tool, e.g. the SOPAS ET configuration software.

14.5.6 Wiring the CAN interface in the CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx



GN = Device number ⑩
 (max. 32 participants) ⑪

Figure 50: Wire the CAN interface of the device in the CDB650-204 connection module. Connection and looping through of the supply voltage and connection of a trigger sensor for read cycle generation at the master, for example, are disregarded here!

- ① RFU63x-131xx, RFU63x-041xx: Ethernet (host port)
 RFU65x-101xx: Ethernet (host port)
- ② Serial host interface
- ③ Switch
- ④ Device
- ⑤ Master
- ⑥ Device number
- ⑦ CAN etc.
- ⑧ Slave
- ⑨ Branch line
- ⑩ RFU63x-131xx and RFU63x0-041xx: connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)

RFU65x-101xx: connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)

- ① Device number (GN)
- ② Maximum 32 users
- ③ Example of alternative connection module.

Alternative connection module for RFU63x: CDM420-0006.

An adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin) is required to connect the RFU63x-131xx or RFU63x-041xx

Alternative connection module for RFU65x: CDM420-0006.

An adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin) is required to connect the RFU65x-101xx



NOTE

Activate the CAN data interface in the device with a configuration tool, e.g. the configuration software SOPAS ET.

Make further settings in the device corresponding to the function of the device in the system configuration.

14.5.7 Wiring digital switching inputs “Sensor 1” and “Sensor 2” of the device in the CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

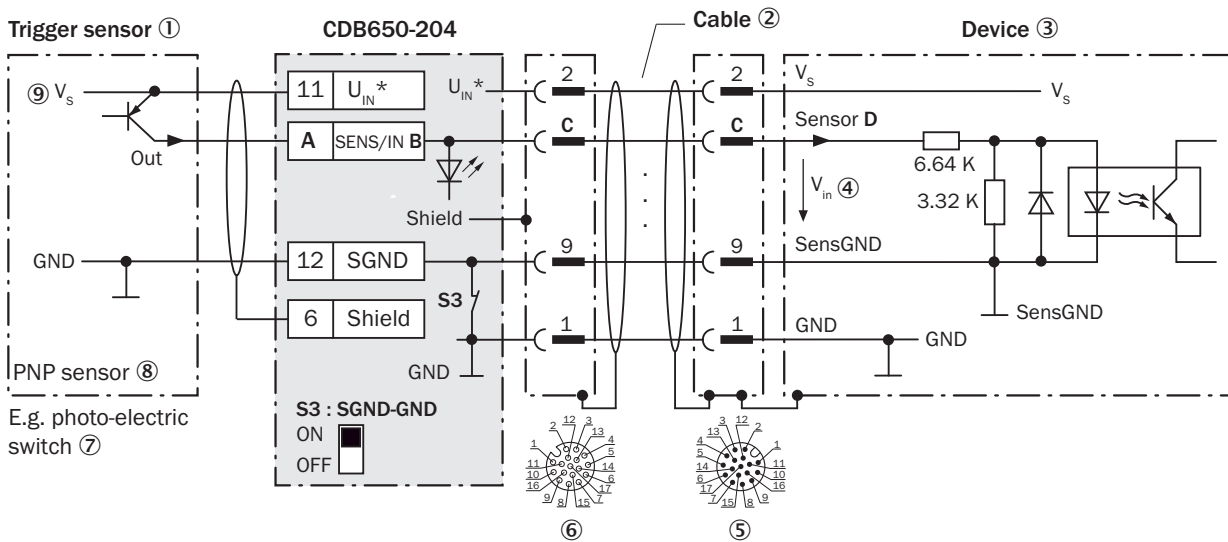


Figure 51: Trigger sensor supplied with power by connection module CDB650-204

- ① Trigger sensor, e.g. for read cycle generation
- ② Connection cable 1:1 (female connector, M12, 17-pin, A-coded / male connector, M12, 17-pin, A-coded)
- ③ Device
- ④ Input voltage V_{in}
- ⑤ Device: male connector, M12, 17-pin, A-coded
- ⑥ Connection module: female connector, M12, 17-pin, A-coded
- ⑦ e.g. photoelectric sensor
- ⑧ PNP sensor
- ⑨ Supply voltage V_s

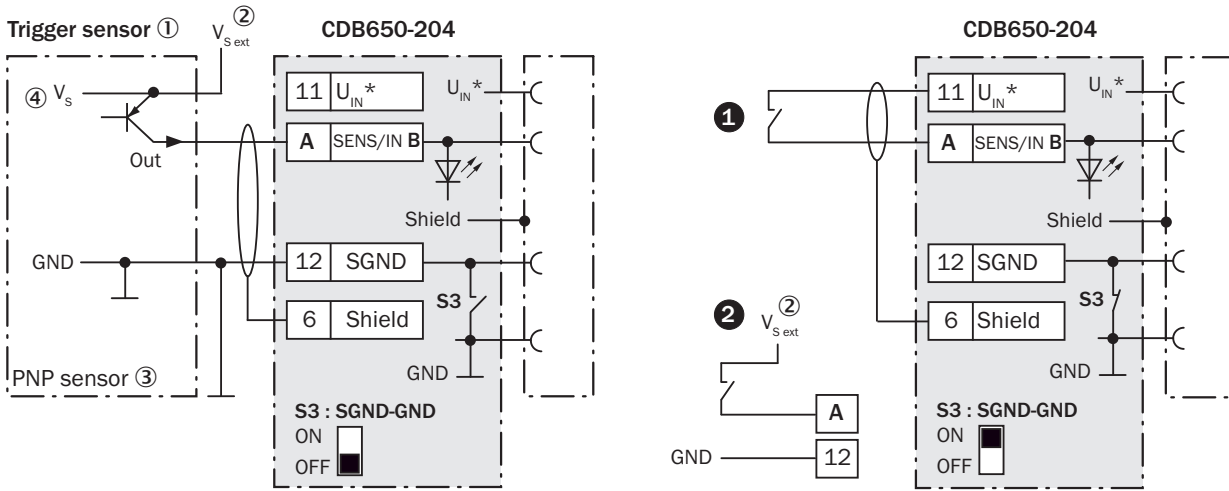


Figure 52: Left: Trigger sensor connected potential-free and supplied with power externally. Right: Alternatively switch, ❶ supplied with power by connection module CDB650-204 or ❷ connected potential-free and supplied with power externally. Switch setting S3 then as in left figure.

- ❶ Trigger sensor, e.g. for read cycle generation
- ❷ External supply voltage $V_{S\ ext}$ ($V_{S\ ext} = U_{V\ ext}$)
- ❸ PNP sensor
- ❹ Supply voltage V_S

Table 42: Assignment of placeholders to digital switching inputs

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

Function of switch S3

Table 43: Switch S3: SGND - GND

Switch setting	Function
ON	GND of the trigger sensor connected with GND of CDB650-204 and GND of the device
OFF	Trigger sensor connected potential-free at CDB650-204 and device. Common, isolated reference potential of all digital switching inputs is SGND.

