OPERATING INSTRUCTIONS

RFMS Pro
Track and trace systems

EN

SICK
Sensor Intelligence.

Contents

Contents

1 About these operating instructions

Please read through this chapter carefully before you use the documentation and work with the RFMS Pro.

1.1 Purpose of this document

These operating instructions are designed to give **technical personnel** instructions on the safe mounting, configuration, electrical installation, commissioning, operation, and maintenance of the RFMS Pro.

1.2 Target group

These operating instructions are intended for people who install, connect, commission, operate, and service the RFMS Pro system.

1.3 Information depth

Note The RFMS Pro system solution is also referred to in these operating instructions as "RFID tunnel" or "tunnel" for short.

These operating instructions contain information about the tunnel on the following topics:

- Product description
- Mounting
- Electrical installation
- Commissioning and standard configuration
- Maintenance
- Fault diagnosis and troubleshooting
- Technical data and dimensional drawings

When planning and using RFID systems such as the RFMS Pro, technical skills are required that are not covered by this document.

The official and legal regulations for operating the RFMS Pro must always be complied with.

The SOPAS configuration software is used to configure the tunnel for the respective application on site.

Note Please also refer to the online RFID information at

http://www.sick.com

There, you can find sample applications and a list of frequently asked questions about RFID.

1.4 Abbreviations used

CAN Controller Area Network = Standardized fieldbus system that uses a message-based data exchange protocol

LED Light-Emitting Diode

MSC Modular System Controller (MSC800)

RFID Radio Frequency Identification = Identification of objects by means of electromagnetic waves

RFMS Radio Frequency Modular System = Modular RFID system

RFU Radio Frequency Unit = Read/write unit for RFID system

SOPAS SICK OPEN PORTAL for APPLICATION and SYSTEMS Engineering Tool = Software for configuring RFMS Pro

1.5 Symbols used

Recommendation Recommendations are designed to assist you in the decision-making process with respect to the use of a certain function or technical measure.

Note Notes provide information on the features of a device or application.

1. / 2. Step by step Instructions that must be carried out in the order described are referred to as step-by-step instructions and are indicated by numbered lists. Read carefully and follow the instructions for action.

➢ **Take action** Instructions for taking action are indicated by an arrow. Read carefully and follow the instructions for action.


WARNING

Warning

A warning indicates a specific or potential hazard. This is to protect you against accidents and protect devices from damage.

Read carefully and follow the warnings.

Software notes show where you make the appropriate settings in the SOPAS configuration software.

● Red, ☼ Yellow, ○ Green

LED symbols describe the status of a diagnostics LED. Examples:

● **Red** The red LED is illuminated continuously.

☼ **Yellow** The yellow LED is flashing.

○ **Green** The green LED is off.

2 On safety

This chapter concerns your own safety and the safety of the system operator.

➢ Please read through this chapter carefully before you work with the RFMS Pro system.

2.1 Qualified safety personnel

RFMS Pro must only be mounted, commissioned, and serviced by adequately qualified safety personnel.

The following qualifications are necessary for the various tasks:

2.1.1 Mounting and maintenance

- Practical technical training
- Knowledge of the current safety regulations in the workplace

2.1.2 Electrical installation and replacement of system components

- Practical electrical training
- Knowledge of current electrical safety regulations
- Knowledge of the operation and control of the devices in their particular application (e.g., conveying line)

2.1.3 Commissioning, operation, and configuring

- Knowledge of the mechanical and electrical parameters of the conveying line and properties of the conveying system as to operation and use
- Basic knowledge of the Windows operating system used
- Basic knowledge of data transmission
- Basic knowledge of the design and setup (addressing) of Ethernet connections when connecting the MSC800 to Ethernet
- Basic knowledge about and experience using an HTML browser (e.g., Internet Explorer) to use the online help
- Basic knowledge of RFID technology

2.2 Applications of the device

The RFMS Pro is a system for identifying objects positioned close to one another on a conveying line. The UHF transponders (known as "RFID tags") are reliably detected and assigned to the objects. The RFMS Pro system identifies objects with just one tag as well as tags in a bundle.

Thanks to its use of standard modules with a rugged, industrial design, which can be freely combined, the RFMS Pro can be adapted to the customer's on-site conditions quickly and conveniently. The mechanical design and the antenna position can be adapted based on the width and height of the conveying system and the various positions of the RFID tags inside the object.

A field-tested algorithm ensures that the RFID tags that are read are reliably assigned to objects. The calculation is performed on the central controller. The tracking algorithm enables several objects to be located in the tunnel.

All the important events relating to the tunnel system converge in the central control unit of the RFMS Pro system. From here, they are then forwarded to downstream systems (such as ERP systems) at a defined output time.

2.3 Correct use

The RFMS Pro may only be used as described in section 2.2 Applications of the **device**.

The system must be mounted and commissioned by qualified safety personnel in accordance with these operating instructions. After that, the system may only be used by competent personnel.

Operation is allowed in an industrial environment, in warehouses or in a manufacturing environment. Acceptable applications include the acquisition of master data in ERP systems, the comparison of incoming goods against advice notes, and the inspection of outgoing goods.

Operation of the RFMS Pro is not allowed outdoors or in an explosion-protected environment.

If used in any other way or if alterations are made to the system and if the devices are opened – including in the context of mounting and installation – this will void warranty claims directed to SICK AG.

Note The antenna and reader types are dependent on the country in which the system is operated. They are subject to national standards and regulations.

2.4 General safety notes and protective measures

WARNING

Safety notes

Observe the following to ensure the safe use of the RFMS Pro system solution as intended.

- The notes in these operating instructions (e.g., regarding the use, mounting, installation, or integration in the machine controller) must be observed.
- The national and international legal specifications apply to the installation and use of the system, to its commissioning, and to recurring technical inspections, in particular:
  - The accident prevention regulations and work safety regulations
  - Any other relevant safety specifications
- The manufacturer and user of the system are responsible for coordinating and complying with all applicable safety specifications and regulations in cooperation with the relevant authorities.
- The evaluations must be carried out by qualified safety personnel or specially qualified and authorized personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- These operating instructions must be made available to the operator of the system. The system operator must be instructed by qualified safety personnel and read the operating instructions.

WARNING

Risk of injury due to falling components

The weight of the tunnel structure is dependent on the number of modules involved.

A large tunnel module weighs approximately 17 kg, a small tunnel module is around 9 kg.

The tunnel superstructure typically weighs about 70 kg.

- Do **not** perform any mounting work alone.
- Ask a second person to hold components while mounting.
- Wear safety shoes.

WARNING

Risk of injury due to tipping components

If modules are screwed together in an upright position, there is a risk that the erected modules could tip over.

- Where applicable, do **not** perform any mounting work alone.
- Ask a second person to assist you while mounting if necessary.
- Wear safety shoes.

WARNING

Risk of injury due to electric current

The central control unit of the tunnel is connected to the power supply (100 ... 264 V AC/ 50 ... 60 Hz).

- Only authorized personnel are allowed to perform electrical installations.
- The power supply must be disconnected when attaching and detaching electrical connections.
- Select and implement wire cross-sections and their correct fuse protection in accordance with the applicable standards.
- Observe the current safety regulations when working on electrical systems.

WARNING

Location of use

The RFMS Pro is intended solely for use in industrial environments and as a stationary system. Radio interference may result when used in residential areas.

2.5 Protection of the environment

The RFMS Pro has been designed to minimize its impact on the environment. It consumes very little energy.

At work, always act in an environmentally responsible manner. For this reason, please note the following information on disposal.

2.5.1 Power consumption

Including its components (controller, read/write device, photoelectric retro-reflective sensor, and measuring wheel encoder), the RFMS Pro consumes max. 50 watts of power.

2.5.2 Disposal after final decommissioning

- Always dispose of unusable or irreparable devices in an environmentally safe manner in accordance with the relevant national waste disposal regulations.
- Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are easy to dismantle.

See also section **7.3** Disposal.

Note SICK AG does not take back devices that are unusable or irreparable.

3 Product description

This chapter provides information on the special features of the RFMS Pro system. It describes the design and operating principle of the system.

3.1 Scope of delivery

The RFMS Pro comprises:

- **Structural** and **reader modules** (application-specific based on the order)
- Mounting brackets
- Mounting rails and mounting brackets (in accordance with the order)
- **System components**
  - MSC800 controller
  - RFU630 read/write device
  - WL18 photoelectric retro-reflective sensor
  - DFV60 measuring wheel encoder
- **Cable set** for connecting the devices
  - T-piece
  - Terminator
  - Ethernet cable (green)
  - CAN cable (purple)
  - Connecting cable for photoelectric retro-reflective sensor (black with green male connector)
  - Connecting cable for measuring wheel encoder - screened (black with green male connector)
  - Antenna downleads
- CD-ROM that includes the following
  - SOPAS configuration software
  - **RFMS Pro** operating instructions in German and English as a PDF
  - Adobe Acrobat Reader for reading PDF files

Important note

➢ It is recommended that you carefully check for and report transport damage of any kind as soon as possible after receiving the system.

➢ Also verify that delivery includes all components listed on the delivery note.

3.2 Special features

The RFMS Pro is a tunnel system that can reliably detect passing UHF transponders (i.e., RFID tags) and assign them to the relevant objects. The system solution applies to objects with just one tag as well as to the identification of tags in a group.

3.2.1 Tunnel design

The RFMS Pro consists of modules that can be freely combined, enabling the tunnel design to be adapted to the relevant on-site conditions quickly and conveniently. As a result, the RFMS Pro can respond flexibly to the different widths and heights of conveying systems, as well as to the different positions of tags on the objects passing through it.

The modules of the RFMS Pro system are self-supporting. They are assembled using mounting brackets – no additional frame is necessary.

Fig. 1: RFID tunnel design

The tunnel system's modular concept distinguishes between two types of module:

- **Reader modules** (1) with integrated antenna and
- Pure **structural modules** (2)

The modules are assembled using **mounting brackets** (3) and the tunnel attached to the conveying system using **mounting rails** and mounting brackets (4).

Reader modules

Reader modules feature an integrated antenna (1) and integrated absorber panels (2). These are covered on the inside by a plastic panel.

Fig. 2: Reader modules

A cable channel (5) is mounted on the outside of the stainless steel wall. This features cutouts for mounting the antenna (4) and connecting the antenna downlead (3).

The reader module's dimensions are 1200 x 500 x 80 mm (length x width x height).

Note A tunnel system can be equipped with a maximum of four reader modules.

Structural modules

Structural modules serve only to create the individual tunnel design; no antennas can be mounted in them. The structural modules are also made from stainless steel (1) and feature a cable channel (2) on the outside.

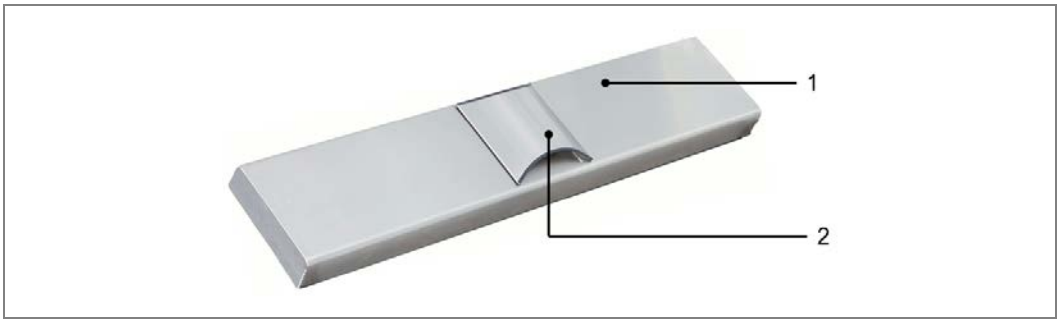


Fig. 3: Structural modules

Structural modules are available in the following dimensions:

1200 x 500 x 80 mm and 1200 x 250 x 80 mm (length x width x height)

Mounting brackets

The individual modules are connected to one another using mounting brackets (1). Variable bracket sizes of 30°, 45°, 90° or 180° permit an individual tunnel design to be created, dependent on the customer application. Internal threads (2) on the side edges of the modules ensure that the mounting brackets can be screwed on quickly.

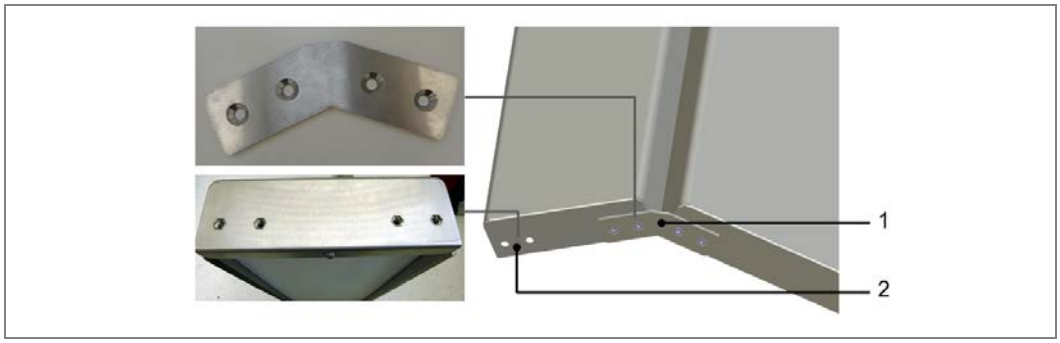


Fig. 4: Mounting brackets

Mounting brackets

The modules or groups of modules are mounted on the conveying system by the customer. Mounting rails and mounting brackets are supplied.

3.2.2 Design variants

Various tunnel designs can be adapted thanks to the modular principle. The structural elements required will depend on the height and width of the conveying system. The number and position of the reader modules in the tunnel are based on the expected detection location of the tags in the tunnel.

The following figures show some typical tunnel designs.

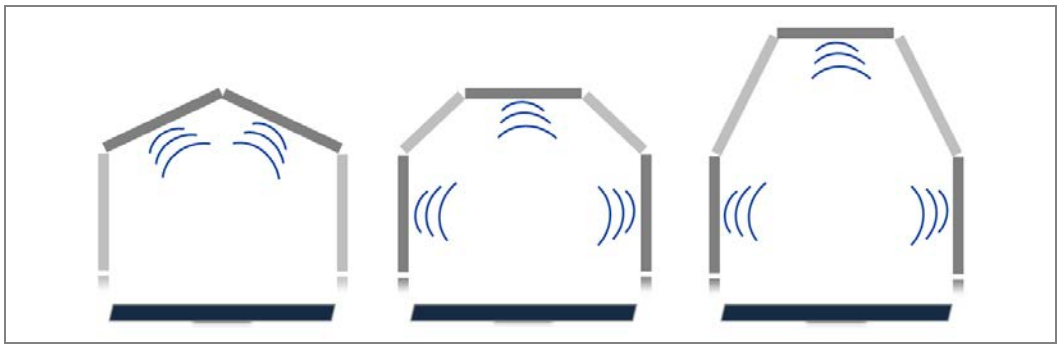


Fig. 5: Typical RFMS Pro design variants

A reader module can also be attached to the underside of the conveying system in order to achieve an optimum read result.

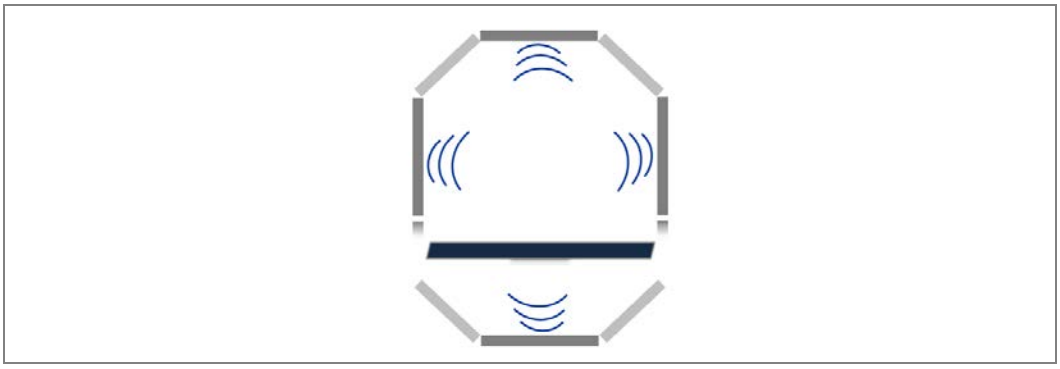


Fig. 6: Conveying system with reader module on the underside

Note When using antennas located underneath the belt, make sure that the area between the antenna and the belt is free of metal (see also the notes in the chapter **Mounting requirements**).

3.2.3 Tunnel devices

The RFMS Pro comprises the following devices:

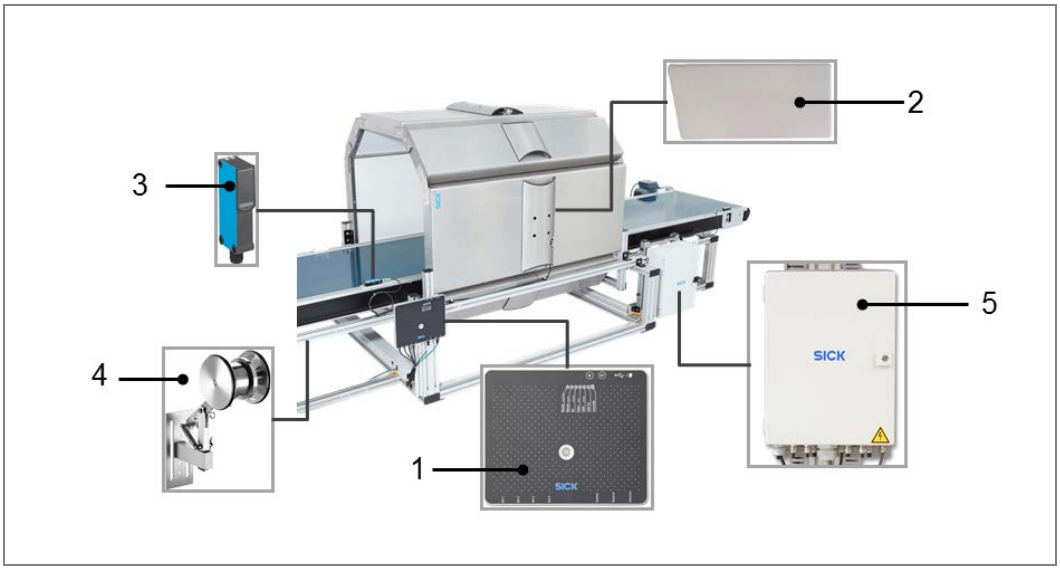


Fig. 7: RFMS Pro device components

No.	Component	Explanation
1	Read/write device	The read/write device is the read unit for RFID detection. Using up to four antennas, it processes all current transponders in the carrier frequency range of 860 - 960 MHz. The frequency depends on the standards and regulations of the country where the system is being used.
2	Reader modules with antennas	The RFID antennas integrated in the reader modules detect RFID transponders inside the tunnel. Depending on the version, up to four antennas are used.

3	Photoelectric retro-reflective sensor	The photoelectric retro-reflective sensor activates the RFID read/write unit. The photoelectric retro-reflective sensor also provides information on when an object enters the tunnel. The controller needs this information, along with the signals from the measuring wheel encoder, to accurately determine the position of the object on the belt. The photoelectric retro-reflective sensor is attached to the conveying system just in front of the tunnel entrance.
4	Measuring wheel encoder	The DFV60 measuring wheel encoder provides the exact position of the object on the belt once it has passed the photoelectric sensor. To do this, the encoder sends two incremental signals in quadrature to the controller. These signals can then be used to determine the speed and position directly on the belt. Measurements are taken on the face of the belt directly via a precise measuring wheel, which is fitted on a spring-loaded mounting arm.
5	Controller/ control cabinet	The controller is the RFMS Pro's central control unit. It evaluates the read results of the RFU630 read/write device and assigns the identified tags to objects. The controller receives the accurately determined positions for the purpose of tag assignment via the integrated photoelectric retro-reflective sensor and the measuring wheel encoder. The controller is mounted in the control cabinet. The central power supply is also housed in the control cabinet.