Characteristic data of digital switching inputs

Table 44: Characteristic data of the digital switching inputs "Sensor 1" and "Sensor 2"

Switching behavior	Power to the input starts the assigned function, e.g. start read cycle. Default setting in the device: logic not inverted (active high), debounce time 10 ms
Properties	<ul style="list-style-type: none"> • Opto-decoupled, reverse polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $V_{in} \leq 2\ V$; $I_{in} \leq 0.3\ mA$ High: $6\ V \leq V_{in} \leq 30\ V$; $0.7\ mA \leq I_{in} \leq 5\ mA$

**NOTE**

Assign the functions for the digital switching inputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.5.8 Wiring digital switching inputs “External input 1” and “External input 2” of the device in the CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

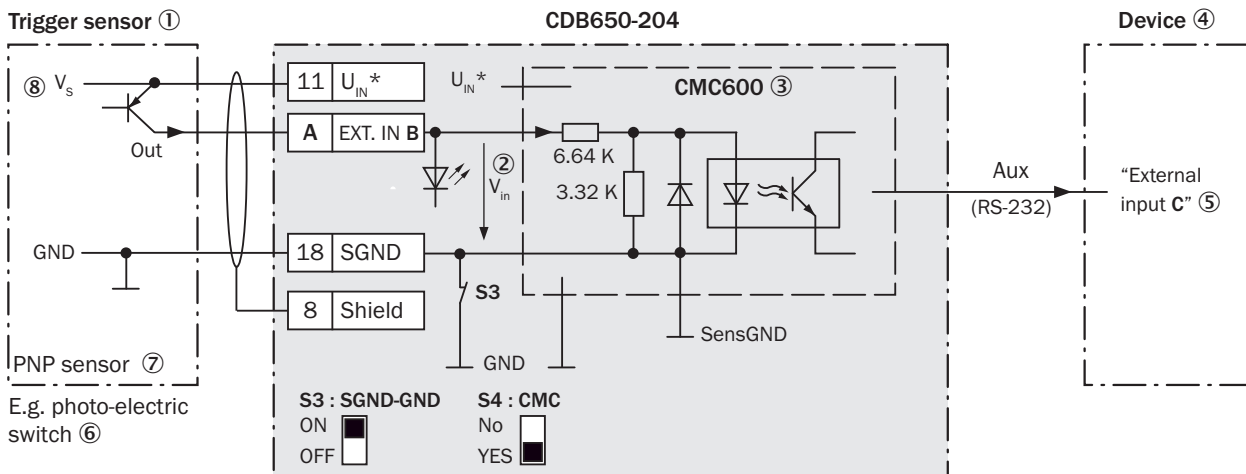


Figure 53: Trigger sensor supplied with power by connection module CDB650-204

- ① Trigger sensor, e.g. for read cycle generation
- ② Input voltage V_{in}
- ③ The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device
- ④ Device
- ⑤ Logical “External input” in the device
- ⑥ e.g. photoelectric sensor
- ⑦ PNP sensor
- ⑧ Supply voltage V_s

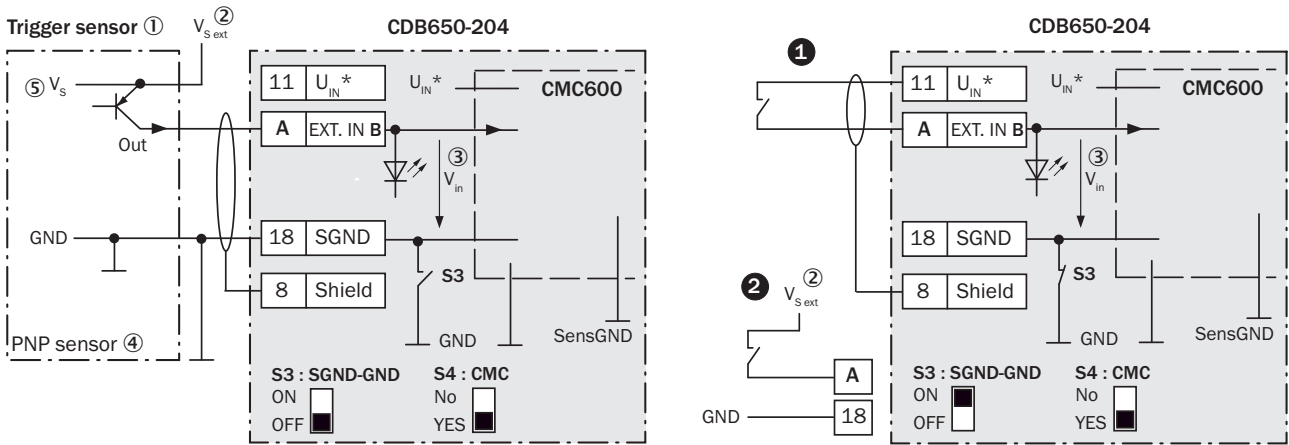


Figure 54: Left: Trigger sensor connected potential-free and supplied with power externally. Right: Alternatively switch, ❶ supplied with power by connection module CDB650-204 or ❷ connected potential-free and supplied with power externally. Switch setting S3 then as in left figure.

- ❶ Trigger sensor, e.g. for read cycle generation
- ❷ External supply voltage $V_{S\ ext}$
- ❸ Input voltage V_{in}
- ❹ PNP sensor
- ❺ Supply voltage V_s

Table 45: Assignment of placeholders to the external digital switching inputs

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

Function of switch S3

Table 46: Switch S3: SGND - GND

Switch setting	Function
ON	GND of the trigger sensor connected with GND of CDB650-204 and CMC600.
OFF	Trigger sensor connected potential-free at CDB650-204 and CMC600. Common, isolated reference potential of all digital switching inputs is SGND.

Functional principle of the external switching inputs

As a software-controlled operation, the CMC600 automatically transmits the output states of its physical digital switching inputs “EXT. IN 1” and “EXT. IN 2” in the connection module via the connecting cable to the serial Aux interface of the device. The device internally implements the states for its logical inputs “External input 1” and “External input 2”.



NOTE

The external digital switching inputs are software-defined. This results in a delay of maximum 15 ms when transmitting the signal input at the CMC600 to the device.

Characteristic data of digital switching inputs

Table 47: Characteristic data of the digital switching inputs “External input 1” and “External input 2”

Switching behavior	Power to the input starts the assigned function, e.g. start read cycle. Default setting in the device: logic not inverted (active high), debounce time 10 ms
Properties	<ul style="list-style-type: none"> • Opto-decoupled, reverse polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $V_{in} \leq 2 \text{ V}$; $I_{in} \leq 0.3 \text{ mA}$ High: $6 \text{ V} \leq V_{in} \leq 30 \text{ V}$; $0.7 \text{ mA} \leq I_{in} \leq 5 \text{ mA}$



NOTE

Assign the functions for the external digital switching inputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.5.9 Wiring the “Result 1” and “Result 2” digital switching outputs of the device in the CDB650-204

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

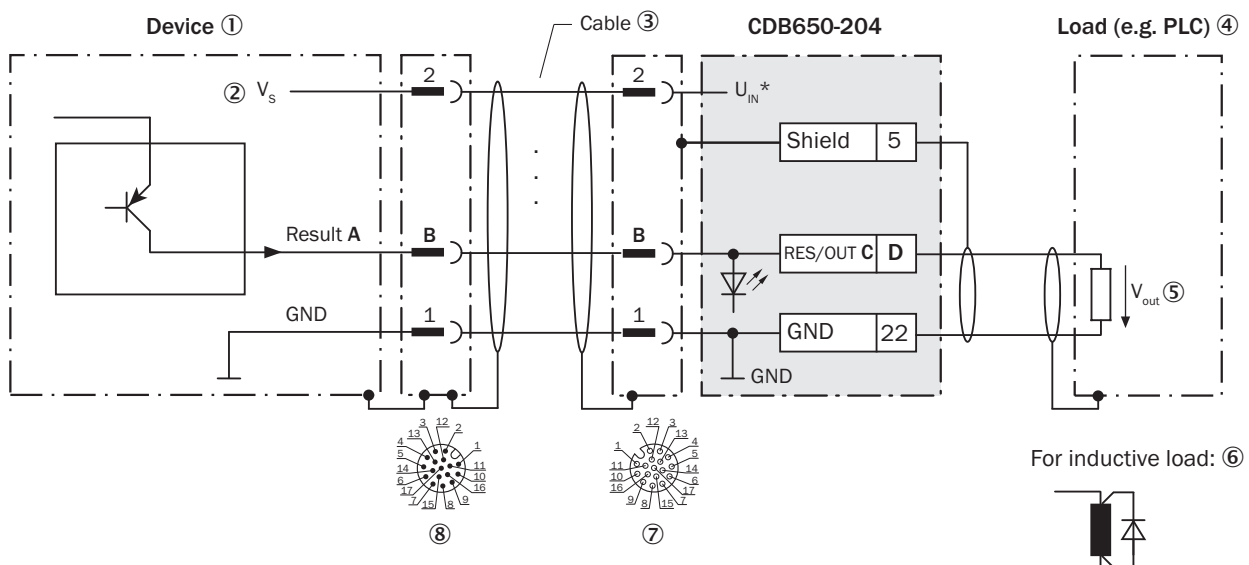


Figure 55: Wiring digital switching outputs “Result 1” and “Result 2” of the device in the connection module CDB650-204

- ① Device
- ② Supply voltage V_s
- ③ Connection 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}
- ⑥ With inductive load: see note
- ⑦ Connection module: female connector, M12, 17-pin, A-coded
- ⑧ Device: male connector, M12, 17-pin, A-coded

Inductive load



NOTE

Provide an arc-suppression circuit at the digital switching output if an inductive load is present.

- ▶ Attach a freewheeling diode directly to the load for this purpose.

Table 48: Assignment of placeholders to digital switching outputs

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

Characteristic data of digital switching outputs

Table 49: Characteristic data of the digital switching outputs “Result 1” and “Result 2”

Switching behavior	PNP switching to supply voltage U_V Default settings in the device: no function, logic: not inverted (active high)
Properties	<ul style="list-style-type: none"> • Short-circuit protected + temperature protected • Not electrically isolated from V_S
Electrical values	$0\text{ V} \leq V_{out} \leq V_S$ $(V_S - 1.5\text{ V}) \leq V_{out} \leq V_S$ at $I_{out} \leq 100\text{ mA}$



NOTE

Assign the functions for the digital switching outputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.5.10 Wiring digital switching outputs “External output 1” and “External output 2” of the device in the CDB650-204

Device = RFU630-131xx, RFU630-041xx

Device = RFU650-101xx

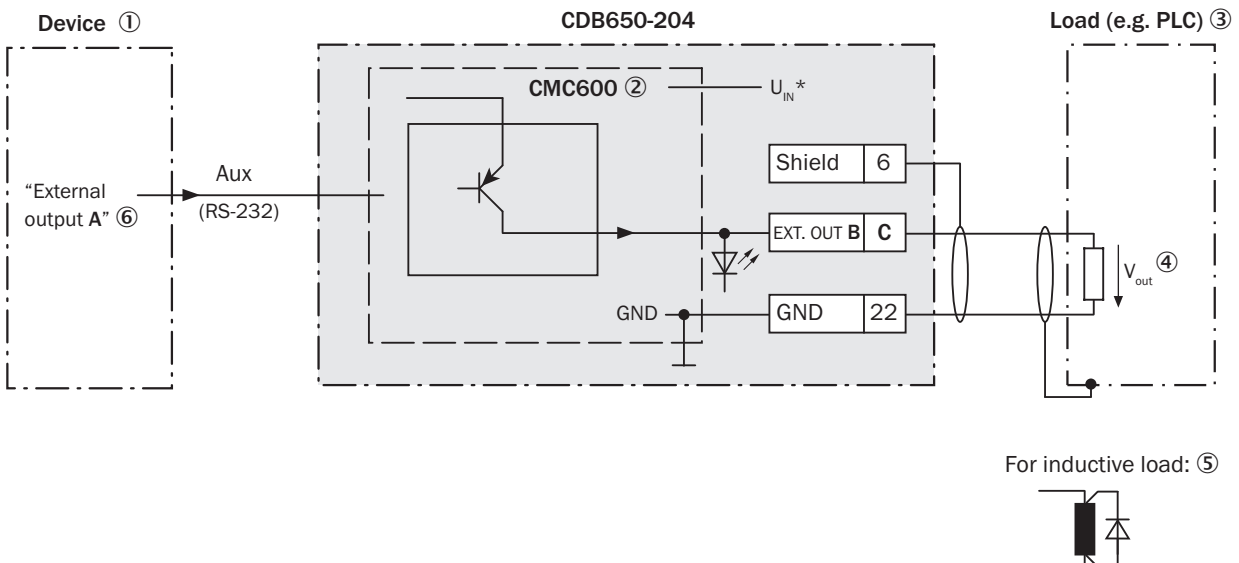


Figure 56: Wiring external digital switching outputs “EXT. OUT 1” and “EXT. OUT 2” of the device in the connection module CDB650-204

- ① Device
- ② The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device
- ③ Load (e.g. PLC)
- ④ Output voltage V_{out}
- ⑤ With inductive load: see note
- ⑥ Logical “External output” in the device

Inductive load



NOTE

Provide an arc-suppression circuit at the digital switching output if an inductive load is present.

- ▶ Attach a freewheeling diode directly to the load for this purpose.

Table 50: Assignment of placeholders to digital switching outputs

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

Functional principle of the external switching outputs

The device outputs the output states of its logical outputs “External output 1” and “External output 2” via its serial Aux interface. By means of a software-controlled operation, the CMC600 automatically adopts the states via the connecting cable and sets them on its physical digital switching outputs “EXT. 1” and “EXT. OUT 2” in the connection module.

Characteristic data of digital switching outputs

Table 51: Characteristic data of the digital switching outputs “External output 1” and “External output 2”

Switching behavior	PNP switching to supply voltage V_S Default settings in the device: no function, logic: not inverted (active high)
Properties	<ul style="list-style-type: none"> • Short-circuit protected + temperature protected • Not electrically isolated from V_S
Electrical values	$0\text{ V} \leq V_{out} \leq V_S$ $(V_S - 1.5\text{ V}) \leq V_{out} \leq V_S$ at $I_{out} \leq 100\text{ mA}$



NOTE

Assign the functions for the external digital switching outputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6 Connection diagrams of connection module CDM420-0006



NOTE

An adapter cable (female connector, M12, 17-pin, A-coded / male connector, D-Sub-HD, 15-pin) is required to connect the device to the connection module.