Tab. 1 RFMS Pro device components

3.2.4 The operating principle of the tunnel

As soon as the object passes the photoelectric retro-reflective sensor on the belt, the RFID read/write unit in the tunnel is activated. The tags contained in the object are detected by the antennas of the reader modules and read by the read/write device. The path of the beam is interrupted, which also enables the time when the object enters the tunnel to be identified.

The measuring wheel encoder uses incremental signals to provide the exact position of the object on the belt once it has passed the photoelectric sensor.

The information provided by all the tunnel's components converges in the controller. An algorithm, which has proven its worth in the field over many years, calculates the unique assignment of every read tag to the associated object.

The read results are evaluated in the controller and forwarded via the host interface to a higher-level system such as an ERP system. The customer defines the time at which data is output.

Processing several objects simultaneously

The RFMS Pro even ensures that tags and objects are uniquely assigned if **several objects** are in the tunnel at the same time.

This means that objects can travel through the tunnel with short distances between them. The distance to be observed between the objects is dependent on the number of tags that must be processed per object.

The RFMS Pro has been designed so that there is a minimum distance of 400 mm between objects.

Note The algorithm works with both RFID tags and bar codes. Therefore, either of these technologies, or even a combination of the two, can be used with the RFMS Pro.

Operation

After installation and configuration, the system continues running without any further handling and provides the required data.

All customer-specific parameters are saved on a microSD card in the controller and read/write device.

3.3 Project planning

3.3.1 System requirements

The following are required to operate the RFMS Pro system:

- Supply voltage: 100 ... 264 V AC/50 ... 60 Hz
- Host computer with RS-232, RS-422, Ethernet or Profibus data interface for further processing of the read data

3.3.2 Information on project planning

Thanks to its modular design, the RFMS Pro can be quickly adapted to the on-site conditions of the conveying system being used. The maximum belt width is typically 800 mm.

The modules and devices are mounted on the conveying system by the customer.

Take the following information into consideration during planning:

Component	Explanation
Label/tag type	EPC Global Gen2 Class1
Typical conveying width	800 mm
Minimum conveying width	300 mm
Minimum distance between objects	400 mm
Transport speed	Up to 3 m/s
Maximum number of tags per object	Dependent on the object length in the direction of transport, materials, density of tags, etc.

Tab. 2 Information on project planning

Enclosed tunnel structure

The modules of the tunnel structure have to interlock to achieve an enclosed tunnel structure.

Note An enclosed tunnel structure prevents tags in the surrounding area being read.

Distance between the module and the outermost tag

During mounting, ensure there is a sufficient distance between the reader module and the outermost tag. This distance depends on the material from which the objects are made, the height of the antenna, and the required reading field, among other factors.

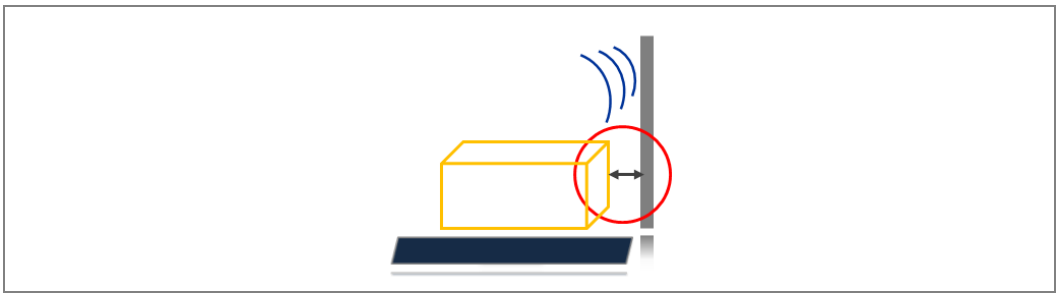


Fig. 8: Distance between reader module and outermost tag in the object

Note Observe a margin of safety for overhanging objects.

Conveying systems with lateral guide

If the belt features a lateral guide made of metal, it must be recessed inside the tunnel. An alternative solution is to use a lateral guide made from a non-metallic material (wood, plastic, etc.).

Antenna underneath the belt

If the tunnel system is designed with an antenna underneath the belt, the area between the antenna and the belt must be free of metal.

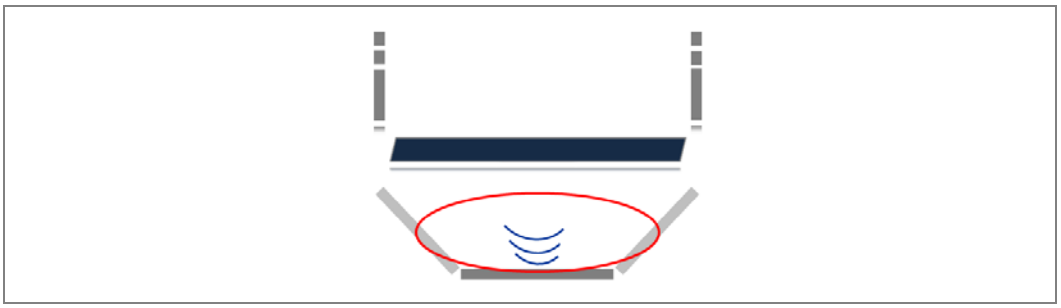


Fig. 9: Antenna underneath the belt - area free of metal

To achieve an **optimal read result**, observe the following:

- The tunnel system's configuration (incremental signals, transport speed, etc.) is set using software
- Ensure that the tunnel contains as few interference factors as possible which have a damping or reflective effect on the UHF field generated and thus reduce the read/write device's sensing range and processing speed. For example, objects which feature RFID tags and are located in the immediate vicinity of the system can have a negative impact on the system's performance
- The read rate achieved must be monitored cyclically during operation. Abnormalities in the rate must be investigated (see below for potential influencing factors)

Other possible factors that could significantly impact the sensing range include:

- Quality of the transponder (antenna gain, the integrated transponder IC and related sensitivity, reflected energy)
- Nature of the object at which the transponder is located (media such as liquids or metals)

3.4 Status indicators

The accessible tunnel LEDs are located on the photoelectric retro-reflective sensor, on the read/write device, and in the control cabinet.

3.4.1 LEDs of the WL18 photoelectric retro-reflective sensor

The photoelectric retro-reflective sensor features a yellow LED receive indicator (1) and a green LED function indicator (2).

The yellow LED must light up if the emitted light signal is reflected by the reflector and received correctly. If the path of the beam is interrupted by an object, the LED must go out. If the LED flashes, the reflector is only detected in the threshold range. The green LED lights up if the operating voltage has been applied.

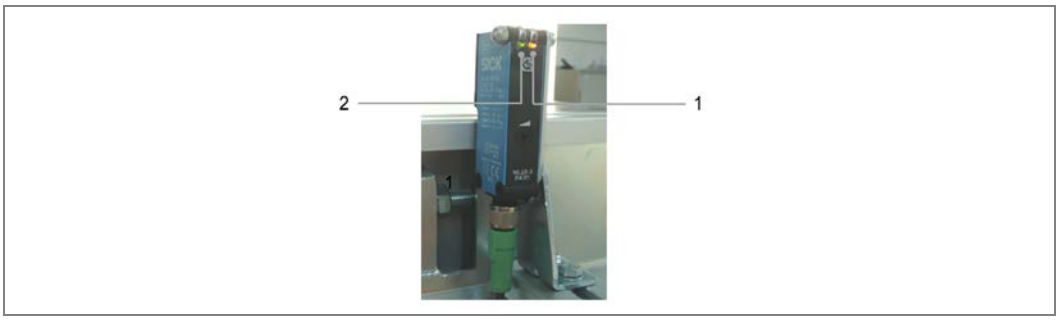


Fig. 10: Status indicators of the WL18 photoelectric retro-reflective sensor

3.4.2 LEDs on the read/write device

Fig. 11: Status indicators on the RFU630 read/write device

LED	Color	Meaning
Ready	Green	Device ready
	Red	Hardware error
Result	Green	Read or write successful
RF	Green	UHF field activated
	Red	Antenna downlead or antennas missing or defective
Data	Green	Data output via host interface
CAN	Green	Data traffic via CAN bus
LNK TX	Green	Data traffic via Ethernet
MicroSD	Green	MicroSD card inserted and ready for operation

Tab. 3 Status indicators on the read/write device

3.4.3 LEDs on the controller

Fig. 12: Status indicators on the MSC800 controller

LED	Color	Meaning
READY	Green	ON: Controller is ready for operation OFF: Controller is not ready for operation
SYSTEM READY	Green	ON: Complete system consisting of MSC800 and all attached devices is ready for operation OFF: Complete system is not ready for operation
RESULT	Green	ON: There is a valid read result OFF: No valid read result
RUN FIELDBUS	Green	ON: Fieldbus communication is active OFF: No fieldbus communication
READY FIELDBUS	Green	ON: Fieldbus application is ready OFF: Fieldbus application is not ready
OUT	Green	ON: Switching output is active OFF: Switching output is deactivated
IN, TRIGGER, INC	Green	ON: Switching input is active OFF: Switching input is deactivated
POWER (1/2)	Green	ON: Supply voltage is on OFF: No supply voltage
MicroSD ACT	Green	ON: MSC800 reads/writes data from/to the microSD card OFF: Deactivated
PROFIBUS STA ERR	Green Green	ON: Data interface is ready for communication ON: Bus or communication error
ETHERNET LNK ACT 100	Green Green Green	ON: Data interface is connected to Ethernet ON: Data transmission ON: Data transmission rate 100 MBit/s OFF: Data transmission rate 10 MBit/s

HOST (1/2) AUX (1/2) Tx 232	 Green Green	 ON: Data interface is sending data ON: Interface is operating as an RS-232 interface OFF: Interface is operating as an RS-422/485 interface
CAN 1/2Rx		ON: Data interface is receiving data

Tab. 4: Status indicators on the MSC800 controller

3.5 Interfaces

There are various data interfaces on the MSC800 controller in the control cabinet for distributing read results to any further system.

Interface	For component	Function
CAN network	RFU630 Optional: CLV bar code scanner	Component monitoring and triggering
Ethernet #1	Customer interface	Transmits the summarized data to the host
Ethernet #2	RFID read/write device	Collects the data received and assigns it to an object
Ethernet #3	Auxiliary interface	Available for maintenance, service, and commissioning by a technician
Digital I/Os	Photoelectric sensor Incremental encoder	Object trigger Incremental encoder No read, good read
RS-232/RS-422 PROFIBUS DP Ethernet	Host	Sends read tags and reports system errors
Serial connection #2 or Ethernet	SICK Visualization Platform	Sends all analysis and diagnostic information

Tab. 5: Function of the data interfaces

The SOPAS configuration software can be used to configure the data interfaces.

3.6 Parameter memory

3.6.1 Parameter set on the MSC800 microSD memory card

The configured parameter values are saved as a parameter set in the internal EEPROM of the MSC800 and on the microSD memory card (SD 1) of the controller (cloning).

If the logic unit has to be replaced, the memory card makes transferring the parameter set to the new device quick and easy (see chapter **7.2.1** Replacing the **controller**).

3.6.2 Parameter set on the read/write device microSD memory card

The read/write device also has a removable memory card on which the last modified parameter set is saved (cloning) or read diagnostic data is recorded externally (see chapter **7.2.6** Replacing a **read/write device**).

Note The photoelectric retro-reflective sensor and measuring wheel encoder have no customer-specific configuration. The devices are operated via plug & play.

4 Mounting

4.1 Preparation for mounting

4.1.1 Placing installation-ready tunnel modules

- Structural and reader modules (depending on application)
- Mounting brackets
- Countersunk head screws
- Mounting rails and mounting brackets, where applicable

4.1.2 Placing installation-ready devices

- MSC800 controller
- RFU630 read/write device
- WL18 photoelectric retro-reflective sensor
- DFV60 measuring wheel encoder

4.1.3 Placing installation-ready accessories

- Mounting brackets and device mounting kits
- Cable set for connecting the devices
  - T-piece
  - Terminator
  - Ethernet cable (green)
  - CAN cable (purple)
  - Antenna downleads
  - Connecting cable for photoelectric retro-reflective sensor (black with green male connector)
  - Connecting cable for measuring wheel encoder - screened (black with green male connector)

4.1.4 Placing installation-ready tools

Fig. 13: Required tools

The following tools are required for installation:

Tool	**Application**
Wrench 24	Cable glands
Wrench 20	Cable glands
Wrench 13	For mounting the components
Socket wrench 11	For mounting antennas
Hex key with ball end 5	For mounting the components
Hex key with ball end 4	For mounting the components
Hex key with ball end 3	For replacing the MSC
Screwdriver 5	For replacing the mounting rail
Screwdriver 2.5	For placing the cables
Diagonal cutter	Electrical installation
Cable stripping knife	Electrical installation
Wire stripper	Electrical installation
Multi-grip pliers	Cable glands, for mounting antennas

Tab. 6: Required tools

4.2 Mounting the tunnel

The recommended mounting sequence depends on whether a tunnel substructure is required for attaching an antenna underneath the belt.

Notes

The standard modules are designed with a slot and groove profile on the longitudinal sides. During assembly, make sure that the slot and groove profiles are aligned correctly.

4.2.1 Attaching an antenna to the underside of the belt

If the customer wants the tunnel structure to be designed with an antenna underneath the belt, start by mounting the tunnel substructure.

The modules are attached to the conveying system with the help of the mounting rails and mounting brackets supplied.

Mounting a group of modules

If the tunnel substructure consists of several modules (e.g., two structural modules and one reader module), first connect the individual modules to create a group of modules.

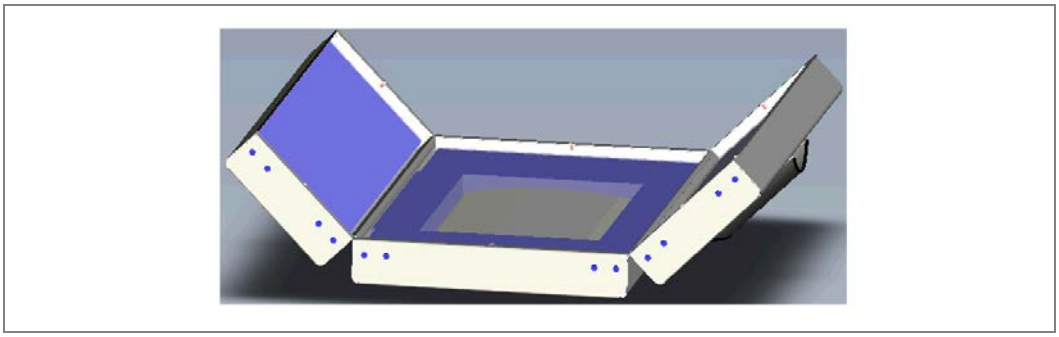


Fig. 14: Group of modules for the tunnel substructure

See chapter **Pre-mounting the tunnel superstructure** for a description of how to proceed.

1. The pre-mounted group of modules is attached to the mounting rails supplied (1) with the help of the mounting brackets (2).

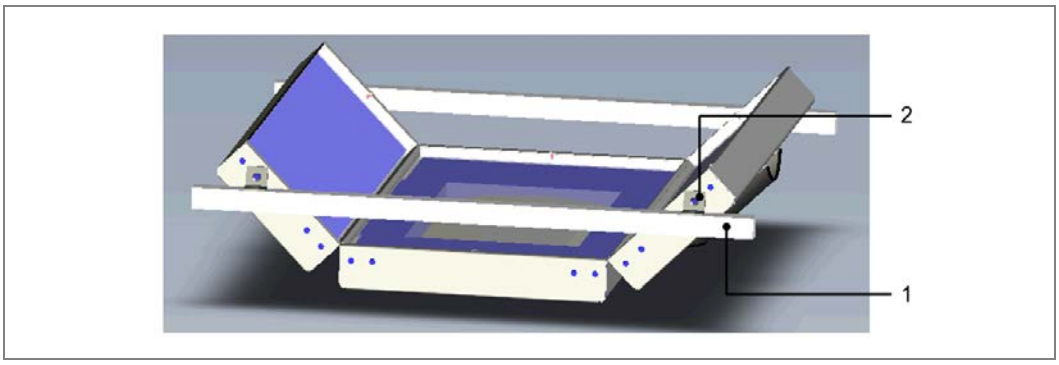


Fig. 15: Group of modules for the tunnel substructure on the mounting rails

2. The customer mounts the group of modules on the conveying system in accordance with the application.

Fig. 16: Group of modules for the tunnel substructure on the conveying system

Mounting a reader module

If the tunnel substructure consists of just one reader module with an antenna, proceed as follows:

1. The reader module is attached to the mounting rails supplied using the mounting brackets.
2. The customer mounts the base module on the conveying system in accordance with the application.

4.2.2 Attaching side modules to the conveying system

The customer mounts the two side modules on the conveying system in accordance with application requirements using, where applicable, the mounting rails and mounting brackets supplied.

1. Mount the side modules on the conveying system.

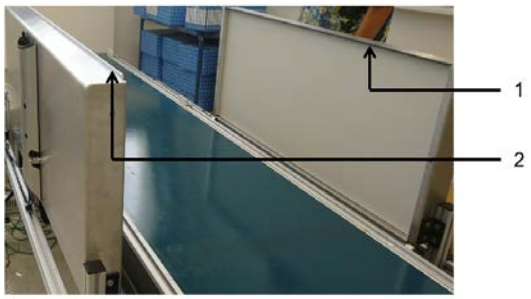


Fig. 17: Mounting the side modules on the conveying system

2. When mounting, make sure that the slot and groove profiles are aligned correctly.

Note One module must have the groove profile (1) facing up and the other the tongue profile (1), to enable the tunnel superstructure to be mounted on them at a later stage.

4.2.3 Premounting the tunnel superstructure

It is recommended that you first connect the superstructure modules together to form a group of modules and then mount that group on the side modules.

It is best to screw the individual modules together to form a group of modules in an upright position and at the required alignment angle.

WARNING

Risk of injury due to tipping components

If modules are screwed together in an upright position, there is a risk that the erected modules could tip over.

- ➢ Where applicable, do **not** perform any mounting work alone.
- ➢ Ask a second person to assist you while mounting if necessary.
- ➢ Wear safety shoes.

Mounting

1. Place the superstructure modules vertically on the floor, with the narrow edge at the bottom.
2. Position the modules so that the slot and groove profiles interlock.