14.6.1 Wiring overview of the CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

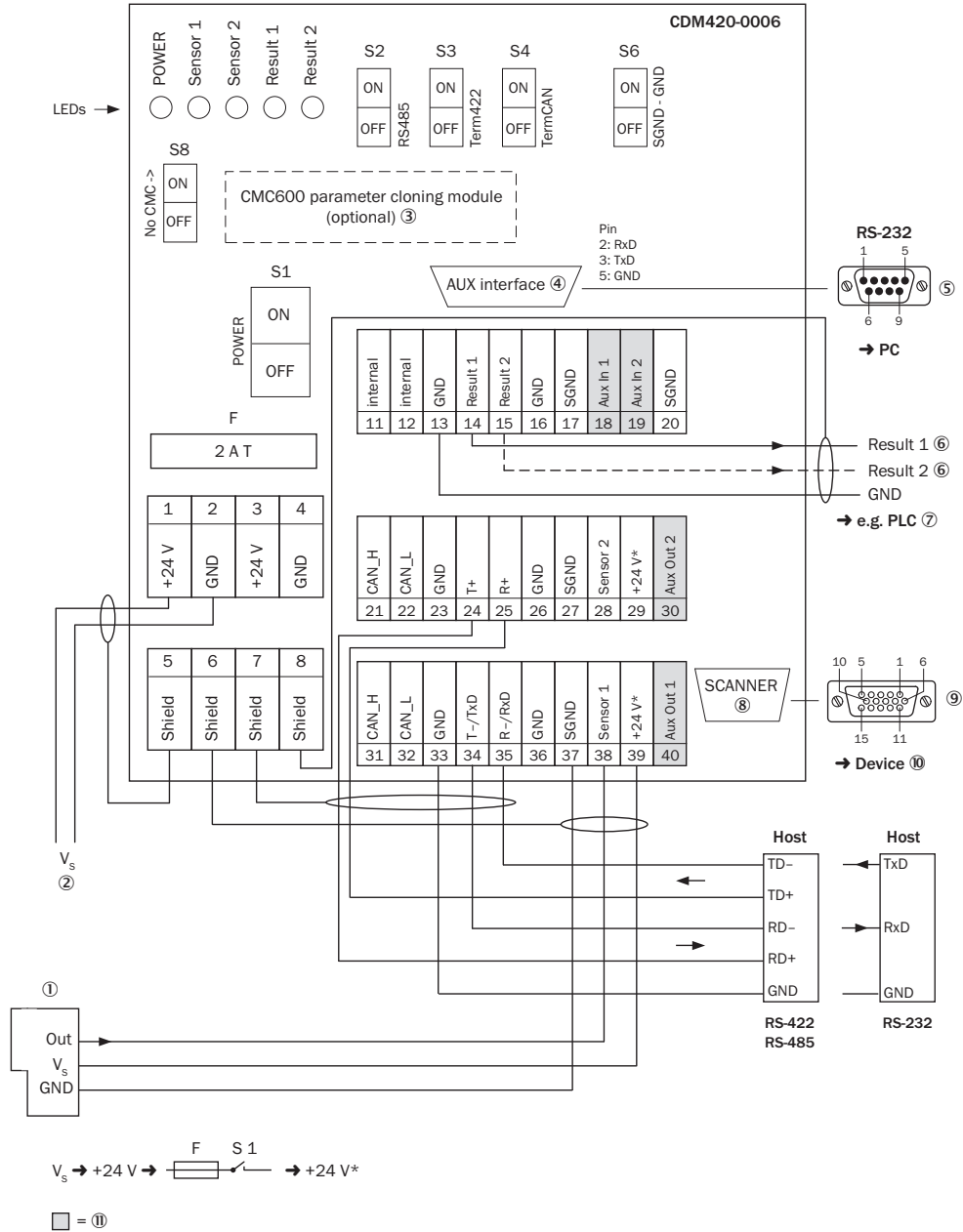


Figure 57: Overview: connection of device and peripherals to the CDM420-0006 connection module

- ① External trigger sensor, e.g. for read cycle generation
- ② Supply voltage V_s
- ③ CMC600 parameter cloning module (optional)
- ④ Auxiliary interface "Aux"
- ⑤ Male connector, D-Sub, 9-pin
- ⑥ Name of switching output
- ⑦ e.g. PLC (programmable logic controller)
- ⑧ SCANNER = Device
- ⑨ Female connector, D-Sub-HD, 15-pin

- ⑩ Device to be connected
- ⑪ The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device (highlighted in gray)

14.6.2 Connecting supply voltage for the device in CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

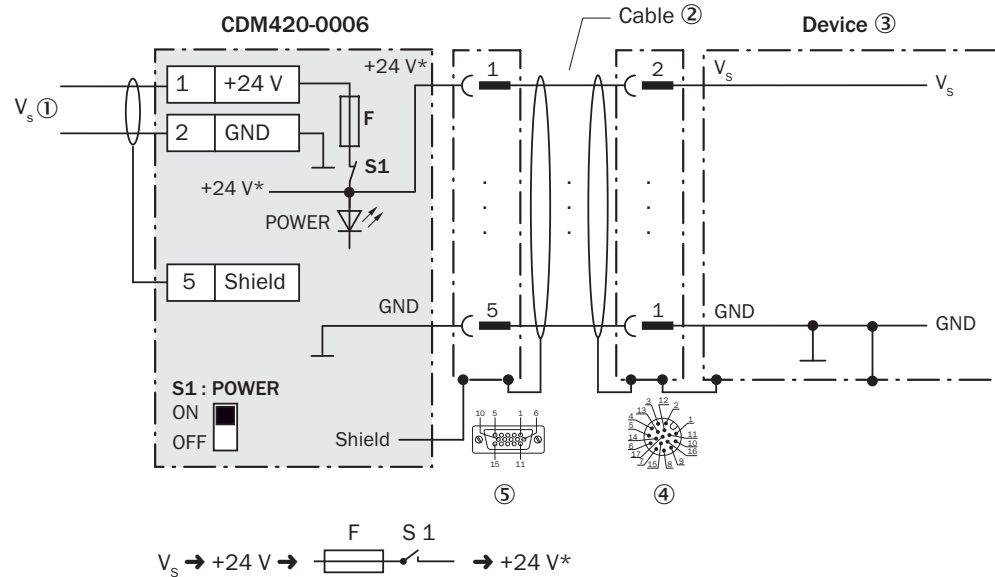


Figure 58: Connecting supply voltage for the device in CDM420-0006 connection module

- ① Supply voltage V_s
- ② Adapter cable (male connector, D-Sub-HD, 15-pin / female connector, M12, 17-pin, A-coded)
- ③ Device
- ④ Device: male connector, M12, 17-pin, A-coded
- ⑤ Connection module: female connector, D-Sub-HD, 15-pin

Function of switch S1

Table 52: Switch S1: Power

Switch setting	Function
ON	Supply voltage +24 V connected to CDM420-0006 and device via fuse as +24 V*. Voltage +24 V* can be additionally tapped at terminals 29 and 39.
OFF	CDM420-0006 and device disconnected from supply voltage. Recommended setting for all connection work.

14.6.3 Connecting serial host interface RS-232 of the device in CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

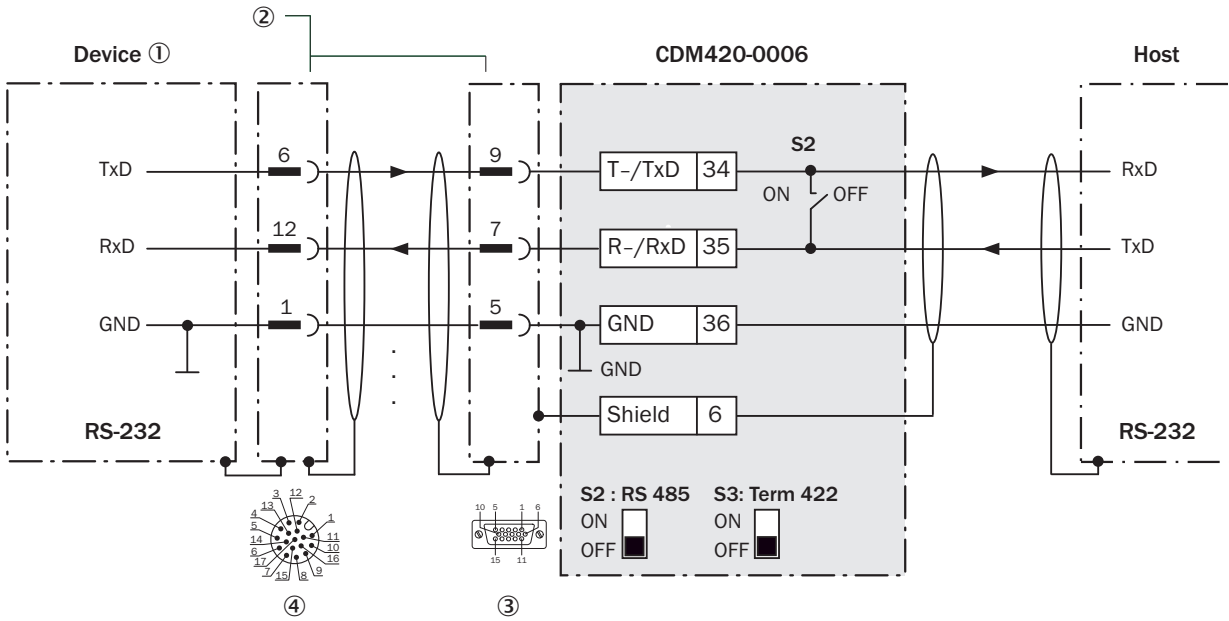


Figure 59: Connecting data interface RS-232 of the device in the connection module CDM420-0006

- ① Device
- ② Adapter cable (male connector, D-Sub-HD, 15-pin / female connector, M12, 17-pin, A-coded)
- ③ Connection module: female connector, D-Sub-HD, 15-pin
- ④ Device: male connector, M12, 17-pin, A-coded



NOTE

Activate the RS-232 data interface in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6.4 Connecting serial host interface RS-422 of the device in CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

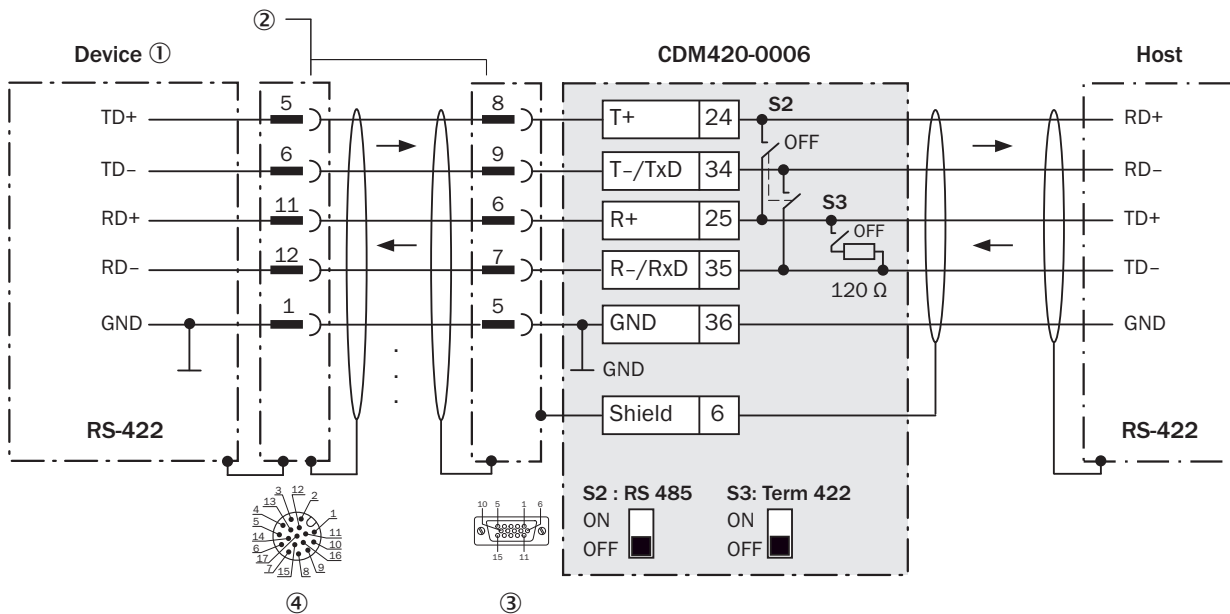


Figure 60: Connecting data interface RS-422 of the device in the connection module CDM420-0006

- ① Device
- ② Adapter cable (male connector, D-Sub-HD, 15-pin / female connector, M12, 17-pin, A-coded)
- ③ Connection module: female connector, D-Sub-HD, 15-pin
- ④ Device: male connector, M12, 17-pin, A-coded

Function of switch S3

Table 53: Switch S3: Term 422

Switch setting	Function
ON	Terminates the RS-422 receiver in the device to improve the noise ratio on the line.
OFF	No termination



NOTE

User of the RS-422 data interface:

- The relevant interface drivers for the device comply with the standard in accordance with RS-422 and RS-485.
- The connection shown above is configured for operation of the host with permanently activated drivers (often described as “RS-422 operation”), i.e. not RS-485 operation.
- Activate the RS-422 data interface (“Point-to-Point” option) in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6.5 Wiring serial host interface RS-485 of the device in CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

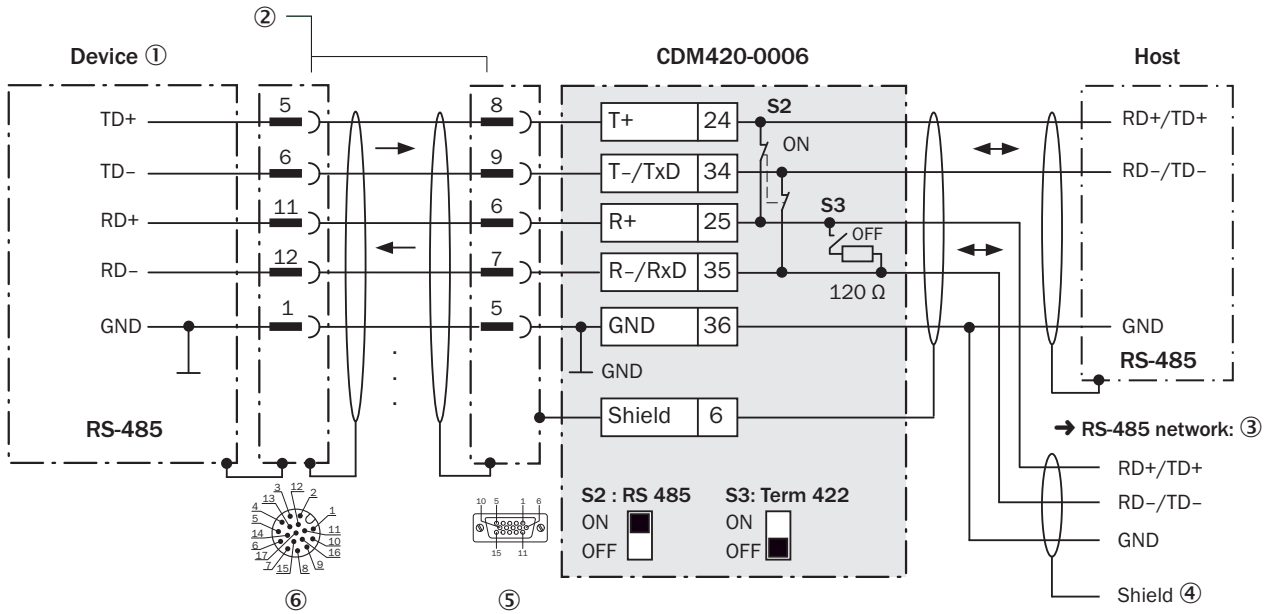


Figure 61: Wiring data interface RS-485 of the device in the connection module CDM420-0006

- ① Device
- ② Adapter cable (male connector, D-Sub-HD, 15-pin / female connector, M12, 17-pin, A-coded)
- ③ RS-485 network
- ④ Shielding
- ⑤ Connection module: female connector, D-Sub-HD, 15-pin
- ⑥ Device: male connector, M12, 17-pin, A-coded

Function of switch S3

Table 54: Switch S3: Term 422

Switch setting	Function
ON	Terminates the device. Required if the device is located at the end of the RS-485 bus cable.
OFF	No termination