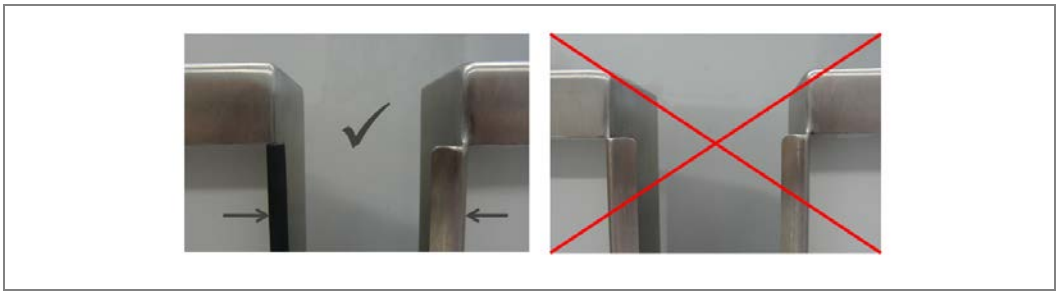


Fig. 18: Slot and groove profiles of the modules

3. A module with a tongue profile must always be inserted into a module with a groove profile.

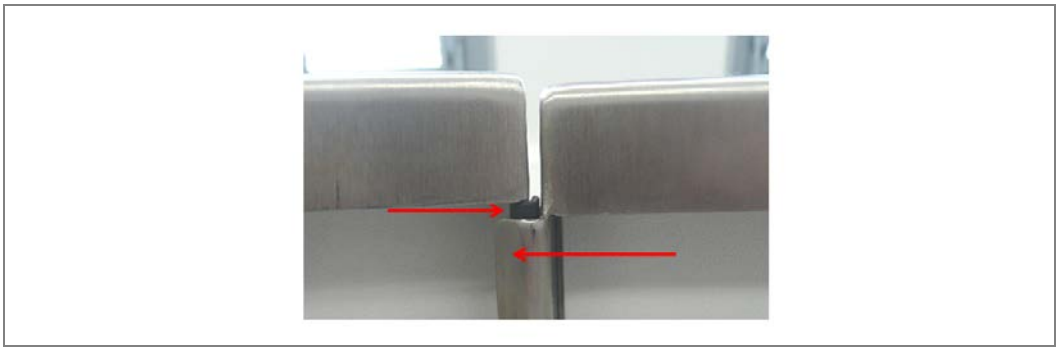


Fig. 19: Inserting a module with a slot profile into a module with a groove profile

Note The modules must always interlock so they are flush.

4. Align the modules so they can be screwed onto the required bracket.

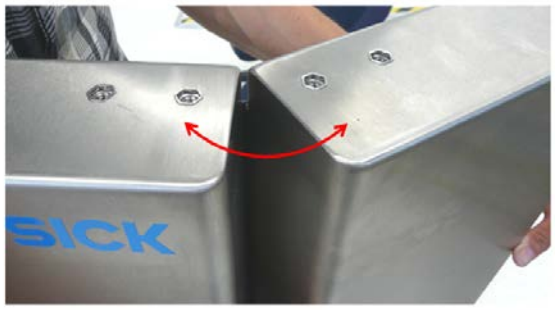


Fig. 20: Aligning modules on the bracket

5. Screw the individual modules together using the mounting brackets supplied. Use the countersunk head screws included with the delivery. You can screw these into the internal threads on the modules directly.

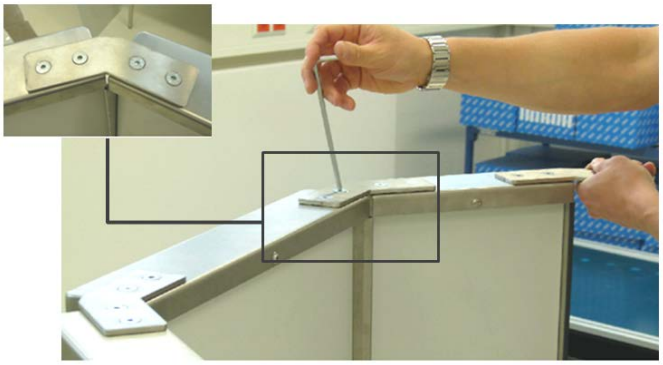


Fig. 21: Screwing modules into the bracket

Note

➢ Check that the screws are firmly tightened.

4.2.4 Placing the tunnel superstructure on the side modules

The group of modules is screwed onto the tunnel's two side modules using mounting brackets.

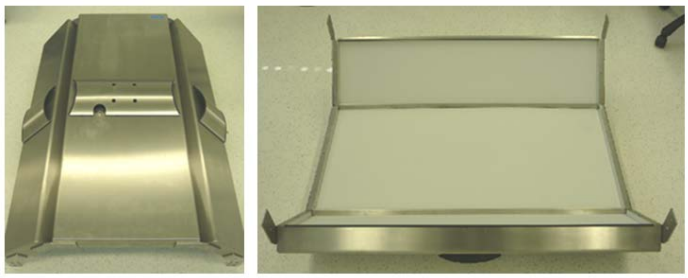


Fig. 22: Group of modules for the tunnel superstructure

WARNING

Risk of injury due to falling components

The weight of the tunnel structure is dependent on the number of modules involved.

A large tunnel module weighs approximately 17 kg, a small tunnel module is around 9 kg.

The tunnel superstructure typically weighs about 70 kg.

➢ Do **not** perform any mounting work alone.

➢ Ask a second person to hold components while mounting.

➢ Wear safety shoes.

Mounting

1. Place the group of modules onto the two side modules.

Note During placement, make sure that the slot and groove profiles are aligned correctly.

Fig. 23: Placing the group of modules on the side modules

2. Screw the superstructure group of modules onto the two side modules using the mounting brackets.

Fig. 24: Screwing the group of modules onto the side modules

Note

➢ Check that the screws are firmly tightened.

➢ Make sure that the tunnel structure is stable.

4.3 Mounting the devices

The device components are mounted in accordance with the customer-specific conditions using the mounting brackets and device mounting kits.

Appropriate cable channels are pre-mounted on the outside of the modules for running cabling to the antennas.

4.3.1 Mounting the photoelectric retro-reflective sensor and reflector

A photoelectric retro-reflective sensor (1) is used as the trigger. The emitted light signal is reflected by a reflector (2). The sender and receiver are positioned parallel to one another in a single housing.

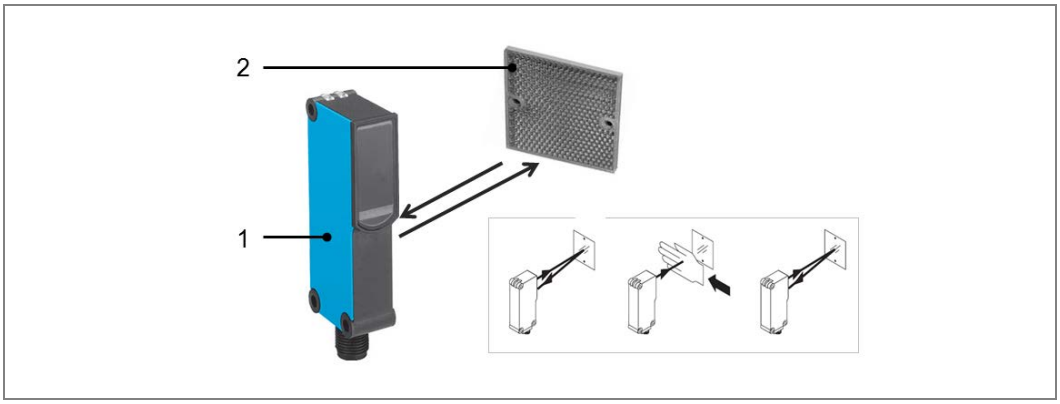


Fig. 25: Photoelectric retro-reflective sensor and reflector

Mounting

1. Mount the photoelectric retro-reflective sensor on the conveying system **at least** 150 mm in front of the tunnel entrance.

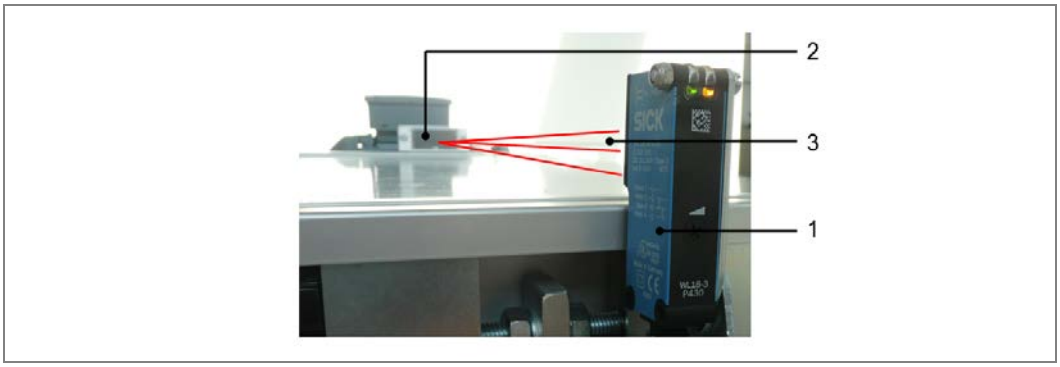


Fig. 26: Mounting the photoelectric retro-reflective sensor and reflector

2. Mount the reflector on the opposite side of the belt.

Note The reflector must be positioned in the path of the beam (3) emitted by the photoelectric retro-reflective sensor.

4.3.2 Mounting the measuring wheel encoder

The position and speed can be determined directly on the belt using the DFV60 incremental measuring wheel encoder. Measurements are taken on the face of the belt (1) directly via a precise measuring wheel (2), which is fitted on a spring-loaded mounting arm (3). This arm compensates for mechanical errors in different directions at the belt.

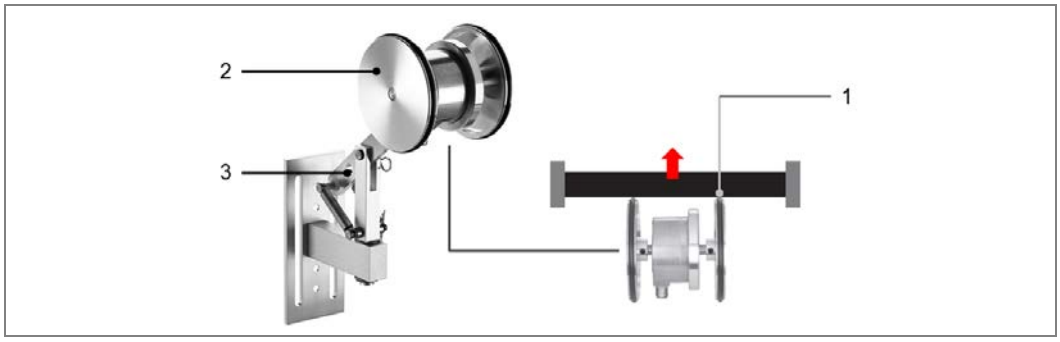


Fig. 27: Mounting the measuring wheel encoder

Mounting

The DFV60 incremental measuring wheel encoder is directly attached to the belt, there is no need to modify the existing structure.

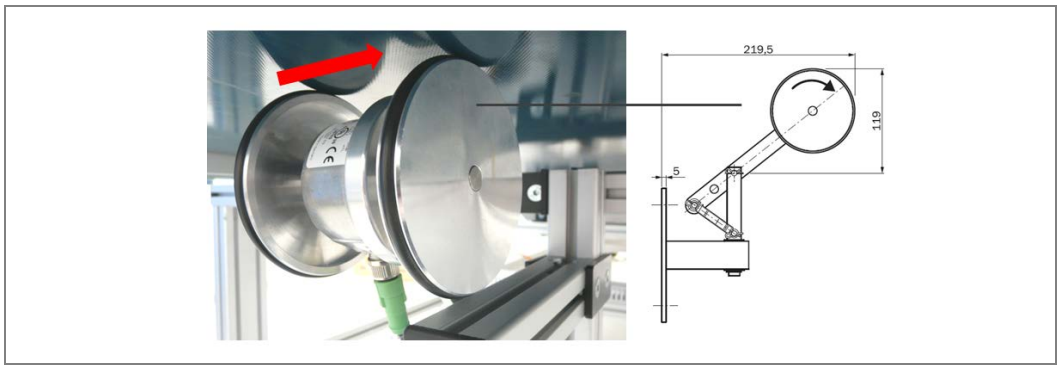


Fig. 28: Attaching the measuring wheel encoder to the belt

Note The encoder must be mounted on the belt where there are minimal vibrations.

➢ Therefore, mount the measuring wheel encoder near the circulating roller or at the end of the belt.

4.3.3 Mounting the read/write device

The RFU630 read/write device is an intelligent sensor for the automatic, fixed identification of wireless data carriers on moving or stationary objects. The RFU630 is a compact read/write unit that uses a maximum of four external antennas to process all current ISO/IEC 18000-6C-compatible transponders in the carrier frequency range of 860 to 960 MHz.

Fig. 29: Mounting the read/write device

The RFU630 uses its Ethernet interface to send read results to the controller for further processing.

Note When mounting the read/write device, remember that the length of the cable to the antennas must be as short as possible. Therefore, mount the RFU630 read/write device near the reader modules to facilitate the connection of the antennas to the RFU630. The antenna downleads supplied are 5 m long.

In addition, the read/write device must be connected to the controller by two cables. The Ethernet cable supplied is 3 m long.

Mounting

1. Mount the read/write device on the mounting set supplied.

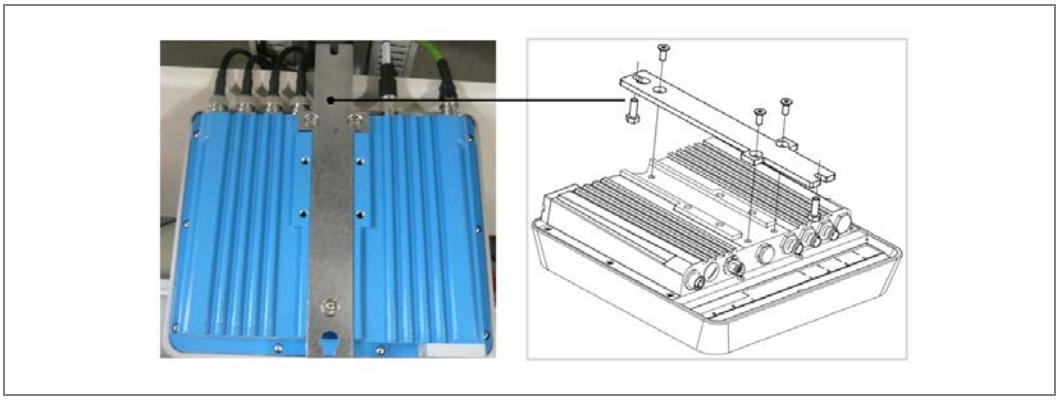


Fig. 30: Mounting the read/write device on the mounting set

2. Mount the read/write device, together with the mounting set, on the conveying system in the required location.

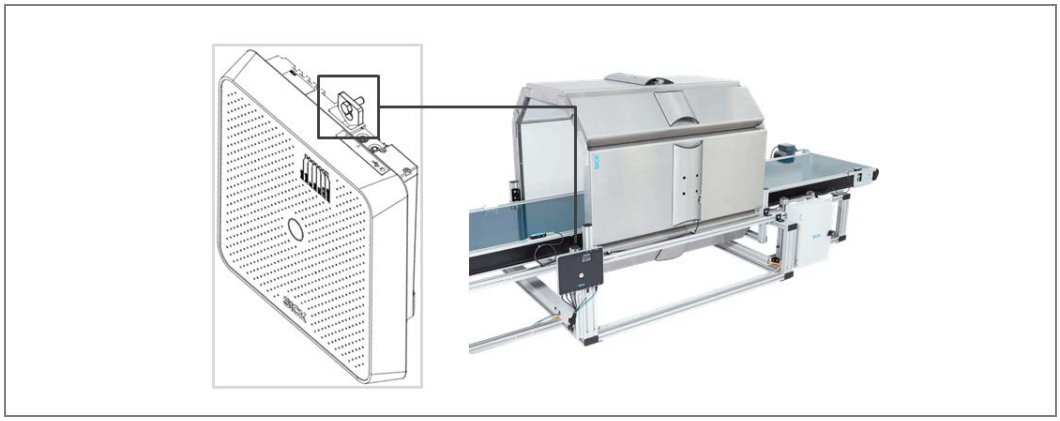


Fig. 31: Mounting the read/write device, together with the mounting set, on the conveying system

Inserting the microSD card

Insert the memory card supplied into the slot on the read/write device.

1. Loosen the two screws on the cover plate and remove it.
2. Insert the microSD card into the slot.
3. Replace the screws on the cover plate.

4.3.4 Mounting the control cabinet

The control cabinet contains the controller and assemblies for the power supply.

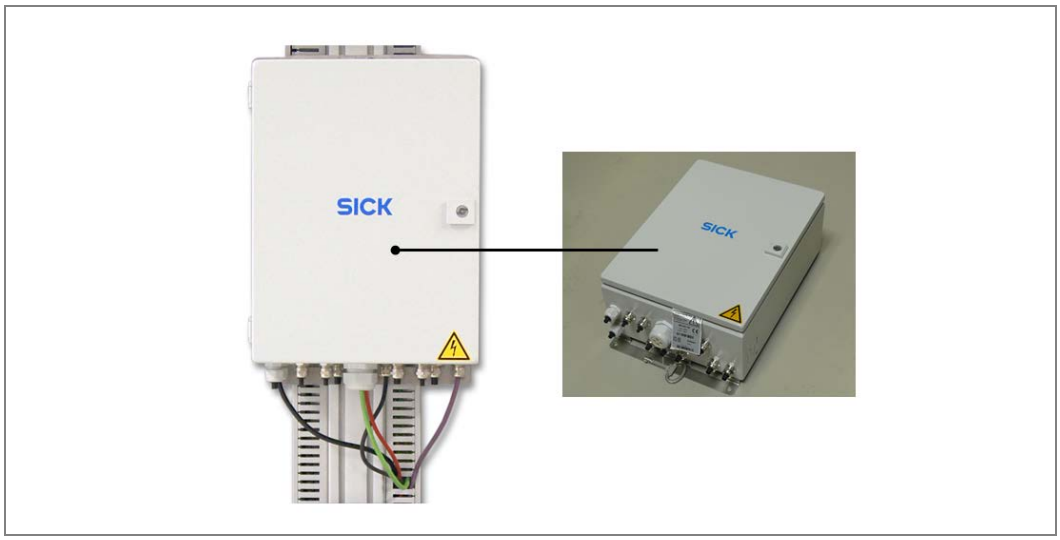


Fig. 32: Mounting the control cabinet

Note The control cabinet should be mounted on the conveying system in a location that makes it easy to lay all cables.

WARNING

Risk of injury due to falling components

The controller typically weighs about 15 kg.

- Do **not** perform any mounting work alone.
- Ask a second person to hold components while mounting.
- Wear safety shoes.

Mounting

The control cabinet is mounted on the conveying system using the attachment rail.

- Attach the control cabinet using fixing screws at the top and bottom.

Fig. 33: Mounting the control cabinet with the mounting kit on the conveying system

4.4 Dismantling the tunnel

WARNING

Risk of injury due to falling components

The weight of the tunnel structure is dependent on the number of modules involved.

A large tunnel module weighs approximately 17 kg, a small tunnel module is around 9 kg.

The tunnel superstructure typically weighs about 70 kg.

➢ Do **not** perform any mounting work alone.

➢ Ask a second person to hold components while mounting.

➢ Wear safety shoes.

WARNING

Risk of injury due to tipping components

If you screw individual groups of modules together in an upright position, there is a risk that the erected walls could tip over.

➢ Do **not** perform any dismantling work alone.

➢ Ask a second person to hold components while dismantling.

➢ Wear safety shoes.

Dismantling

1. Switch off the supply voltage.
2. Disconnect all connection cables.
3. Remove all devices from the mounting brackets.
4. Dismantle the tunnel modules or groups of modules.
5. Unscrew the groups of modules.

Note Upon final, please observe the requirements for environmentally correct disposal in the **Disposal** chapter.

5 Electrical installation

WARNING

Disconnect the power to the system

The system could inadvertently start while connecting the devices.

➢ Make sure that the entire system is disconnected from the power supply during electrical installation.

WARNING

Risk of injury due to electric current

The central control unit of the tunnel is connected to the power supply (100 ... 264 V AC/ 50 ... 60 Hz).

➢ Standard safety regulations must be met when working on electrical systems.

➢ The power supply must be disconnected when attaching and detaching electrical connections.

WARNING

Risk of injury due to electric current

Only a qualified electrician or person trained under the guidance and supervision of a qualified electrician is permitted to work on electrical systems or equipment in accordance with electrical regulations.

5.1 Components in the control cabinet

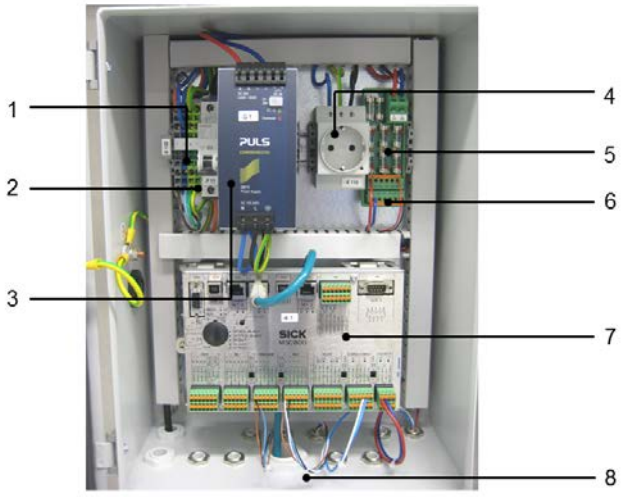


Fig. 34: Components in the control cabinet

No.	Component	Explanation
1	Power supply 110 to 230 V AC	Terminal strip for connecting the power supply
2	Fuse/main switch	For switching the complete system on/off (all system components are connected behind the fuse)

3	Power supply 24 V DC	For powering the components
4	Power outlet	May be used for service purposes
5	Fuses	The fuses are equipped with LEDs that illuminate when a fuse is defective. Top: two spare fuses (type: T2A and T4A) Based on the technical specification, the RFU630 must be fuse protected with 2 A. The fuse can be found at F6.
6	Connecting terminal 24 V	For internal power supply • Top: +24 V • Bottom: ground
7	Controller	The controller controls the complete system, evaluates the data, and sends the results to a host.
8	Cable glands	The cable glands are dust-proof and splash-proof. Make sure that the cable glands are correctly installed as required.

Tab. 7: Components in the control cabinet

5.2 Cable channels

When possible, route the cables in the cable channels. Cable channels are located on the outside of the modules (1) and in the control cabinet (2). If necessary, open the cable channels before routing any cables in the control cabinet.

Fig. 35: Routing cables via cable channels

5.3 Connecting the power supply to the controller

WARNING

Disconnect the power to the system

➢ Make sure that the cable is disconnected from the power supply and measures are taken to prevent reconnection.

Connecting the power supply

WARNING

Risk of injury due to electric current

The power supply being fed in (100 ... 264 V AC/50 ... 60 Hz) is protected by a 1-pin miniature circuit breaker (phase).

If the phase and neutral conductor are swapped when connecting to the -X100 terminal block, there is a risk of electrocution if you touch the respective contacts, even after switching off the input circuit with the -F12 miniature circuit breaker.

➢ Carefully connect the power supply to the -X100 terminal block.

➢ Verify that the power supply is connected correctly before the main switch is used to switch on the customer's power.

Note

To ensure the cables are securely attached and in compliance with the IP 65 enclosure rating, the lock nuts for strain relief on the control cabinet must be tightened.

➢ Check that the cables are securely attached.

➢ No visible metal surfaces on the wires are permitted.

Connect the power supply to the -X100 terminal block as follows:

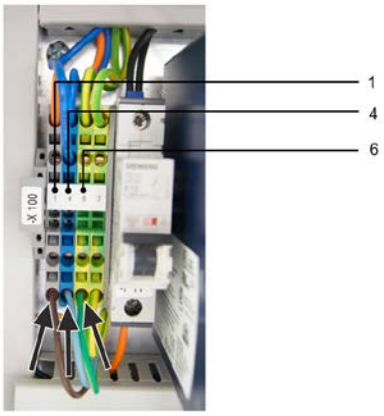


Fig. 36: Connecting the power supply

Terminal	Color of the terminal block	Signal	Function
-X100/1.1	Gray	L	Power supply 100 ... 264 V AC/50 ... 60 Hz (phase)
-X100/1.4	Blue	N	Power supply 100 ... 264 V AC/50 ... 60 Hz (neutral conductor)

-X100/1.6	Green-yellow	PE	Protective conductor
-X100/1.6	Green-yellow	PE	

Tab. 8: MSC800-1100: -X100 terminal block pin assignment for power supply IN

5.4 Connecting the measuring wheel encoder to the controller

The DFV60 measuring wheel encoder is connected to the controller via a connecting cable, which is supplied. This cable has an M12 male connector (1) on one end. The other end is open **with** a shield (2).

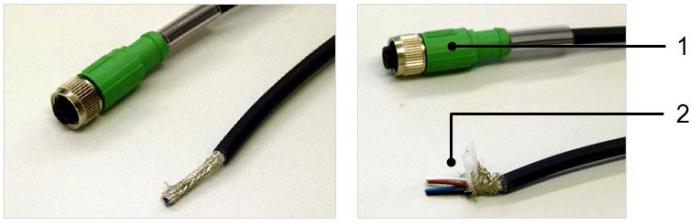


Fig. 37: Cable for connecting the measuring wheel encoder to the MSC800

Note Make sure that you do not mix up this cable with the connecting cable for the photoelectric retro-reflective sensor, as they do look the same.

However, that cable has no shield.

Screwing the M12 male connector onto the measuring wheel encoder

Screw the M12 male connector onto the measuring wheel encoder's connector.

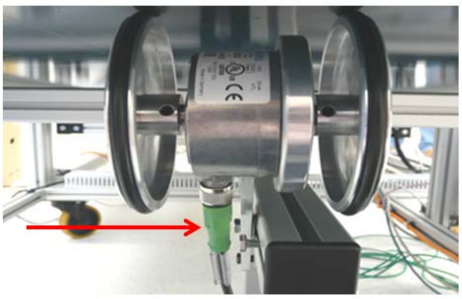


Fig. 38: Screwing the M12 male connector onto the measuring wheel encoder

Routing the cable to the control cabinet

1. Route the open end of the encoder cable to the controller.
2. Shorten the cable to the required length.
3. Remove the cable sheath to the length required for a connection of approx. 30 cm.

Connecting the cable shield

To protect the encoder signal against external interference, the cable shield must be connected to the housing of the MSC800.

1. Remove the cable insulation to approx. 300 mm.
2. Shorten the shield, leaving 30 mm at the bottom end.
3. Insert the cable through the cable gland screw.
4. Put the shield around the cable gland screw as shown.

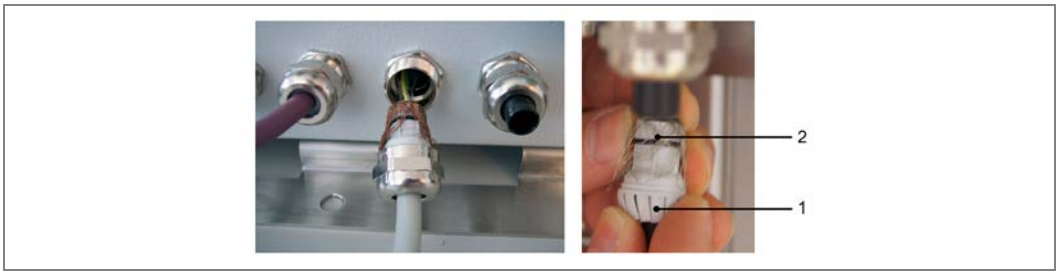


Fig. 39: Connecting the cable shields at the inlet to the controller cabinet

5. Screw in the cable gland screw. Use wrench 20 to tighten the screw.

Note

➢ Make sure that the cable is securely attached and cannot be pulled out (strain relief).

Connecting wires in the controller terminal block

1. Remove the insulation from the four cable ends to a length of approx. 10 mm.
2. Twist the wires.

   Do not use conductor sleeves and do not solder the wires.
3. Insert the wires in the terminal block as follows: Using a small screwdriver, push the clamping device down.

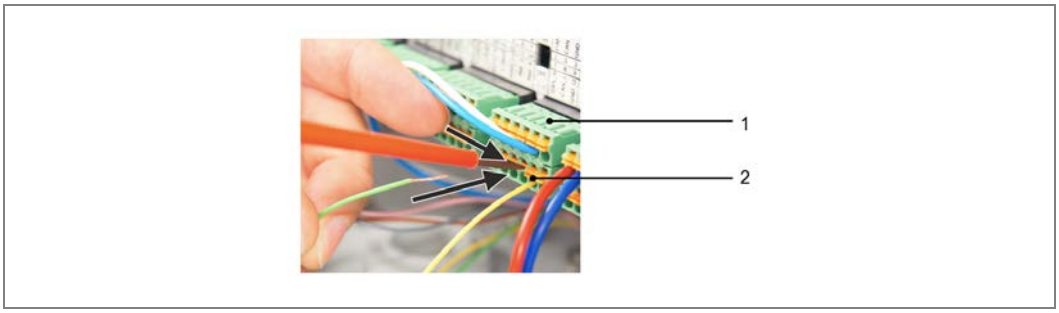


Fig. 40: Connecting wires in the controller terminal block

4. Insert the wire end. Make sure that no wires are sticking out.
5. Release the clamping device and check that the wires are firmly attached.

Encoder-connecting cable connections

Connect the free wire ends in the **INC** terminal block as follows:

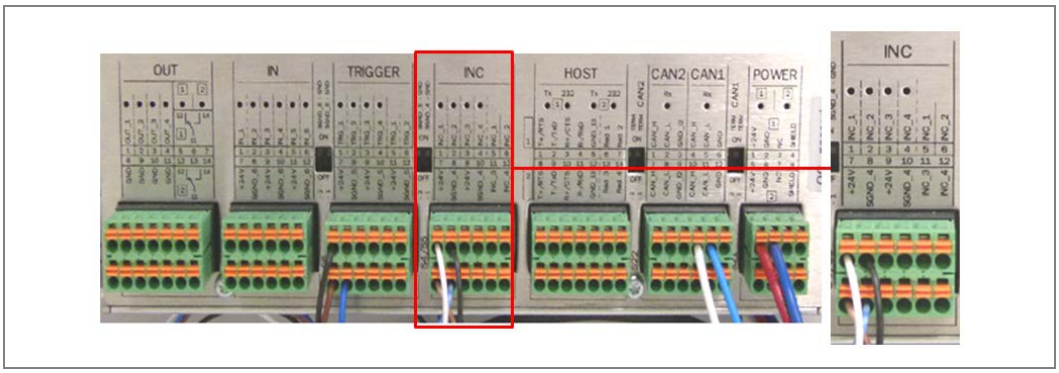


Fig. 41: Connecting the encoder-connecting cable wires in the controller terminal blocks

Wire color	Terminal block	Connection
Brown	INC	7 24 V
Blue	INC	8 SGND_4
White	INC	1 INC_1
Black	INC	2 INC_2

Tab. 9: Connecting the encoder-connecting cable wires in the controller terminal blocks

5.5 Connecting the photoelectric retro-reflective sensor to the controller

The WL18 photoelectric retro-reflective sensor is connected to the controller via a connecting cable, which is supplied. This cable has an M12 male connector (1) on one end.
The other end is open **without** a shield (2).

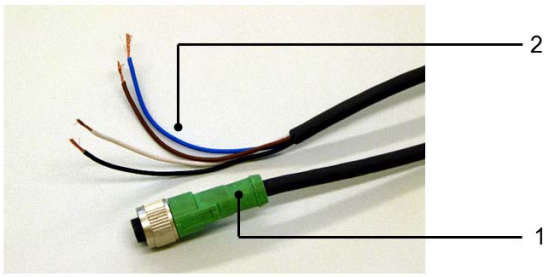


Fig. 42: Cable for connecting the photoelectric retro-reflective sensor to the MSC800

Screwing the M12 male connector onto the trigger

Screw the M12 male connector onto the photoelectric retro-reflective sensor's connector.

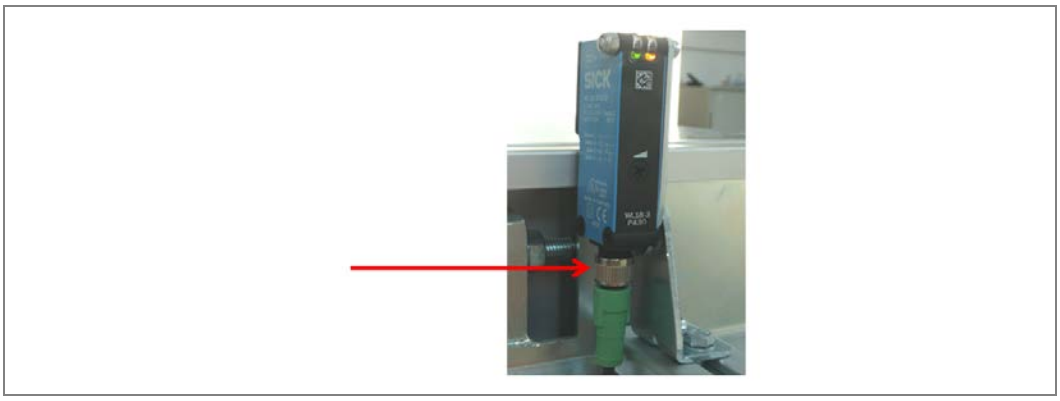


Fig. 43: Screwing the M12 male connector onto the photoelectric retro-reflective sensor

Routing the cable to the control cabinet

1. Route the open end of the connecting cable through the cable gland into the control cabinet, as shown for the encoder.
2. Shorten the cable to the required length.
3. Remove the cable sheath to the length required for a connection.
4. Screw in the cable gland screw. Use wrench 20 to tighten the screw.

Note ➢ Make sure that the cable is securely attached and cannot be pulled out (strain relief).

Trigger-connecting cable connections

Remove the insulation from the four cable ends and twist the wires.

Connect the free wire ends in the **TRIGGER** terminal block as follows:

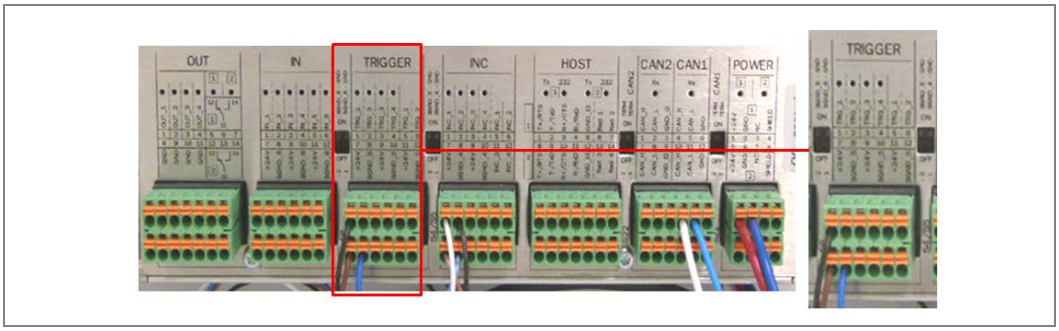


Fig. 44: Connecting the trigger-connecting cable wires in the controller terminal blocks

Wire color	Terminal block	Connection
Brown	TRIGGER	7 24 V
Blue	TRIGGER	8 SGND_5
Black	TRIGGER	1 TRG_1

Tab. 10: Connecting the trigger-connecting cable wires in the controller terminal blocks

5.6 Switching on signal ground

Activate the signal ground for the measuring wheel encoder and the photoelectric retro-reflective sensor.

➢Use a small screwdriver to push the switch between the two terminal blocks **up**.

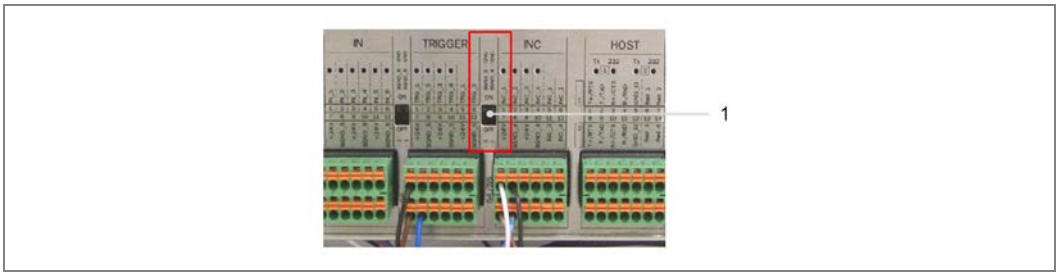


Fig. 45: Switching on signal ground for the encoder and the photoelectric sensor

5.7 Connecting the read/write device to the controller

The read/write device is connected to the controller by two cables.

- The **CAN cable** connects the read/write device to the CAN bus and to the power supply. The CAN cable consists of a T-piece and purple (open end) cable.
- The **Ethernet cable** with welded male connector forms the communications interface between the read/write device and the controller.

Connecting the CAN cable

A T-piece and prefabricated (purple) cable connect the read/write device to the controller.

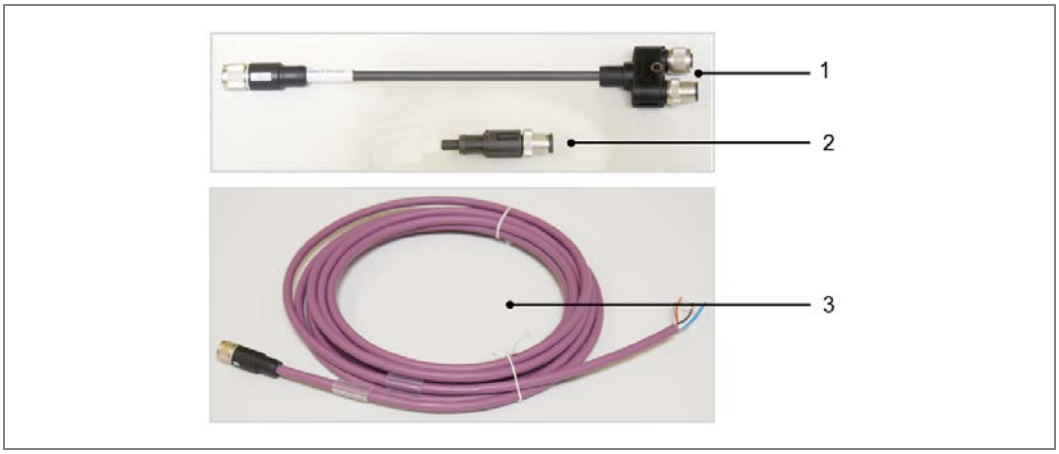


Fig. 46: CAN cable for connecting the read/write device to the controller

No.	Component
1	T-piece
2	Terminator
3	CAN cable (purple) with open end

Tab. 11: CAN cable components for connecting the read/write device to the controller

1. Connect the T-piece (1) to the **System** read/write device connection.

Note Insert the male connector carefully to prevent the fine contacts from bending.

2. Connect the terminator (2) to the T-piece female connector (1).
3. Connect the CAN cable to the T-piece male connector.
4. Guide the open end of the purple CAN cable through the cable channel and through the cable gland into the control cabinet.
5. Put the shield around the cable gland screw of the control cabinet as shown above.

Read/write device-CAN cable connections

Insert the free wire ends into the terminal blocks **CAN 1** (1) and into the **fuse block** (2).