NOTE

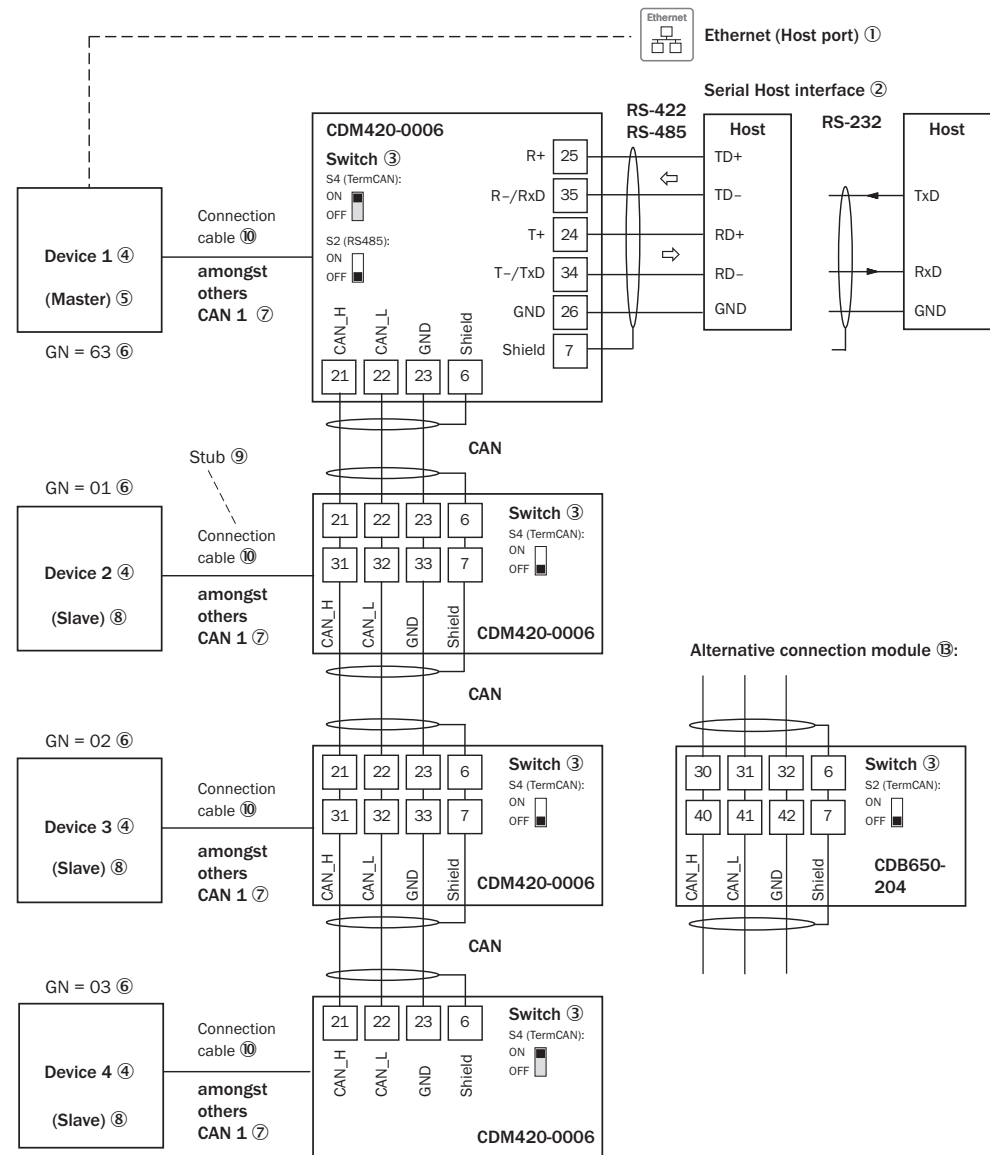
User of the RS-485 data interface:

- The relevant interface drivers for the device comply with the standard in accordance with RS-422 and RS-485.
- This operating mode is only permitted if all connected devices use a corresponding RS-485 protocol.
- This configuration is not permitted when using the standard data output and protocol of the device. In case of doubt, contact SICK Service.
- Activate the RS-485 data interface ("Bus" option) in the device using a configuration tool, e.g. the SOPAS ET configuration software.

14.6.6 Wiring the CAN interface in the CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx



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

Figure 62: Wire the CAN interface of the device in the CDM420-0006 connection module. Connection and looping through of the supply voltage and connection of a trigger sensor for read cycle generation at the master, for example, are disregarded here!

- ① Ethernet (host port)
- ② Serial host interface
- ③ Switch
- ④ Device
- ⑤ Master
- ⑥ Device number
- ⑦ CAN etc.
- ⑧ Slave
- ⑨ Branch line
- ⑩ Adapter cable (female connector, M12, 17-pin, A-coded/male connector, D-Sub-HD, 15-pin)
- ⑪ Device number (GN)
- ⑫ Maximum 32 users
- ⑬ Alternative connection module CDB650-204.

A connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded) is required to connect the device



NOTE

Activate the CAN data interface in the device with a configuration tool, e.g. the configuration software SOPAS ET.

Make further settings in the device corresponding to the function of the device in the system configuration.

14.6.7 Wiring digital switching inputs “Sensor 1” and “Sensor 2” of the device in the CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

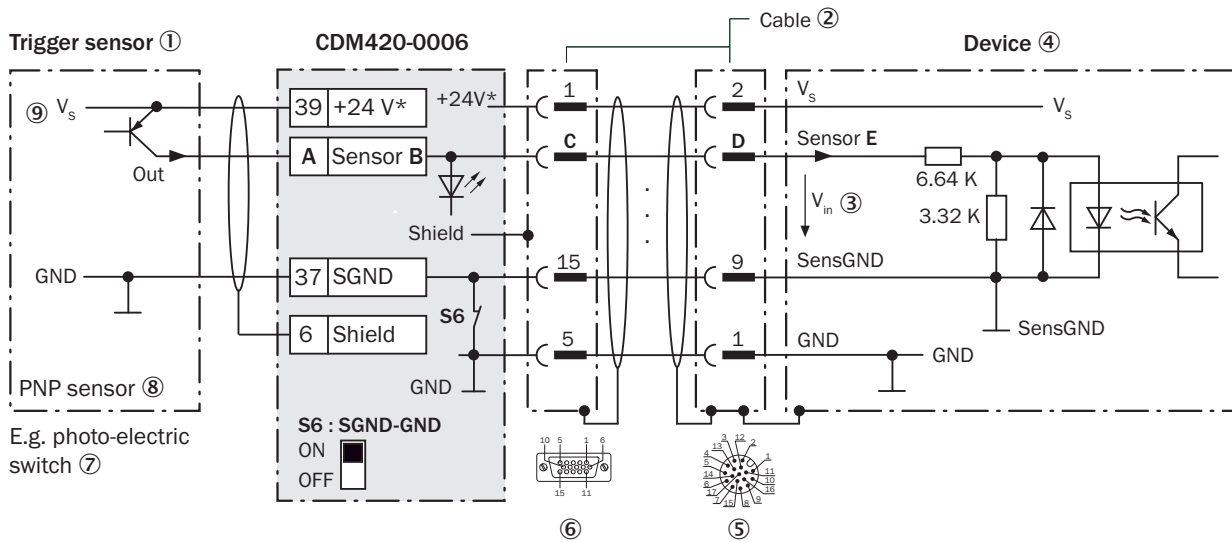


Figure 63: Trigger sensor supplied with power by connection module CDM420-0006

- ① Trigger sensor, e.g. for read cycle generation
- ② Adapter cable (male connector, D-Sub-HD, 15-pin / female connector, M12, 17-pin, A-coded)
- ③ Input voltage V_{in}
- ④ Device
- ⑤ Device: male connector, M12, 17-pin, A-coded
- ⑥ Connection module: female connector, M12, 17-pin, A-coded
- ⑦ e.g. photoelectric sensor
- ⑧ PNP sensor
- ⑨ Supply voltage V_s

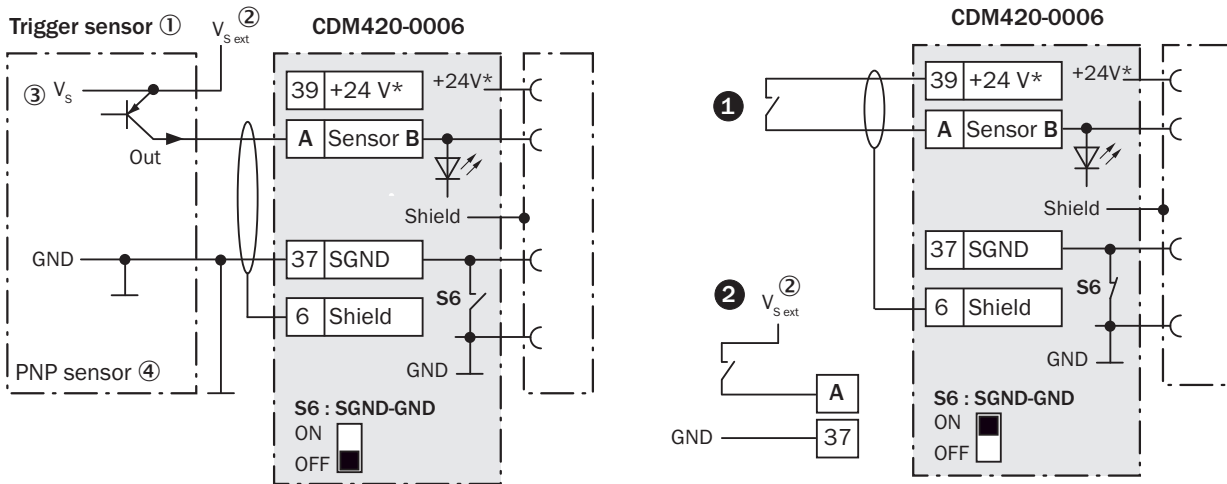


Figure 64: Left: Trigger sensor connected potential-free and supplied with power externally. Right: Alternatively switch, ① supplied with power by connection module CDM420-0006 or ② connected potential-free and supplied with power externally. Switch setting S6 then as in left figure.