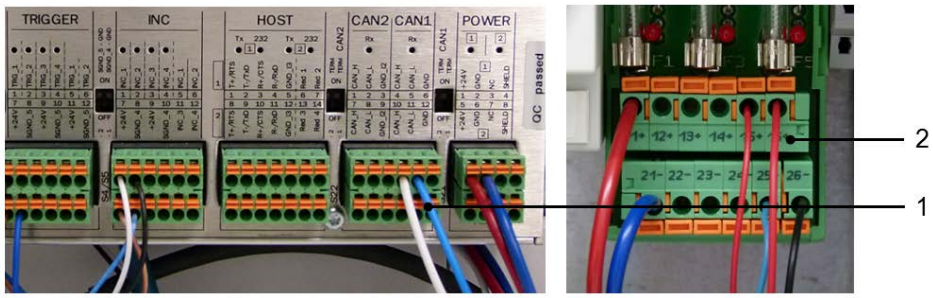


Fig. 47: Connecting the read/write device-CAN cable wires in the controller terminal blocks

Wire color	**Terminal block**	**Connection**
White	CAN 1 X2	4 CAN_H
Blue	CAN 1 X2	5 CAN_L
Wire color	**Area on fuse block**	**Connection**
Red	Fuse block F1_6	16 +
Black	Fuse block F1_6	26 -

Tab. 12: Connecting the read/write device-CAN cable wires in the controller terminal blocks

Connecting the read/write device to the controller by Ethernet cable

1. Route the Ethernet cable from the read/write device through the cable channel to the controller.
2. Put the rubber sleeve (1) and the nut (2) over the cable.

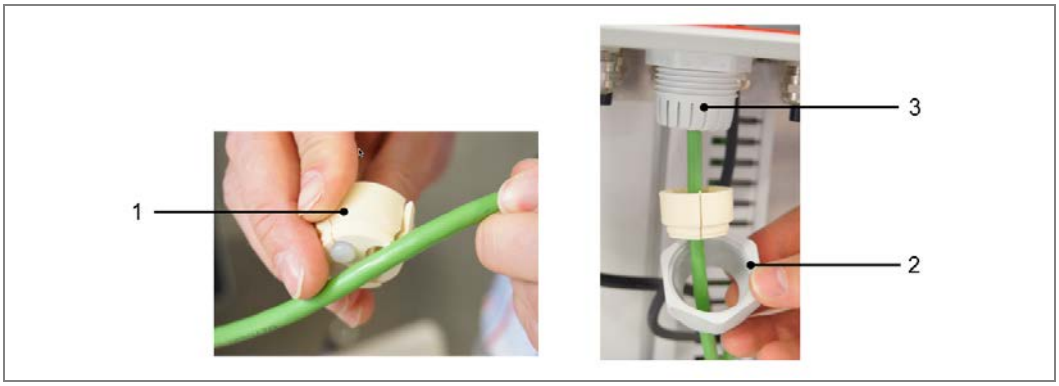


Fig. 48: Ethernet cable for connecting the read/write device to the controller

3. Route the cable as shown through the sleeve and cable gland of the control cabinet (3).
4. Screw on the cable gland.

Ethernet cable connection

Connect the read/write device and controller via the Ethernet interface.

Fig. 49: Communications interface between the read/write device and controller by Ethernet cable

Wire color	Read/write device connection	Connection
Green	Ethernet	1
Wire color	**Area on controller**	**Connection**
Green	ETHERNET X12	2

Tab. 13: Communications interface between the read/write device and controller by Ethernet cable

5.8 Connecting antennas

The connecting cables supplied are used to connect the antennas integrated in the reader modules to the antenna inputs of the read/write device. Typically, the antenna downleads supplied are 5 m long.

The cable has two different connectors on the ends.

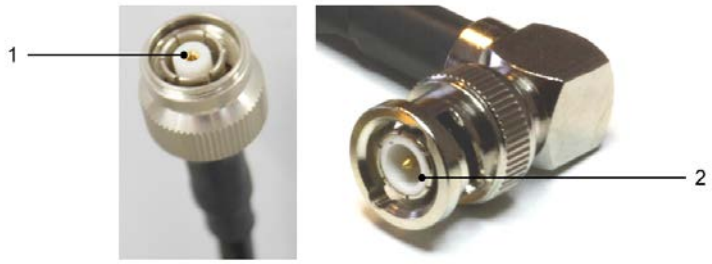


Fig. 50: Antenna downlead connectors

No.	Component
1	Connector on the read/write device side
2	Connector on the antenna side

Tab. 14: Antenna downlead connectors

Recommended assignment for the connections

Assign the connections as shown in the figure below.

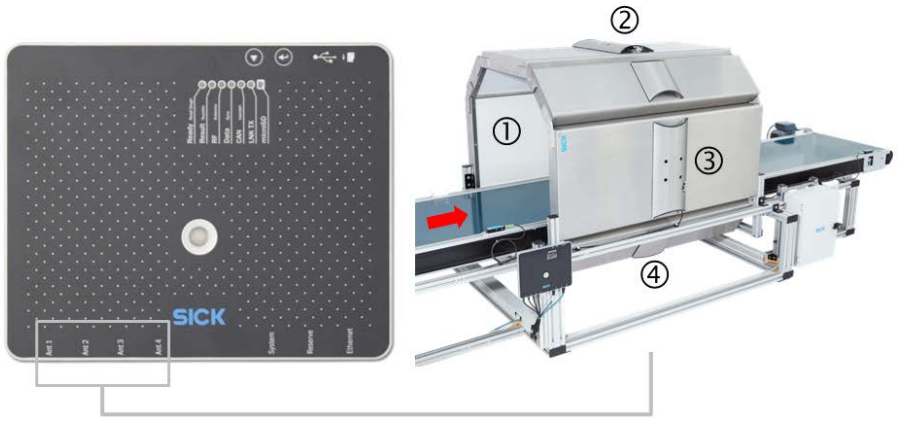


Fig. 51: Recommended connections for the antennas to the read/write device

Rules for correctly routing the cables

Please note the following when routing the antenna downleads:

- Always route the downleads **from the read/write device to the antenna**.
- Route the cable ends through the cable channels attached to the modules.

Fig. 52: Routing antenna downleads

- Make sure that the downleads are **never kinked**. Otherwise, function may be significantly impaired.
- Always wind-up the antenna downleads with a minimum **15 cm radius**.
- Tightly screw the connector onto the antenna.

Fig. 53: Screwing the connector onto the antenna

Looping excess downlead in the cable channels

Stow excess downleads looped in the cable channels. The loops can stretch across several cable channels.

➢ Make sure that the loops have a sufficiently large radius.

Fig. 54: Looping excess antenna downlead

➢ Stow the loops in the cable channels. Utilize the full width of the cable channel for the loops.

Fig. 55: Looping excess antenna downlead

➢ Use a cable tie to secure the end of the downlead.

Tips

➢ Create as few loops as possible.

➢ Create loops with as large a radius as possible.

➢ Use several cable channels to stow the loops if necessary.

6 Commissioning

WARNING

Do not commission without a thorough check by qualified safety personnel

Before operating the tunnel for the first time, make sure that it has been checked and approved by qualified safety personnel. Observe the notes provided in chapter **On safety**.

6.1 Switching on the system

Switch on the system. The system starts up automatically after connecting the power supply.

Thorough internal check of operational readiness

Self-diagnosis is performed to check the operational readiness of the read/write device and the controller.

The read/write device LED indicator shows the device status during the power-up cycle.

Operational readiness after 60 sec

The system is ready for operation after approx. 60 seconds.

6.2 Checking the operational readiness of the devices

If all devices have been connected correctly, the devices can be checked after the startup process to ensure that their operating principle is correct.

6.2.1 Checking the operational readiness of the photoelectric retro-reflective sensor

If the reflector and the photoelectric sensor have been correctly aligned with one another and if a sufficient sensing range is in place, the yellow LED receive indicator lights up.

Fig. 56: Reading the operational readiness of the photoelectric sensor

If the yellow LED receive indicator does not light up, you need to readjust the photoelectric sensor and the reflector or increase the sensing range.

➢ Position the reflector in the path of the photoelectric sensor's beam and align the light spot on the reflector.

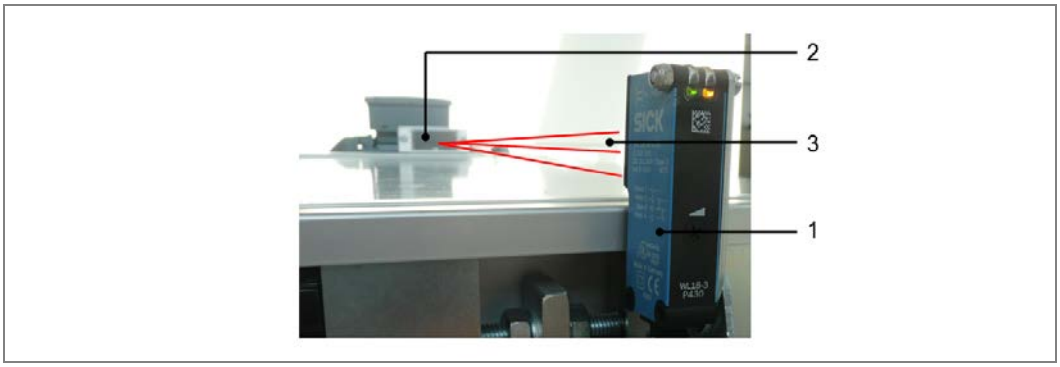


Fig. 57: Aligning the reflector and the photoelectric sensor

Adjust the sensing range using the potentiometer (rotary knob) on the photoelectric sensor.

➢ Turn the potentiometer to the right until the yellow receive indicator lights up. The reflector is reliably detected.

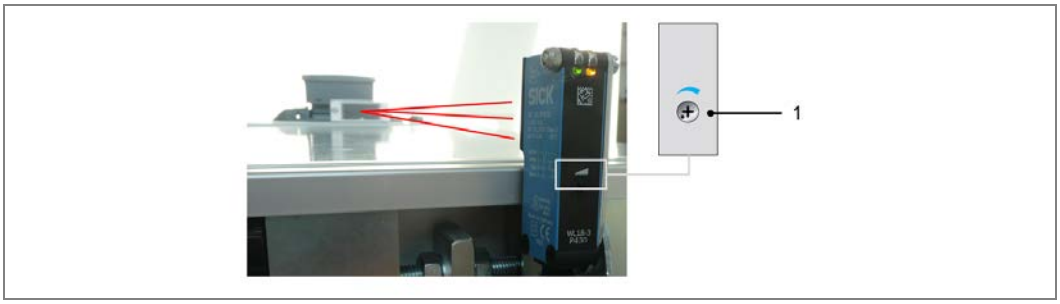


Fig. 58: Adjusting the sensitivity of the photoelectric sensor via the potentiometer

Note If the yellow LED flashes, the reflector is only detected in the threshold range.

Checking object detection

➢ Move an object into the path of the beam. The LED receive indicator must go out.

➢ If it stays on or flashes, the rotary knob must be used to reduce the sensitivity until it goes out.

Once the object is removed, the LED must light up again.

➢ If this does not happen, adjust the sensitivity until the switching threshold is correctly adjusted.

The correct device status can also be read on the controller. If there is free access to the reflector, the LED at connection **7 TRG_1** in the **TRIGGER** block must light up (1).

Fig. 59: Checking the operational readiness of the photoelectric sensor via the LEDs on the controller

6.2.2 Checking the operational readiness of the measuring wheel encoder

Check that the operating principle of the measuring wheel encoder is correct.

➢ If possible, manually turn the measuring wheel of the encoder and observe the LEDs **INC_1** and **INC_2** in terminal block **INC** (1).

- The LEDs must flash on alternately (see red double-ended arrow).

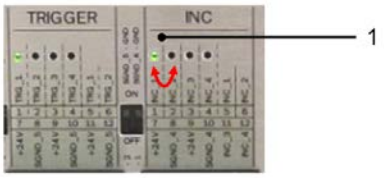


Fig. 60: Checking the operational readiness of the encoder via the LEDs on the controller

Note

➢ Alternatively, you can start the belt.

➢ Make sure there is sufficient contact between the measuring wheel and the belt.

6.2.3 Checking the operational readiness of the MSC800

If the controller is ready for operation following startup, the **DEVICE READY** LED must light up.

Fig. 61: Checking the operational readiness of the controller

6.3 Configuration using SOPAS

The tunnel is adjusted by configuring the reading conditions on site. This enables measurement, analysis, and output properties to be configured as required.

The SOPAS configuration software supplied makes interactive configuration possible. You can use the software to configure and test the properties, analysis behavior, and output properties of the system as required.

In this chapter, we describe a standard configuration, which ensures proper operation of the tunnel.

Installing the SOPAS configuration software

Installation instructions are also available in the booklet included with the CD-ROM sleeve. Install SOPAS on the configuration computer.

1. Start the configuration PC and insert the installation CD.
2. If installation does not start automatically, launch the **setup.exe** file on the CD-ROM.
3. Follow the operating instructions to complete the installation.

6.3.1 Activating RFU630

Activate the CAN interface in the RFU630 via a separate connection, e.g., Ethernet or serial RS-232.

Ideally, you should use the Ethernet connection that has already been established with the MSC800 controller.

1. Disconnect the Ethernet cable from the female connector on the controller.
2. Insert the Ethernet cable in the Ethernet female connector on the configuration PC.
3. Connect to SOPAS and make your settings.

The CAN interface must be configured as follows:

Data transmission rate	500 kBit/s
Mode	SICK network

Read the following chapters for basic information on how to use SOPAS. Details on how to set configurations can be found in the corresponding operating instructions.

Note

- This step must be performed before the complete system is configured (see below).
- Following CAN activation, the Ethernet cable must be inserted back into the **ETHERNET2** female connector on the MSC800.

Establishing an Ethernet connection with the controller

1. Connect the controller to the configuration computer.
2. Use the **ETHERNET 1** input.

6.3.2 Starting SOPAS

You have connected the MSC800 to the configuration PC.

➢ Launch SOPAS by double-clicking on the program icon on the desktop. The start screen is displayed.

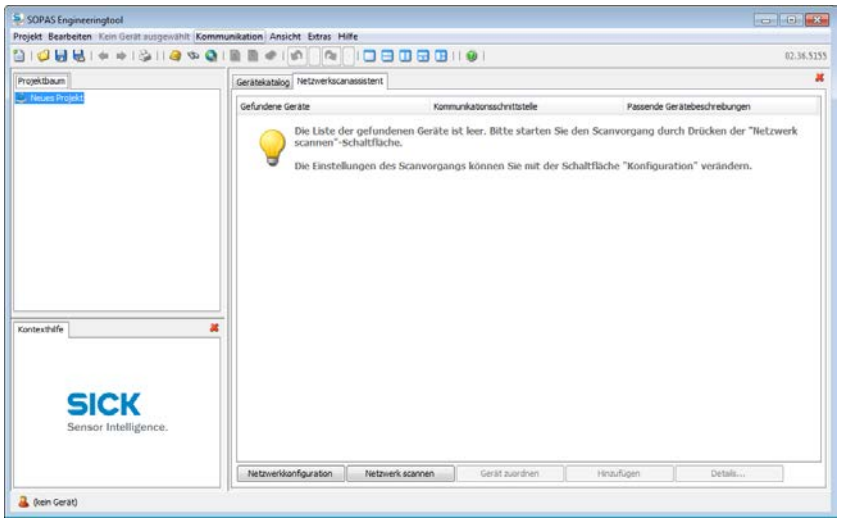
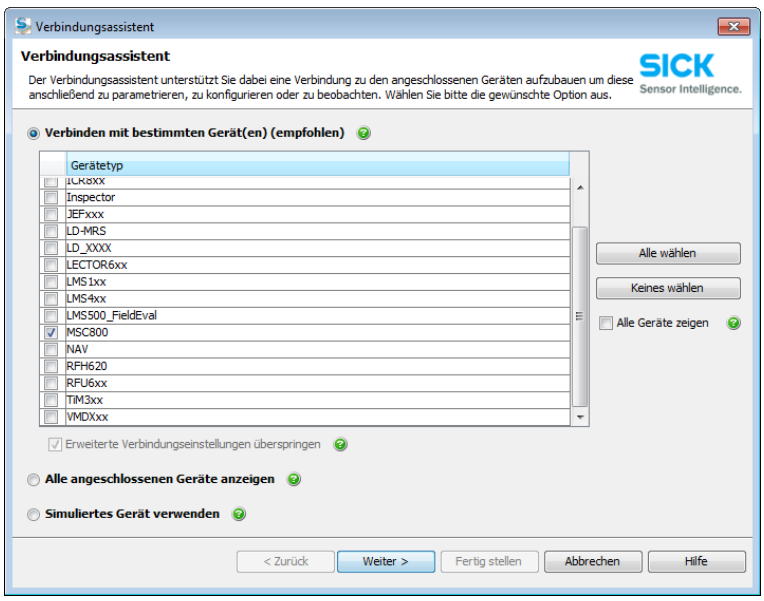


Fig. 62 SOPAS start screen

6.3.3 Connecting the configuration PC to the controller

The entire tunnel is configured via the MSC800 controller.

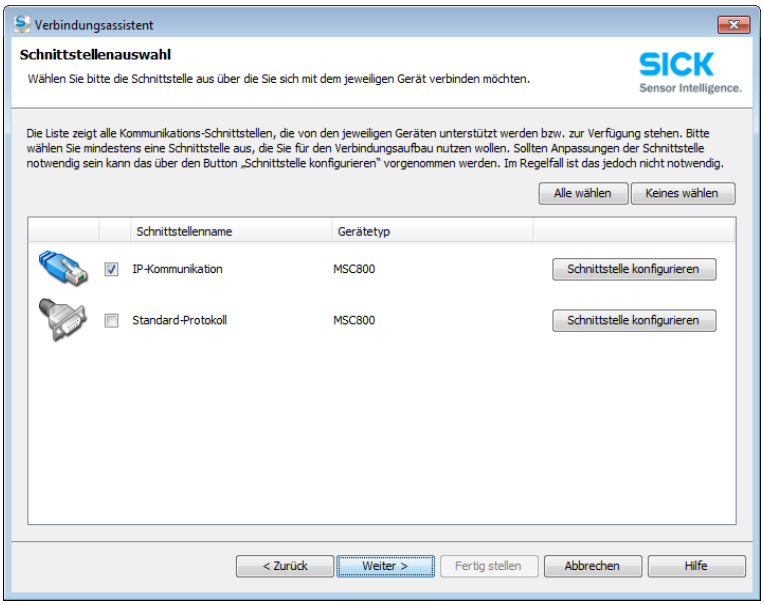
1. Establish the connection to the connected controller. To do this, click on the **Connect to new device** button.
2. The connection wizard launches. This helps you to establish a connection to a connected device.



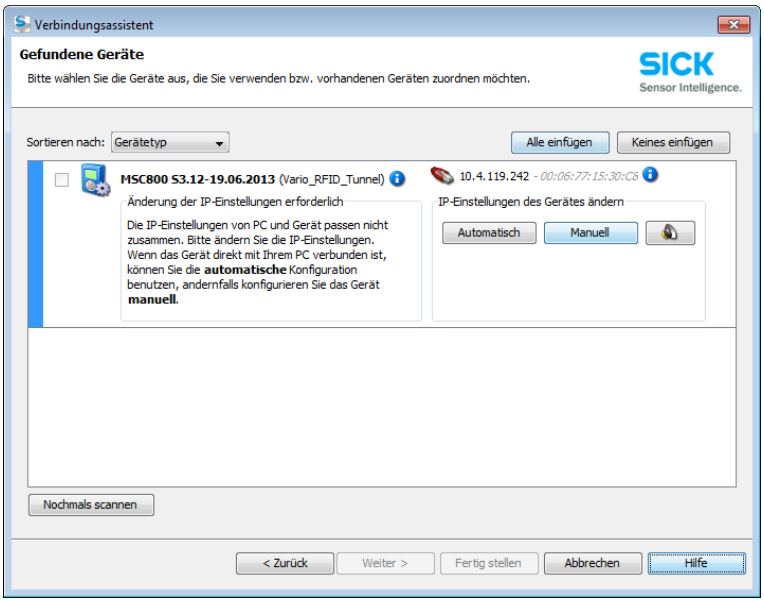
3. Select the **Connect to particular device(s)** option and select the **MSC800** controller from the list of devices. This restricts the search for connected devices to the controller.
4. Confirm with **Next**.

Selecting an interface

1. On the second page of the connection wizard, you state via which interface the configuration is to be performed.
2. If the configuration is to be carried out via an Ethernet cable, as in the example, check the **IP communication** box.



3. Confirm with **Next**. The controller is displayed with its factory-set IP address.



If the male connector symbol is red, this indicates that the number ranges of the IP addresses of the controller and the configuration PC do not match.

4. The device's IP setting can be adapted **automatically** (for a direct connection between PC and device) or **manually** (for a configuration via the company network).

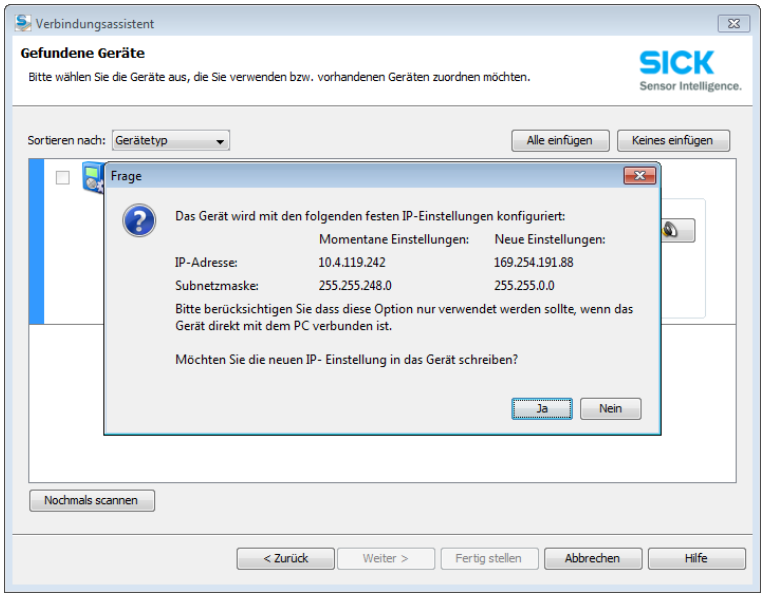
Note If the connection cannot be established due to a firewall, you will see a corresponding message.

➢ Clarify how to proceed with your system administrator.

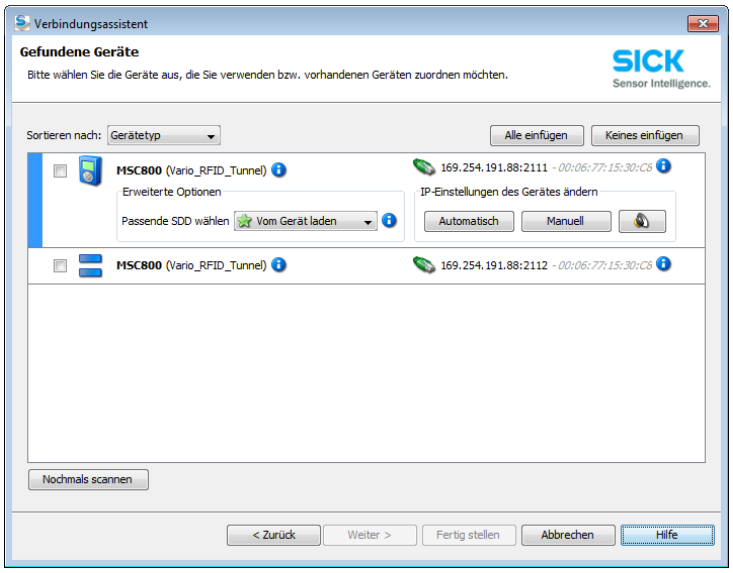
Adapting the IP address for the configuration

Use the SOPAS wizard to automatically adapt the IP address of the connected device to the number range of the connected configuration PC.

1. Click on the **Automatic** button to assign a free IP address to the controller.



2. Confirm with **Yes** and the controller will be correctly addressed by the configuration PC via its IP address.



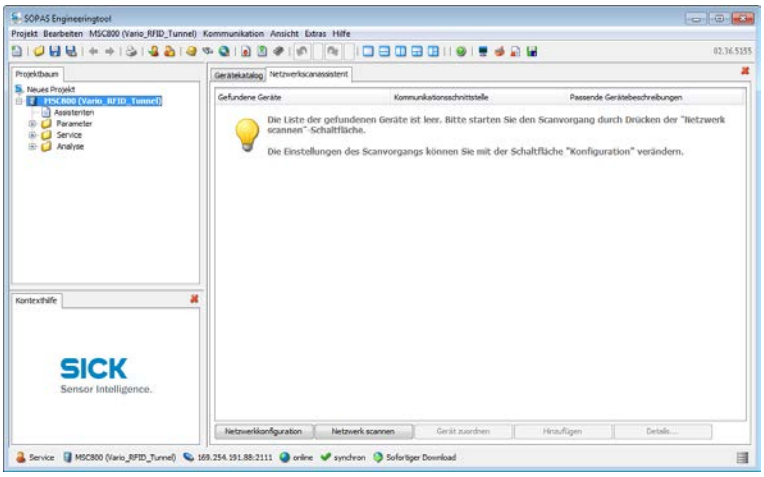
The controller (like all SICK devices) uses two ports. Ports are parts of a network address, via which various connections can be established between devices.

Note Port **2112** is freely configurable, while data output is permanently defined for port **2111**. It is used to configure the device.

3. Select the fixed port **2111**. To do this, check the relevant box.

Displaying the controller in the project tree

1. Quit the connection wizard by clicking **Finish**. The wizard closes and the connected controller is displayed in the SOPAS project tree.



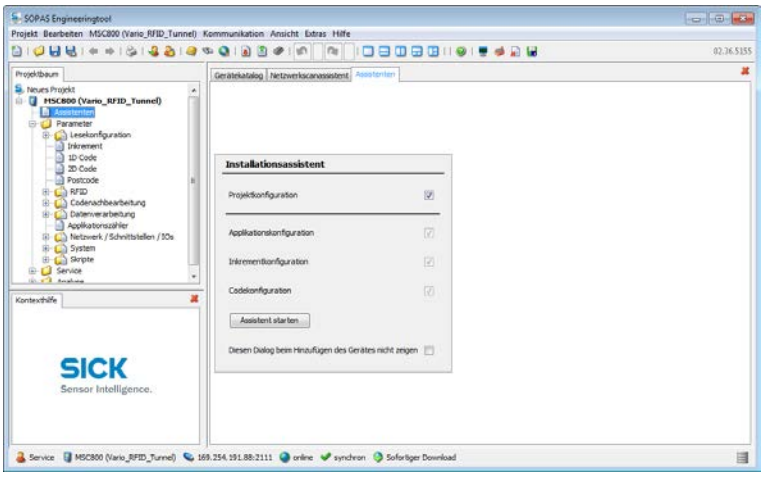
One or more devices are combined and edited in a project.

2. The individual function areas of the configuration are opened via the tree structure. Click on the plus symbol to expand the tree.

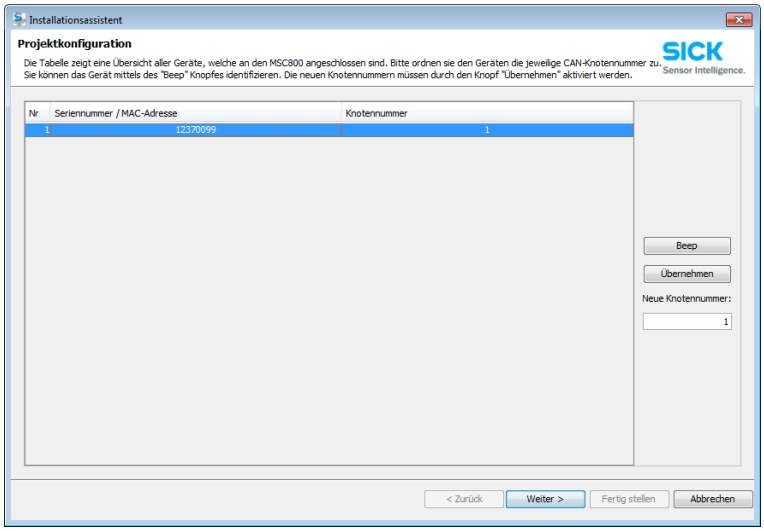
6.3.4 Combining devices in the project.

In the next step, the connected RFU630 read/write device is transferred to the SOPAS project.

1. Open the tree structure of the project. If you have logged on as a **Service** user, the configuration wizard appears first.
2. Double-click to open the wizard. All boxes are checked.



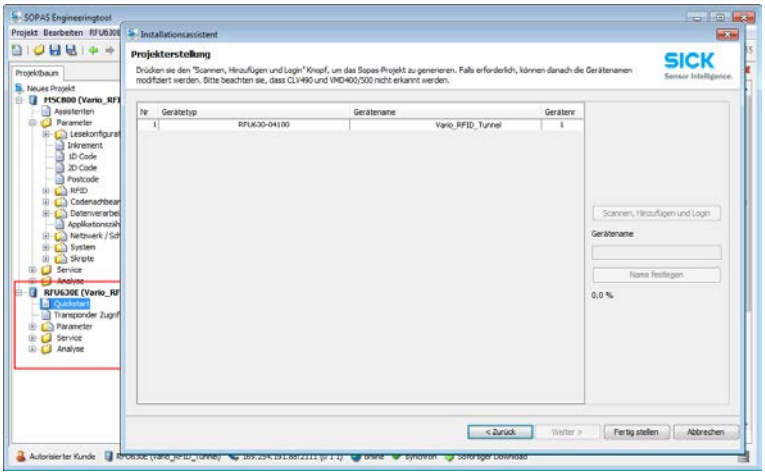
3. Launch the wizard. The wizard lists the RFU630 read/write device connected to the central control unit. The device connected via the CAN bus is identified by its serial number.



The measuring wheel encoder and the photoelectric retro-reflective sensor are not shown, as they are not connected to the CAN bus.

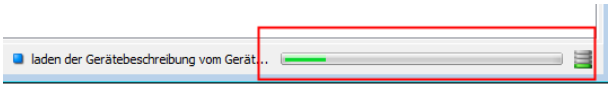
Note Use the **Beep** button to identify the listed device acoustically, so that you can make a corresponding assignment of serial number and device.

4. Click **Next** in the wizard.
5. Click on the **Scan, add, and login** button.



6. The read/write device is added to the project in addition to the controller and is visible in the project tree. The list on the wizard page includes the read/write device with device type and name.

Note If the device driver of the RFU630 read/write device is not yet contained in SOPAS, it will be loaded via the CAN interface by clicking **Scan, add, and login**. You can identify the loading process in the status bar by means of the progress bar and the text **Loading the device description from the device**.



The loading process can take several minutes.

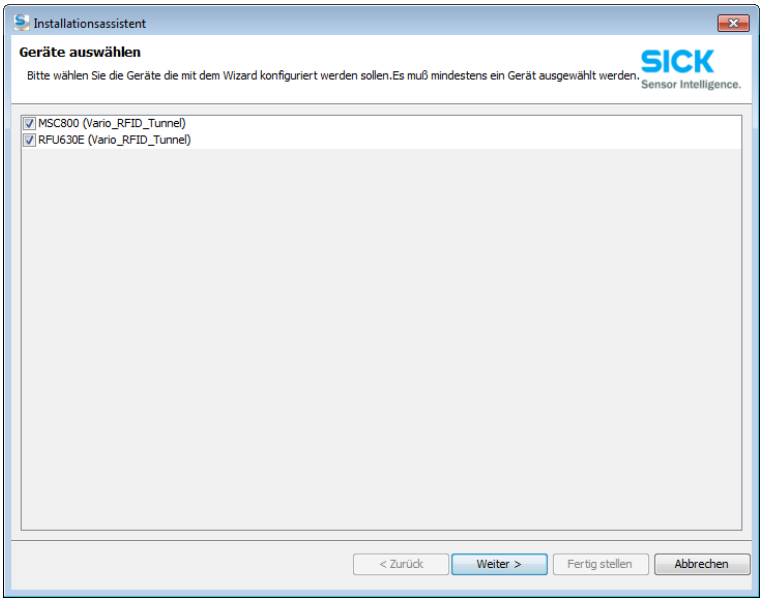
You must always wait until the loading process is complete before continuing with the wizard.

7. Quit the project configuration by clicking **Finish**. A second wizard is launched.

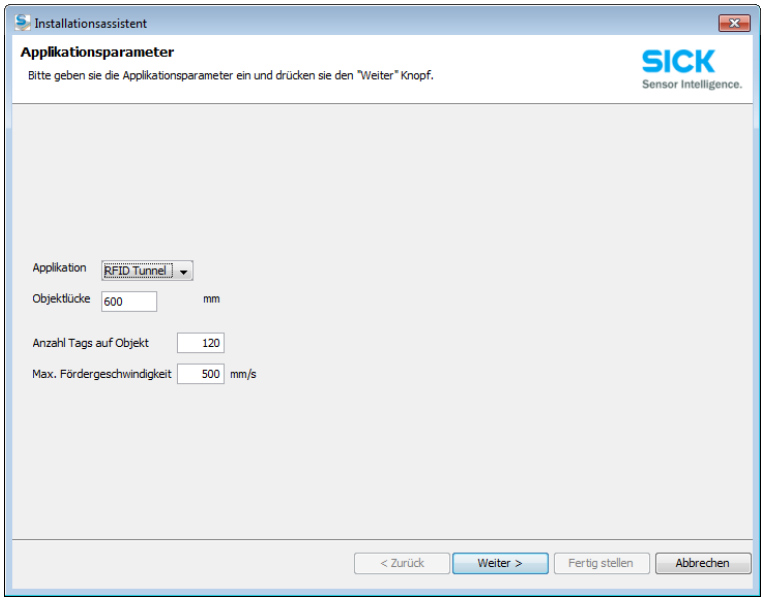
6.3.5 Configuring the tunnel globally

This wizard is used to define the global parameter settings for the entire tunnel and to transfer them to the connected devices.

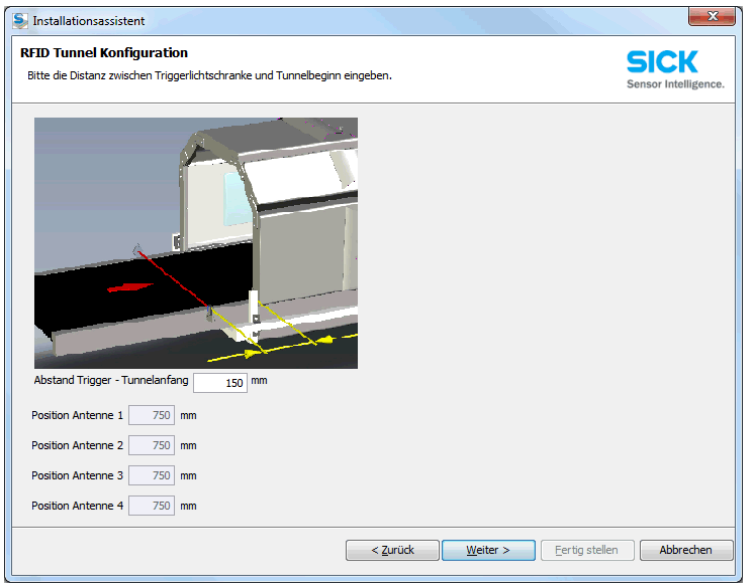
1. Select all components to which the parameter settings should apply (central control unit and RFU630 read/write device).



2. Click **Next** to go to the second page of the wizard. In the **Application** field, select **RFID tunnel** (i.e., the entire system).

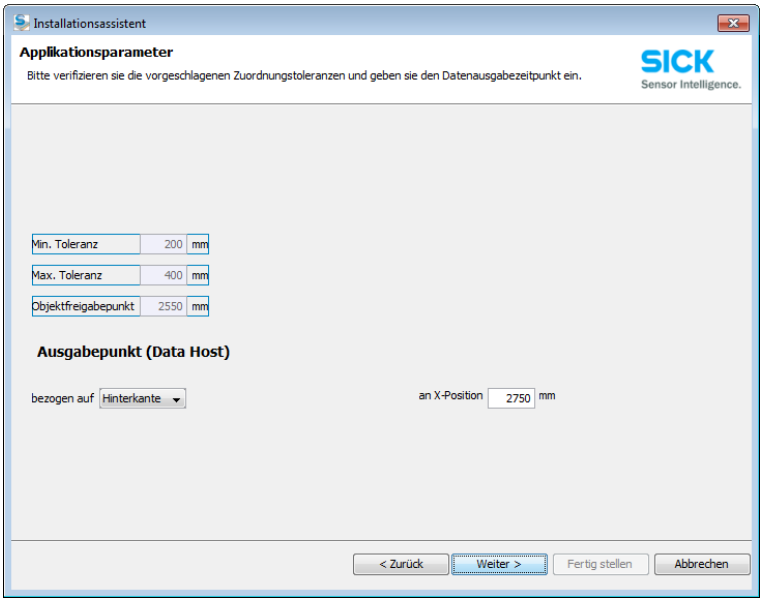


3. In the **Gap between objects** field, enter the minimum distance at which the objects should travel through the tunnel. Also define the **maximum number of tags** to be read and assigned per object, as well as the maximum **belt speed**.
4. Click **Next** to go to the next page of the wizard. Specify how far in front of the tunnel entrance the photoelectric retro-reflective sensor has been mounted. With this setting you define the start position to which the measuring wheel encoder relates when determining the position of the object.



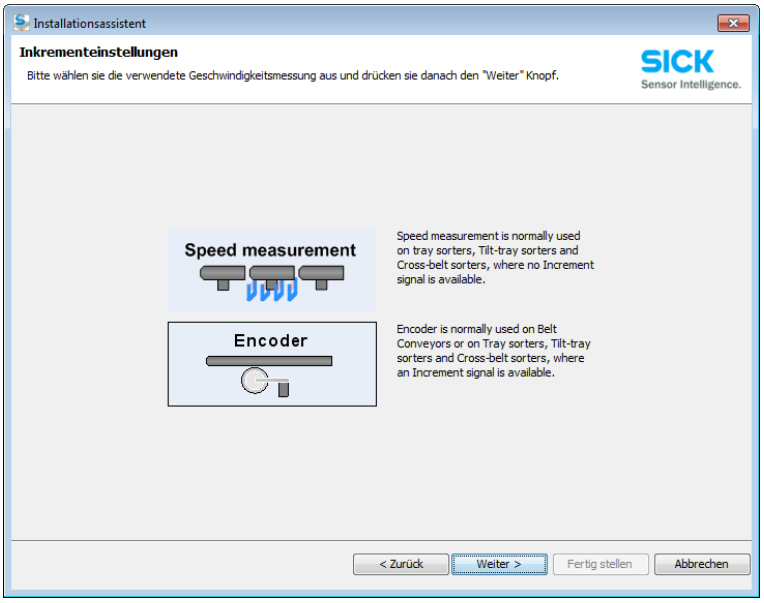
The data in the **Position of antenna 1** to **4** fields specifies after how far the object is located underneath the antenna, i.e., in the best read position (150 mm + tunnel length 1200 mm / 2).