- ① Trigger sensor, e.g. for read cycle generation
- ② External supply voltage $V_{S\ ext}$ ($V_{S\ ext} = U_{V\ ext}$)
- ③ PNP sensor
- ④ Supply voltage V_S

Table 55: Assignment of placeholders to digital switching inputs

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

Function of switch S6

Table 56: Switch S6: SGND - GND

Switch setting	Function
ON	GND of the trigger sensor connected with GND of CDM420-0006 and GND of the device
OFF	Trigger sensor connected potential-free at CDM420-0006 and device. Common, isolated reference potential of all digital switching inputs is SGND.

Characteristic data of digital switching inputs

Table 57: Characteristic data of the digital switching inputs "Sensor 1" and "Sensor 2"

Switching behavior	Power to the input starts the assigned function, e.g. start read cycle. Default setting in the device: logic not inverted (active high), debounce time 10 ms
Properties	<ul style="list-style-type: none"> • Opto-decoupled, reverse polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $V_{in} \leq 2\ V$; $I_{in} \leq 0.3\ mA$ High: $6\ V \leq V_{in} \leq 30\ V$; $0.7\ mA \leq I_{in} \leq 5\ mA$



NOTE

Assign the functions for the digital switching inputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6.8 Wiring digital switching inputs “External input 1” and “External input 2” of the device in the CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

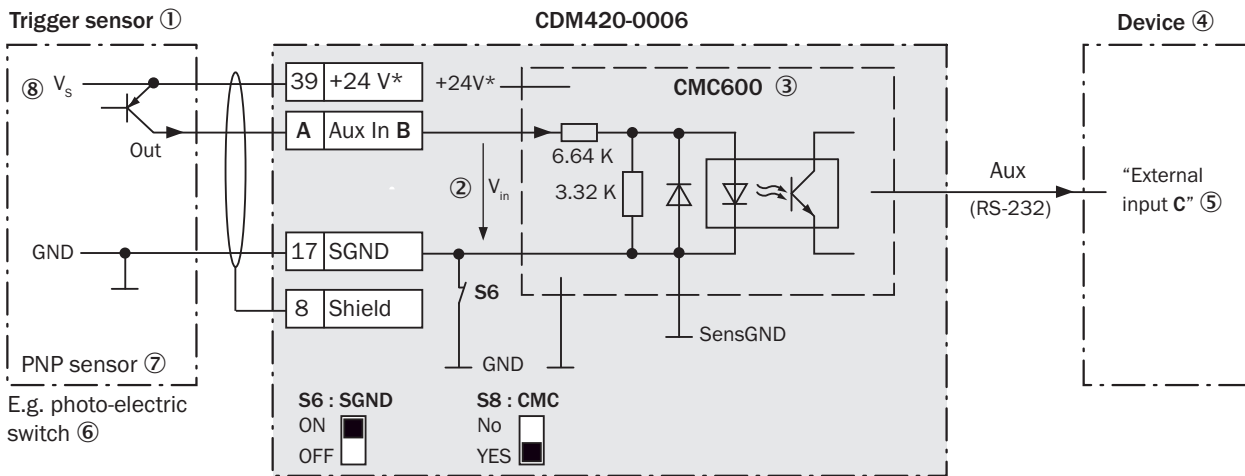


Figure 65: Trigger sensor supplied with power by connection module CDM420-0006

- ① Trigger sensor, e.g. for read cycle generation
- ② Input voltage V_{in}
- ③ The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device
- ④ Device
- ⑤ Logical “External input” in the device
- ⑥ e.g. photoelectric sensor
- ⑦ PNP sensor
- ⑧ Supply voltage V_s

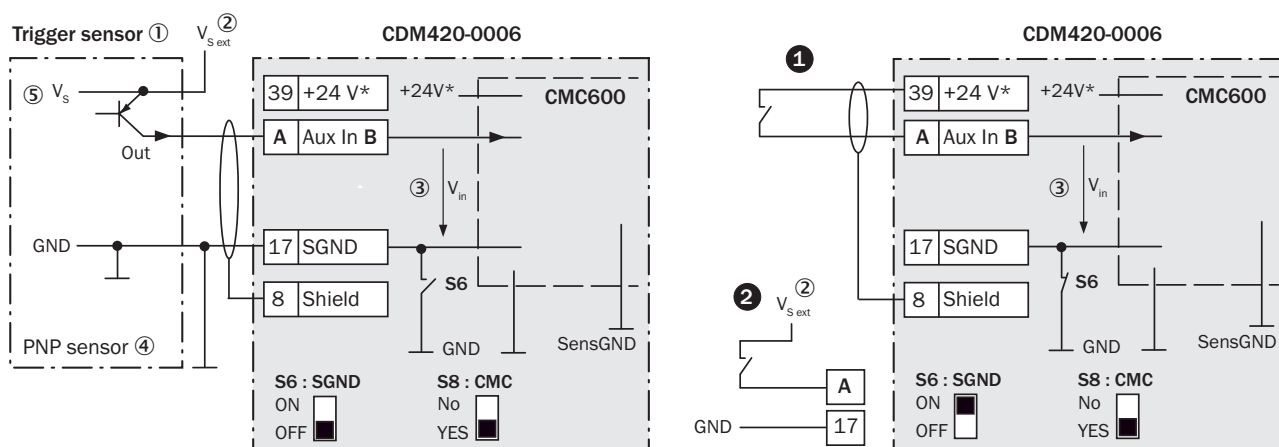


Figure 66: Left: Trigger sensor connected potential-free and supplied with power externally. Right: Alternatively switch, ❶ supplied with power by connection module CDM420-0006 or ❷ connected potential-free and supplied with power externally. Switch setting S3 then as in left figure.

- ❶ Trigger sensor, e.g. for read cycle generation
- ❷ External supply voltage $V_{S\ ext}$
- ❸ Input voltage V_{in}
- ❹ PNP sensor
- ❺ Supply voltage V_s

Table 58: Assignment of placeholders to digital switching inputs

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

Function of switch S6

Table 59: Switch S6: SGND - GND

Switch setting	Function
ON	GND of the trigger sensor connected with GND of CDM420-0006 and CMC600
OFF	Trigger sensor connected potential-free at CDM420-0006 and CMC600. Common, isolated reference potential of all digital switching inputs is SGND.

Functional principle of the external switching inputs

As a software-controlled operation, the CMC600 automatically transmits the output states of its physical digital switching inputs “Aux In 1” and “Aux In 2” in the connection module via the connecting cable to the serial Aux interface of the device. The device internally implements the states for its logical inputs “External input 1” and “External input 2”.



NOTE

The external digital switching inputs are software-defined. This results in a delay of maximum 15 ms when transmitting the signal input at the CMC600 to the device.