5. Click **Next** to go to the next page of the wizard. Accept the suggested tolerance values and, in the **to x position** field, define the position on the belt at which the read tag information should be transferred to the downstream host system.

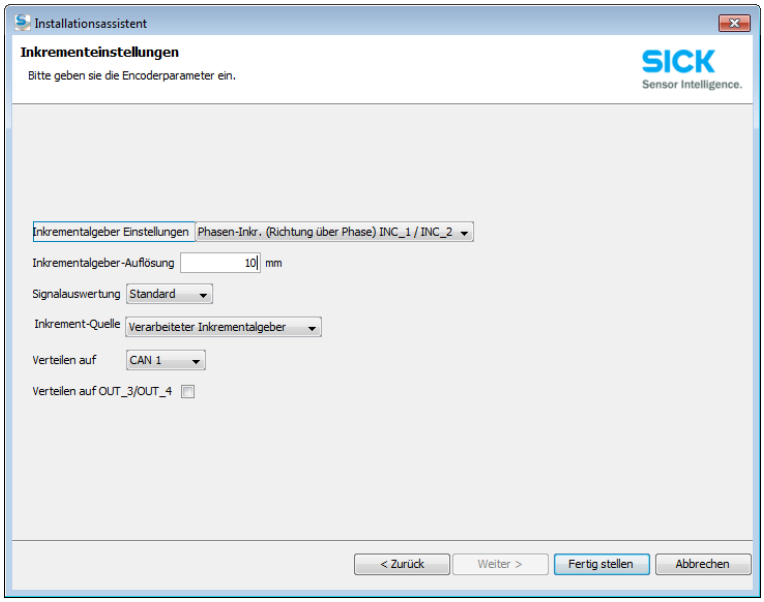


The distance between the photoelectric retro-reflective sensor and the X position is relative to the back edge of the object.

6. Click **Next** to go to the next page of the wizard. Here you are able to specify how the belt speed should be determined. As a rule, the measuring wheel encoder determines the belt speed via the number of incremental signals.



7. Click **Next** to go to the next page of the wizard in order to configure the encoder. In the **Incremental settings** field, select **Phase incr. (direction via phase) INC_1/INC_2**. The encoder provides two signals in quadrature for the purpose of determining positions.



The data in the **Incremental encoder resolution** field enables you to specify how far the belt should travel before the encoder sends an incremental signal to the controller; in the example, this setting is every 10 mm.

8. Complete the configuration by clicking **Finish**.

Result

The global configuration is transferred to the MSC800 central control unit and the RFU630 read/write device connected to it.

6.3.6 Saving the configuration

If you are connected to a device via SOPAS, all changes to the configuration will be transferred to and implemented in the device immediately. However, they are only saved in the device **temporarily**.

Saving the configuration in the non-volatile memory

To save the relevant displayed configuration in the non-volatile memory of the device, proceed as follows:

1. In the SOPAS toolbar, click on the **Permanently save** symbol. The configuration is transferred globally to all devices and saved to them permanently.
2. The permanently saved configuration in the device will be loaded each time the device is restarted.

Saving the configuration on the PC

You can also save the settings you have made and displayed on your PC as a file.
The settings saved there can then be loaded and transferred to the device subsequently if required.

1. In the toolbar, click on the **Save project** button.
2. Select the directory and file name, then confirm.

6.3.7 Checking system readiness

If the system is configured and working properly, the **SYSTEM READY** LED must illuminate on the controller.

Fig. 63: Checking system readiness

This confirms that the controller has received positive feedback from all components and the devices are communicating with each other.

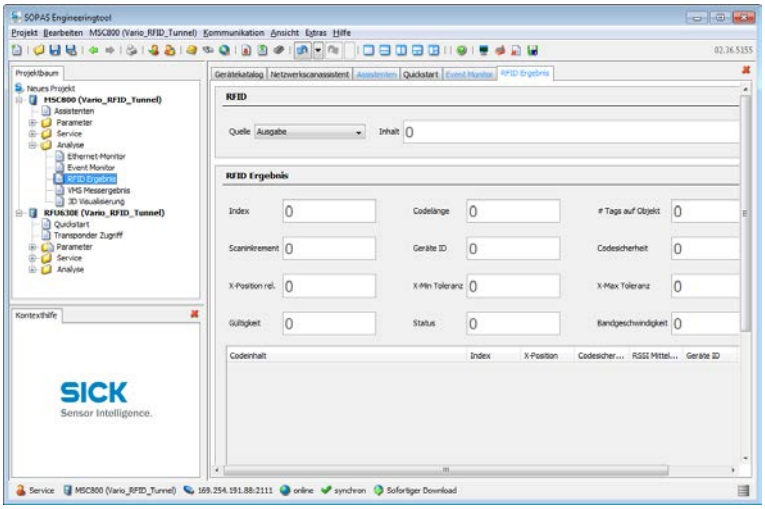
6.4 Performing a test run

Finish commissioning the system by performing a test run. The test run must ensure that the trigger and the measuring wheel encoder are operating correctly and that the tags are being read and assigned to the objects correctly.

Place one or more objects with transponders (EPC Gen2 C1 standard) on the belt and allow them to pass through the tunnel.

The read result is output in your SOPAS project directly for analysis and must be verified accordingly.

1. Open the SOPAS project tree.
2. Below the controller, select **Analysis → RFID result**. A window of the same name is displayed. All entries are still set to zero.



3. Allow the objects to pass along the belt and check the read result in the **RFID result** window directly. The fields are completed with the determined data automatically.

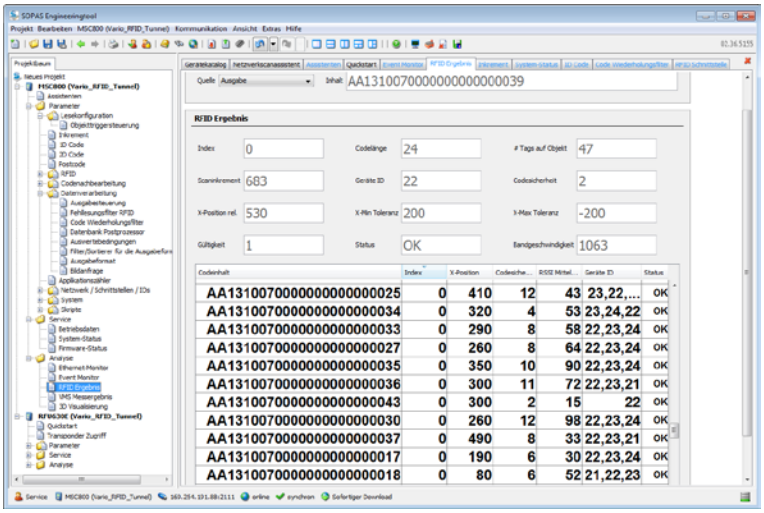


Fig. 64: Checking the RFID read results from the test run

Check the read results in the top section of the window as follows:

Field	Meaning
Index	Each object that passes through the tunnel is indexed by a number. The read tags are assigned to the object based on the allocated index number. The count starts at 0, i.e., the first object to pass through receives index = 0, the second object receives index = 1, etc. ➢ Check that the index has been incremented correctly. For example, if you have allowed five objects to pass through the tunnel, the index must be at 4.
# of tags on object	This field shows how many tags have been read per object. ➢ Check that all the tags contained in the object have been read.
Speed	This field shows the belt speed in millimeters per second (in the example, 1063 = 1.063 m/s). You can use the belt speed to check whether the saved incremental resolution (in the example, 10 mm) has been set correctly.

Tab. 15 Checking the RFID read results from the test run (conveying system and object)

In the bottom section of the window, the read tags are listed along with their assignment to the object. First and foremost, check here that all tags have been assigned to the object correctly. Take note of the following columns in particular:

Field	Meaning
Index	This column shows the object index assigned to each object passing through the tunnel. ➢ Check that all tags have been assigned to the objects correctly. In the example, 47 tags must have been assigned to the object with index = 0.
X position	The X position specifies at which point on the belt the tag was assigned to the object. The position is determined by the location of the controller relative to the front edge of the object. As a rule, the determined X position is inside the object (from 0 up to the maximum object length). However, the determined position can also be in front of or behind the object, depending on external influences (e.g., reflection). In this case, the value is negative or greater than the object length. ➢ Check the determined X positions and contact your local SICK support team for detailed information in the event of significant deviations.
Code reliability	Here you can see how often the RFU630 read/write device has read a tag. ➢ Make sure that a tag is read as often as possible. ➢ If the number is low, you may have to set the sender power of the antennas to a higher value or adapt the belt speed (see below).

RSSI average value	The RSSI average value specifies the average signal strength value.
Device ID	This column shows which of the four possible antennas have read the tag. The numbers start with an offset of 2 followed by the actual antenna number 1 to 4. ➢ Make sure that the tags are read by all antennas if possible. ➢ Check whether your tunnel is working with all four antennas or whether you may have to post-install antennas (e.g., underneath the tunnel).
Status	This column indicates that a tag has been successfully read and assigned to the object.

Tab. 16 Checking the RFID read results from the test run (tag information)

Note If no tags are being read, it could be due to the following causes:

- ➢ Check that you are using transponders that comply with the standard (Gen.2 Class 1).
- ➢ Check the position of the tag on the object. The tag must not be placed directly on metal. If the object contains a liquid, the tag must be positioned a sufficient distance away from it.
- ➢ Check that the **antenna downleads** are connected correctly. If necessary, increase the sender power of the antenna (see below).
- ➢ It may be necessary to install **additional antennas**, depending on the position of the tags in the object.
- ➢ Check that **triggering** is working correctly via the **photoelectric sensor**.
- ➢ Check that the **belt speed** has been displayed correctly in the MSC800.
- ➢ Check that the **incremental encoder resolution** has been entered correctly.

Continuing the configuration process

You can make additional parameter settings in the SOPAS navigation tree under **Parameters**. Among other things, you can access the antenna configuration, selection screen for transponders, object trigger control, configuration for data processing, data output interface(s), and switching inputs and outputs here.

Under **Antenna configuration**, you can set the sender power for the individual external antenna(s) each with separate sliders for reading and writing. You should also enter the conduction loss and gain of each cable/antenna used.

Note Test the settings when the system is in real operation and modify the settings if necessary.

Saving the configuration

- In the project tree, select each device and click on the **Permanently save** symbol.
- Click on the **Save as** symbol to create a backup copy of the configuration on the computer.

Note Application-specific adjustments (e.g., host's output or interfaces) must be made individually by a qualified technician. Such adjustments are not covered in these operating instructions.

7 Maintenance

The following maintenance work must be carried out at the specified time intervals:

Device	Maintenance task	Interval *	Performed by
RFU630	Cleaning the cooling ribs on the housing	2x/year	Trained personnel
Photoelectric retro-reflective sensor	• Cleaning the light emission part and the reflector • Optical inspection of the photoelectric retro-reflective sensor and the reflector for rotation that may have occurred from contact or something similar	4/year	Trained personnel
Measuring wheel encoder	Optical inspection of the measuring wheel encoder for wear of the measuring wheel and measuring wheel/belt contact	4/year	Trained personnel
General	Optical inspection of the electrical cabling and wiring for damage	1/year	Specialist
	Inspection of general tunnel read performance (as described in 6.4, for example)	1/year	Specialist

* The intervals depend on ambient conditions and the degree of contamination.
They should also be defined according to the significance for the customer process.
Tab. 17: Maintenance intervals

7.1 Maintenance during operation

7.1.1 Visual inspection of the photoelectric retro-reflective sensor

SICK photoelectric sensors are maintenance-free. We recommend doing the following regularly:

- Clean the external lens surfaces
- Check the screw connections and plug-in connections

Check that the photoelectric sensor and the reflector are aligned correctly.

7.1.2 Visual inspection of the measuring wheel encoder

➢ Check that the measuring wheel has sufficient contact with the belt.

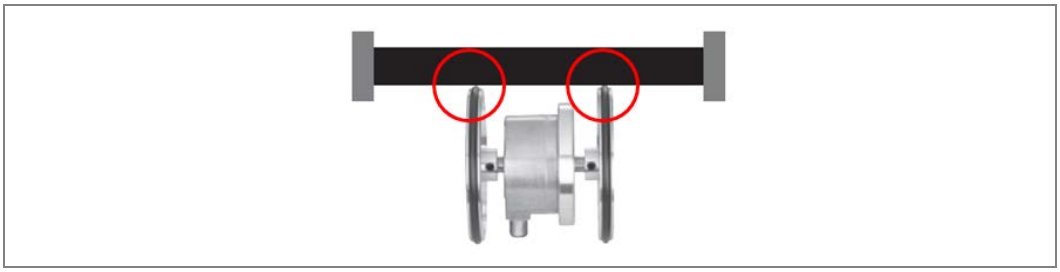


Fig. 65: Visual inspection of the measuring wheel encoder

➢ Check the measuring wheel for wear.

➢ If contact with the belt is impaired due to wear, the entire measuring wheel encoder must be replaced.

7.1.3 Visual inspection of the cables

Regularly check the electrical installation. Check that all cable connections are securely attached.

WARNING

Loose connections or scorched cables

➢ Deficiencies such as loose connections or scorched cables must be rectified immediately.

WARNING

Damaged cable insulation

There are life-threatening risks due to electric shock if the insulation of connecting cables is damaged.

7.2 Replacing components

Faulty or damaged components must be dismantled and replaced by new or repaired components. All customer-specific parameters are saved on a microSD card in the controller as well as in the RFU630 read/write device. Therefore, components can be easily replaced without involving a qualified technician.

Notes Repairs to the tunnel components may only be performed by qualified and authorized service personnel from SICK.

WARNING

Disconnect the power to the system

➢ Disconnect the power to the entire system for as long as it takes to replace devices.

7.2.1 Replacing the controller

WARNING

Risk of injury due to electric current

The MSC800 is connected to the power supply (100 ... 264 V AC/50 ... 60 Hz).

➢Standard safety regulations must be met when working on electrical systems.

Note ➢Before removing the controller, note the cable assignments to the connections.

Removing connecting cables

1. Switch off the controller supply voltage.
2. Unplug the connected Ethernet cable (1) from the female connector.

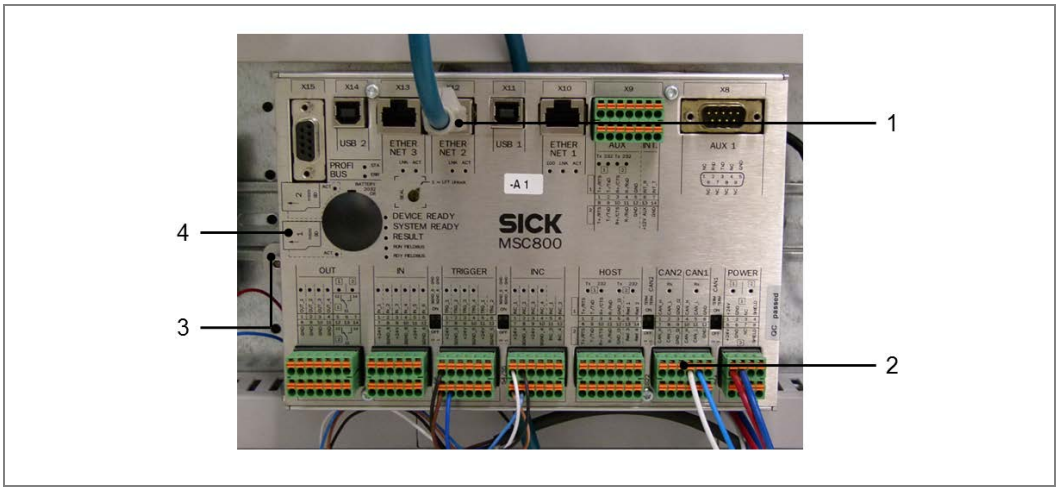


Fig. 66: Unplugging the cables and terminal blocks from the controller

3. Unplug the terminal blocks (2) with the cabling from the controller slots. The terminal blocks are coded to prevent unintentional switching.

Note Make sure that no wires are released from the terminal blocks.

Removing the controller

4. Loosen the fixing screw (3) of the controller on the left side.
5. Pull the controller to the right and then remove it from the control cabinet.
6. Remove the microSD card from the slot (4) in the removed controller.

Installing the controller

1. Insert the removed microSD card in **Slot SD 1** of the new controller.
2. Insert the new controller in the control cabinet.
3. Pull it to the left and use the fixing screw to secure it in the control cabinet.
4. Return the terminal blocks with cabling to their intended slots.
5. Insert the Ethernet cables in the female connectors provided.
6. Switch on the controller supply voltage. The controller starts and, after initialization, loads the parameter set from the memory card to the non-volatile parameter memory of the logic unit.

7.2.2 Replacing the battery in the MSC800

A battery powers the real-time clock of the MSC800. The battery must be replaced when drained.

Fig. 67: Position of the battery in the MSC800 controller

1. Remove the black plastic cover on the MSC800.
2. Remove the battery from the holder and replace it with a new type 2032 CR battery.
3. Replace the black plastic cover on the MSC800.
4. Dispose of the old battery as hazardous waste according to RoHS guidelines (Europe).
5. Set the system time again using the SOPAS software (project tree → MSC800 → System → REAL-TIME CLOCK area).

7.2.3 Replacing the power supply

WARNING

Risk of injury due to electric current

The MSC800 is connected to the power supply (100 ... 264 V AC/50 ... 60 Hz).

➢Standard safety regulations must be met when working on electrical systems.

Note

➢Before removing the power supply, note the cable assignments to the connections.

Removing the power supply

1. Switch off the MSC800 supply voltage.
2. Loosen and disconnect all cables from the power supply module (1).

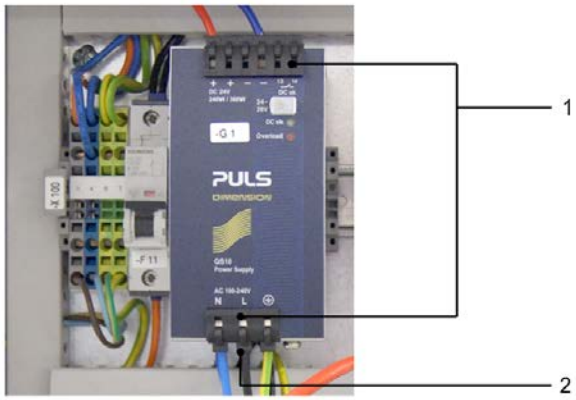


Fig. 68: Disconnecting the cables from the controller power supply

3. Unplug the defective power supply module from the control cabinet. Use a suitable screwdriver to slide the black clip forward on the bottom of the power supply (2).
4. Lift the power supply and pull it forward out of the holder.

Installing the power supply

1. Place the new power supply module on the controller mounting rail and press until the power supply module clicks into place.
2. Reconnect all the cables to the power supply.
3. Switch on the controller supply voltage.

7.2.4 Replacing the photoelectric retro-reflective sensor

1. Unscrew the M12 male connector from the photoelectric retro-reflective sensor's connector.
2. Release the mounting via which the defective photoelectric retro-reflective sensor is attached to the belt.