Characteristic data of digital switching inputs

Table 60: Characteristic data of the digital switching inputs “External input 1” and “External input 2”

Switching behavior	Power to the input starts the assigned function, e.g. start read cycle. Default setting in the device: logic not inverted (active high), debounce time 10 ms
Properties	<ul style="list-style-type: none"> • Opto-decoupled, reverse polarity protected • Can be wired with PNP output of a trigger sensor
Electrical values	Low: $V_{in} \leq 2 \text{ V}$; $I_{in} \leq 0.3 \text{ mA}$ High: $6 \text{ V} \leq V_{in} \leq 30 \text{ V}$; $0.7 \text{ mA} \leq I_{in} \leq 5 \text{ mA}$



NOTE

Assign the functions for the external digital switching inputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6.9 Wiring digital switching outputs “Result 1” and “Result 2” of the device in CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

Inductive load



NOTE

Provide an arc-suppression circuit at the digital switching output if an inductive load is present.

- ▶ Attach a freewheeling diode directly to the load for this purpose.

Table 61: Assignment of placeholders to digital switching outputs

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

Characteristic data of digital switching outputs

Table 62: Characteristic data of the digital switching outputs “Result 1” and “Result 2”

Switching behavior	PNP switching to supply voltage V_S Default settings in the device: no function, logic: not inverted (active high)
Properties	<ul style="list-style-type: none"> • Short-circuit protected + temperature protected • Not electrically isolated from V_S
Electrical values	$0 \text{ V} \leq V_{out} \leq V_S$ $(V_S - 1.5 \text{ V}) \leq V_{out} \leq V_S$ for $I_{out} \leq 100 \text{ mA}$



NOTE

Assign the functions for the digital switching outputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

14.6.10 Wiring digital switching outputs “External output 1” and “External output 2” of the device in the CDM420-0006

Device = RFU63x-131xx, RFU63x-041xx

Device = RFU65x-101xx

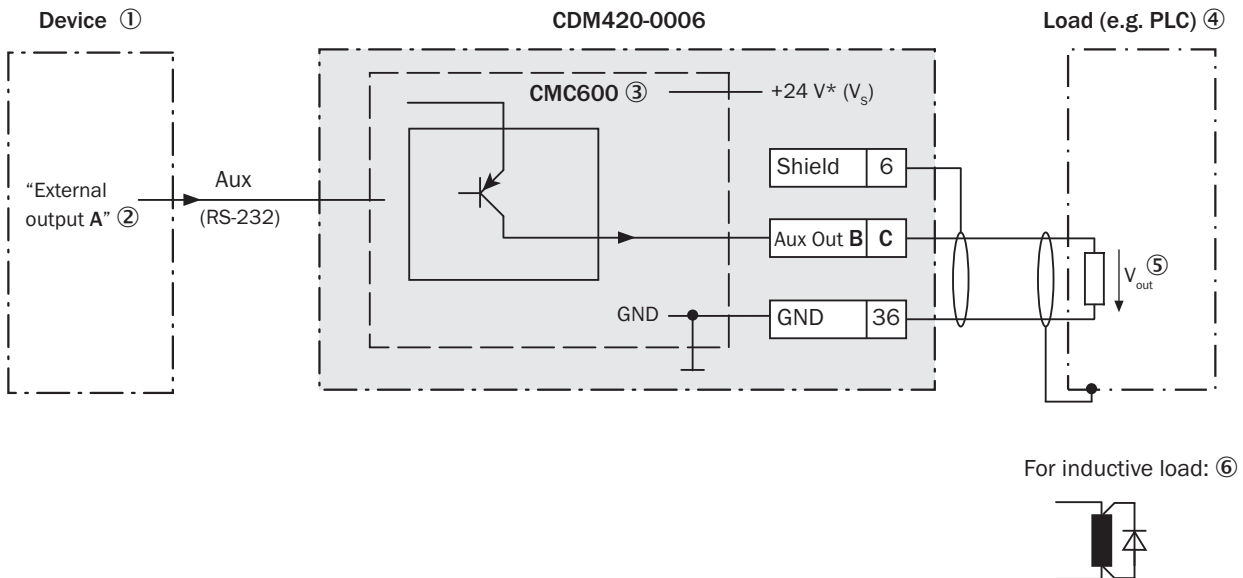


Figure 67: Wiring external digital switching outputs “Aux Out 1” and “Aux Out 2” of the device in the connection module CDM420-0006

- ① Device
- ② Logical “External output” in the device
- ③ The optional parameter cloning module CMC600 is required in the connection module in order to be able to use the additional external digital switching inputs and outputs of the device
- ④ Load (e.g. PLC)
- ⑤ Output voltage V_{out}
- ⑥ With inductive load: see note

Inductive load



NOTE

Provide an arc-suppression circuit at the digital switching output if an inductive load is present.

- Attach a freewheeling diode directly to the load for this purpose.

Table 63: Assignment of placeholders to digital switching outputs

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

Functional principle of the external switching outputs

The device outputs the output states of its logical outputs “External output 1” and “External output 2” via its serial Aux interface. By means of a software-controlled operation, the CMC600 automatically adopts the states via the connecting cable and sets them on its physical digital switching outputs “Aux Out 1” and “Aux Out 2” in the connection module.

Characteristic data of digital switching outputs

Table 64: Characteristic data of the digital switching outputs “External output 1” and “External output 2”

Switching behavior	PNP switching to supply voltage V_S Default settings in the device: no function, logic: not inverted (active high)
Properties	<ul style="list-style-type: none"> • Short-circuit protected + temperature protected • Not electrically isolated from V_S
Electrical values	$0\text{ V} \leq V_{\text{out}} \leq V_S$ $(V_S - 1.5\text{ V}) \leq V_{\text{out}} \leq V_S$ at $I_{\text{out}} \leq 100\text{ mA}$



NOTE

Assign the functions for the external digital switching outputs in the device with a configuration tool, e.g. the configuration software SOPAS ET.

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14.8 Abbreviations used

Table 65: Abbreviations used

CAN	Controlled Area Network. Field bus protocol based on the CAN bus
CDB	Connection Device Basic
CDF	Connection Device Fieldbus
CDM	Connection Device Modular
CE	Communauté Européenne. European Community
CMC	Connection Module Cloning
CMD	Connection Module Display

CMF	Connection Module Fieldbus
CMP	Connection Module Power
CoLa-A	Command Language ASCII (SICK-specific protocol)
CSN	CAN Sensor Network (SICK-specific protocol)
DNS	Domain Name Server
ESD	ElectroStatic Discharge Electrostatic discharge
ETSI	European Telecommunications Standards Institute
EMC	Electromagnetic Compatibility
FCC	Federal Communications Commission
GSD	General Station Description (for PROFIBUS/ PROFINET)
HTML	Hyper Text Markup Language
I	Input
LED	Light Emitting Diode. Light emitting diode
LPS	Limited Power Supply
MAC	Medium Access Control
MTBF	Mean Time Between Failures
MTTF	Mean Time To Failure
MTTR	Mean Time To Repair
O	Output
PD	Powered Devices. Energy consumer
PDF	Portable Document Format
PoE	Power over Ethernet. Voltage supply via the Ethernet
PSE	Power Sourcing Equipment. Power source when using PoE
RHCP	Right hand circular polarized
RFID	Radio Frequency Identification
RTF	Rich Text Format (standard document format with format descriptions)
RFU	Radio Frequency Ultra high frequency
SD	Secure Digital
SOPAS ET	SICK Open Portal for Application and Systems Engineering Tool (PC software for Windows for device configuration)
SDD	SOPAS Device Description (device description file)
SELV	Safety Extra Low Voltage
PLC	Programmable Logic Controller
TCP/IP	Transmission Control Protocol/Internet Protocol
TID	Tag Identifier
UHF	Ultrahighfrequency
UII	Unique Item Identifier
UL	Underwriters Laboratories
USB	Universal Serial Bus
VESA	Video Electronics Standards Association

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