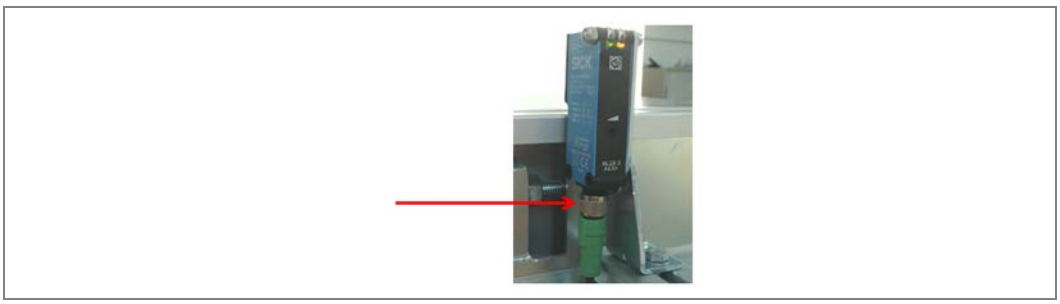


Fig. 69: Dismantling the photoelectric retro-reflective sensor and removing it from the belt

3. Replace the defective photoelectric sensor with a new one. Mount the new photoelectric retro-reflective sensor on the belt.
4. Screw the M12 male connector onto the photoelectric retro-reflective sensor's connector.
5. Align the photoelectric sensor with the reflector. The reflector must be positioned in the path of the beam emitted by the photoelectric retro-reflective sensor.

Note Check that the operating principle of the photoelectric retro-reflective sensor is correct. See chapter **Checking the operational readiness of the photoelectric retro-reflective sensor** for a detailed description of how to proceed.

7.2.5 Replacing the measuring wheel encoder

1. Unscrew the M12 male connector from the measuring wheel encoder's connector.

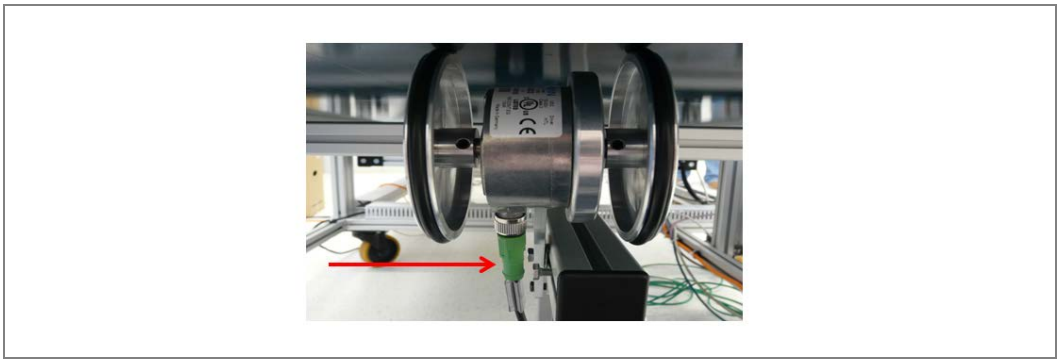


Fig. 70: Replacing the measuring wheel encoder

2. Release the mounting via which the defective encoder is attached to the belt.
3. Replace the defective measuring wheel encoder with a new one. Mount the new encoder on the belt.

Note Pay attention to the correct installation direction on the belt.

4. Screw the M12 male connector onto the measuring wheel encoder's connector.

Note ➢ Check that the operating principle of the measuring wheel encoder is correct. See chapter **Checking the operational readiness of the measuring wheel encoder** for a detailed description of how to proceed.

7.2.6 Replacing a read/write device

Note ➢ Before removing the read/write device, note the cable assignments to the connections.

Removing the read/write device

1. Unscrew the cables to the antennas (1), the CAN cable (2), and the Ethernet cable (3) from the female connectors.

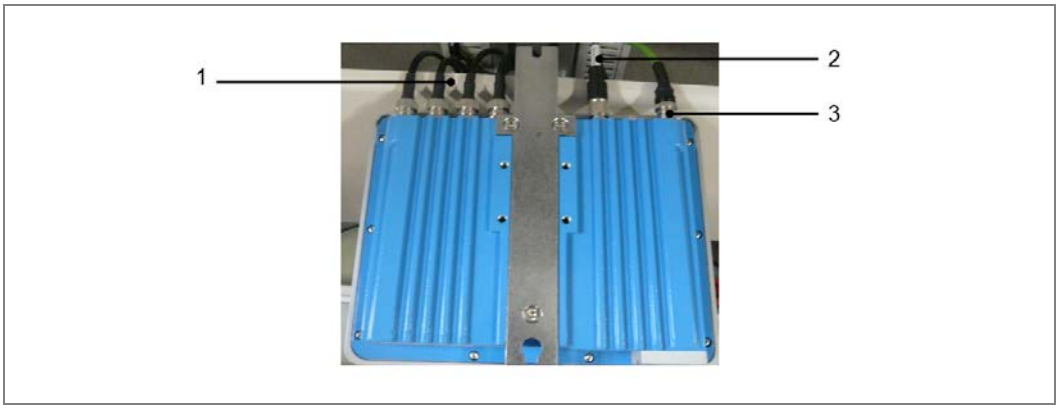


Fig. 71: Unplugging the connecting cable from the read/write device

2. Unscrew and remove the read/write device fixing screw (1).

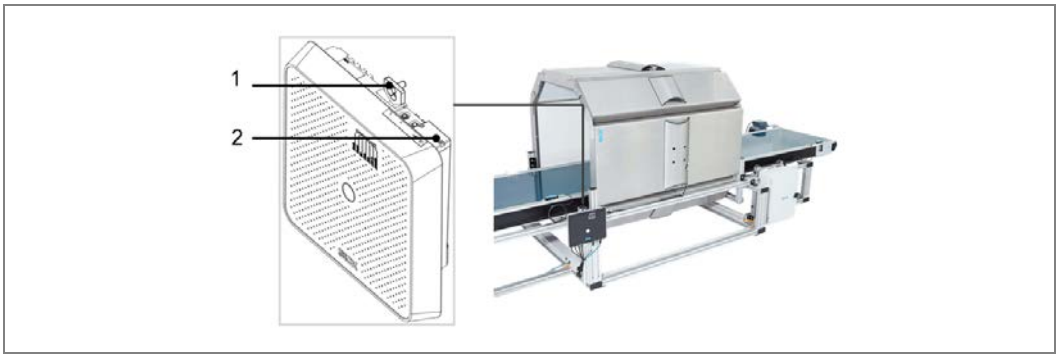


Fig. 72: Removing the read/write device from the mounting rail

3. Remove the microSD card from the slot (2) in the removed read/write device. Loosen the two screws on the cover plate and remove it.

Installing the read/write device

4. Insert the removed microSD card in the slot of the new read/write device. Replace the screws on the slot cover plate.
5. Mount the new read/write device on the conveying system.
6. Attach the cable as before.

7.2.7 Replacing an antenna

Antennas must be completely replaced. They are removed from and reinstalled in the reader modules. The reader modules do not have to be dismantled for this.

Note If the antenna underneath the belt is defective, check whether the on-site conditions permit the replacement to be performed from below. If not, you must dismantle the reader module before replacing the defective antenna.

Preparatory work

1. Unscrew the antenna downlead (1) from the defective antenna's female connector.

Fig. 73: Unscrewing the antenna downlead from the female connector

2. Remove the cover plate (1) on the inside of the module. To do this, release one of the two fixing screws (2). Which screw you release will depend on which side you want to pull the cover plate out of the module from.

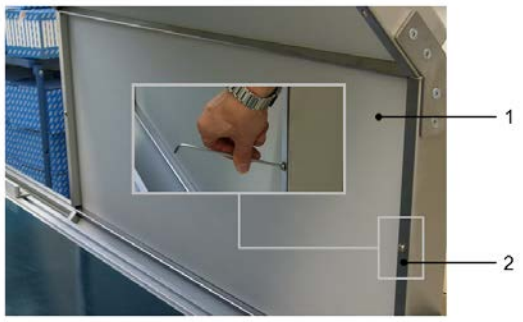


Fig. 74: Releasing the position screw from the inner cover plate of the reader module

3. Push the cover plate toward the released fixing screw as far as it will go, then tip it forward and out of the holder on the other side.

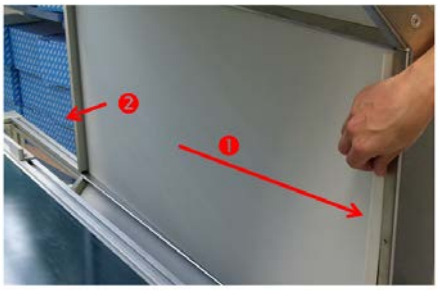


Fig. 75: Tipping the inner cover plate of the reader module out of the holder

4. Remove the cover plate and pull it out of the reader module.

Fig. 76: Pulling the inner cover plate out of the reader module

5. The antenna, surrounded by the absorber panels, is now freely accessible.

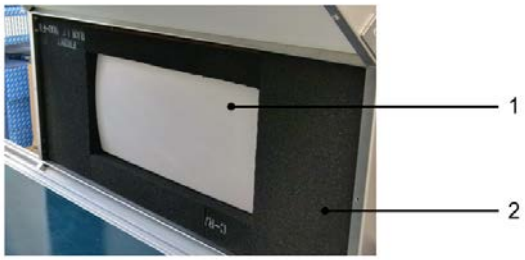


Fig. 77: Reader module with antenna and absorber panels

Removing the antenna

1. Release the fixing nuts for the antenna through the cutouts in the cable channel. Use socket wrench 11 for this.

Fig. 78: Releasing the fixing nuts for the antenna

2. Remove the antenna from the reader module from the inside.

Fig. 79: Removing the antenna from the reader module

Installing the antenna

1. Install the new antenna in the reader module.

Note Make sure that the installation direction of the antenna is correct so the angled plug of the antenna downlead fits into the cutout provided in the cable channel.

2. Attach the fixing nuts from the outside and screw the antenna on.
3. Mount the cover plate. The cover plate is symmetrical so there is no need to take note of which side is the top and which is the bottom.
4. Screw the position screw into the cover plate.
5. Reattach the antenna downlead.

7.3 Disposal

Unusable or irreparable devices must be dismantled and disposed of in an environmentally safe manner in accordance with the relevant national waste disposal regulations.

SICK AG is not currently able to take back devices that are irreparable or can no longer be used.

8 Fault diagnosis

This chapter describes how to identify and remedy tunnel faults.

8.1 Response to faults

WARNING

Cease operation if the cause of the malfunction has not been clearly identified

Immediately put the machine out of operation if you cannot clearly identify the fault and if you cannot safely remedy the problem.

8.2 SICK support

If you cannot remedy the fault with the help of the information provided in this chapter, please contact your respective SICK subsidiary.

8.3 Component fault indicators

This section explains what the LED fault indicators of the individual devices mean and how to respond to them.

8.3.1 Read/write device fault indicator

The following LEDs indicate a fault:

LED	Color	Meaning
Ready	Red	Hardware error
RF	Red	Antenna or antenna downlead is connected incorrectly ➢ Verify that the antenna or antenna downlead is connected correctly. Ports are assigned incorrectly ➢ If you are working with fewer than four antennas, check that the correct ports have been used based on the specified configuration. More ports are often activated than there are antennas. Antenna is defective ➢ Replace the antenna.

Tab. 18: LED indicators in case of a fault for the read/write device

The SOPAS configuration software is used by default for diagnostics in case of a fault.

8.3.2 Photoelectric retro-reflective sensor fault indicator

If the yellow LED receive indicator behaves as follows, this indicates a fault:

Yellow LED	Meaning
Permanently off	Reflector is not positioned in the path of the photoelectric sensor's beam. ➢ Readjust the photoelectric sensor, clean it or check the application conditions.
Flashing	Reflector is detected in the threshold range. ➢ Readjust the photoelectric sensor, clean it or check the application conditions.
On or flashing, even if there is an object in the path of the beam	➢ Reduce the sensitivity on the potentiometer until the LED goes out. Once the object is removed, the LED must light up again. ➢ If this does not happen, adjust the sensitivity until the switching threshold is correctly set.

Tab. 19: LED indicators in case of a fault for the photoelectric retro-reflective sensor

8.4 Troubleshooting the controller

Check that all MSC800 interfaces are wired correctly.

Checking the trigger

The **TRG_1** LED (1) must light up in the **TRIGGER** block.

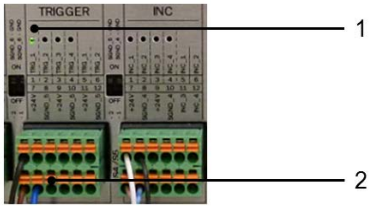


Fig. 80: Fault situation: LED for triggering

If the LED does not light up, it could be down to the following causes:

Cause	Remedy
Path of the beam is permanently interrupted by an object	➢ Remove the object to remedy the continuing interruption.
Photoelectric sensor is not aligned with the reflector	➢ Readjust the photoelectric sensor and align it with the reflector.
Signal ground has not been activated	➢ Set the **SGND_5** switch for signal ground to **on**.
Wire is not attached correctly in the terminal block (2)	➢ Check that the wires are attached correctly. • Brown wire to 7 24 V • Blue wire to 8 SGND_5 • Black wire to 1 TRG_1
Incorrectly set sensitivity	➢ Readjust the receiver unit of the photoelectric retro-reflective sensor (see section **Checking the operational readiness of the photoelectric retro-reflective sensor** in chapter **Commissioning**).
Photoelectric sensor is defective	➢ Replace the device.

Tab. 20: Fault situation: LED for triggering

Checking the measuring wheel encoder

When the measuring wheel is turned, LEDs **INC_1** and **INC_2** in terminal block **INC** (1) must flash alternately.

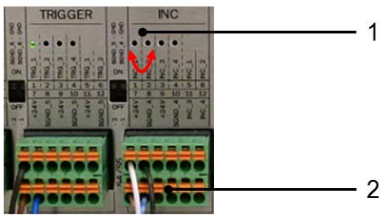


Fig. 81: Fault situation: LED for incremental signals

If the LEDs do not flash, it could be due to the following causes:

Cause	Remedy
Measuring wheel has no or only insufficient contact with the belt	➢ Make sure there is sufficient contact between the measuring wheel and the belt on site. ➢ Replace the measuring wheel if it appears worn.
Signal ground has not been activated	➢ Set the **SGND_4** switch for signal ground to **on**.
Wire is not attached correctly in the terminal block (2)	➢ Check that the wires are attached correctly.
Encoder is defective	➢ Replace the device.

Tab. 21: Fault situation: LED for incremental signals

Checking the RFU630 read/write device Ethernet connection

The read/write device must be connected to the controller via the **X12** ETHERNET connection. If this is not the case, the **SYSTEM READY** LED does not light up.

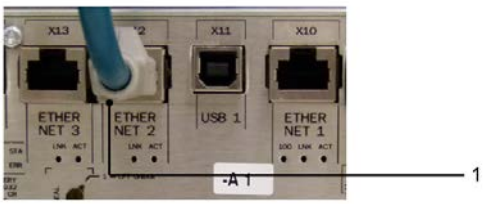


Fig. 82: Fault situation: RFU630 Ethernet cable

Cause	Remedy
Ethernet cable is connected incorrectly	➢ Connect the RFU630 read/write device Ethernet cable via the **X12** connection.

Tab. 22: Fault situation: RFU630 Ethernet cable

Checking the CAN1 cabling

If the RFU630 is cabled correctly, the LED in terminal block **CAN1** lights up weakly during operation.

If the belt is switched off, the LED should flicker if cabled correctly.

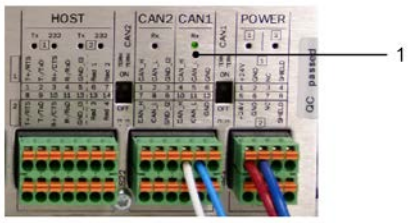


Fig. 83: Fault situation: CAN1 cabling

If the LED lights up **brightly** like the others, the CAN connection of the device is not correct. This can have the following causes:

Cause	Remedy
The wires have been swapped	➢ Connect the RFU630 as follows: • White wire to 4 CAN_H • Blue wire to 5 CAN_H
Wire is not attached correctly in the terminal block	➢ Check that the wires are attached correctly.
Terminator is defective	➢ Replace the terminator.

Tab. 23: Fault situation: CAN1 cabling

8.5 Faults in operation

Device faults (hardware/software)

Controller does not work

Cause	Remedy
Fuse is defective	➢ Check the fuse block and replace the defective fuse if necessary (type 2 A).

DEVICE READY LED on the MSC800 does not light up.

Cause	Remedy
Device is defective	➢ Replace the MSC800 (see chapter **Replacing components**).

Tab. 24: Fault situation: Controller does not work

RFU630 does not work

Cause	Remedy
Fuse is defective	➢ Check the fuse block and replace the defective fuse if necessary.

Ready LED on the RFU630 lights up red.

Cause	Remedy
Device is defective	➢ Replace the RFU630 (see chapter **Replacing components**).

Tab. 25: Fault situation: RFU630 does not work

Antenna does not work

SYSTEM READY LED on the MSC800 does not light up.

RF LED on the RFU630 lights up red (if no object is located in the tunnel).

Cause	Remedy
Antenna downlead is defective	➢ Check that the antenna downlead is attached correctly.
Antenna or antenna downlead is connected incorrectly	➢ Verify that the antenna or antenna downlead is connected correctly.
Ports are assigned incorrectly	➢ If you are working with fewer than four antennas, check that the correct ports have been used based on the specified configuration. More ports are often activated than there are antennas.
Antenna is defective	➢ Replace the antenna (see chapter **Replacing components**).
RFU630 is disconnected from the power supply	➢ Check the fuse block and replace the defective fuse if necessary.

Tab. 26: Fault situation: Antenna does not work

Photoelectric retro-reflective sensor does not work

The LED at connection **7 TRG_1** does not light up (see chapter **Checking the trigger**).

The yellow LED receive indicator on the photoelectric sensor does not light up (see chapter **Photoelectric retro-reflective sensor fault indicator**).

Cause	Remedy
Path of the beam is permanently interrupted by an object	➢ Remove the object to remedy the continuing interruption.
Photoelectric sensor has become twisted and is no longer aligned with the reflector	➢ Readjust the photoelectric sensor and align it with the reflector.

Tab. 27: Fault situation: Photoelectric retro-reflective sensor does not work

Measuring wheel encoder does not work

The LEDs in terminal block **INC** (1) do not flash alternately during operation at a low transport speed.

At a high transport speed, the two LEDs do not light up.

Cause	Remedy
Measuring wheel has no or only insufficient contact with the belt	➢ Check the measuring wheel for signs of wear. ➢ Replace the measuring wheel encoder if necessary.

'SYSTEM READY' LED does not light up

SYSTEM READY LED on the MSC800 does not light up.

Possible causes can include:

Cause	Remedy
Photoelectric sensor (trigger) is defective	➢ Readjust the device. ➢ Replace the device.
Measuring wheel encoder is defective	➢ Replace the device.
RFU630 is defective	➢ Replace the device.
Controller is defective	➢ Replace the device.
Antenna is defective	➢ Replace the antenna.
CAN cable is attached incorrectly	➢ Check the CAN connection for the RFU630 on the **CAN1** terminal block.
Ethernet cable from RFU630 is not connected correctly	➢ Connect the RFU630 ETHERNET cable via the X12 connection.

Tab. 28: Fault situation: 'SYSTEM READY' LED does not light up

Note Before replacing a device, a detailed fault analysis should be performed using SOPAS.

8.6 Detailed fault analysis

The controller outputs faults in different ways. Fault output is staggered and allows a more detailed analysis:

- Communication errors can occur when transmitting telegrams to the MSC800. The MSC800 then returns a fault code.
- For faults that occur when reading, fault codes are written to a **status log**.

8.6.1 The status log

- The status log is retained even after switching the device off and on again.
- The system distinguishes between four types of faults:
  - Information
  - Warning
  - Fault
  - Critical fault

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

Note Please contact SICK support for a more detailed analysis of the fault situation.

8.6.2 Checking the status log with SOPAS

To display the status log, the SOPAS configuration software must be connected online with the MSC800.

➢ Connect the SOPAS-ET configuration software to the device.

➢ Open the MSC800 project tree, SERVICE, SYSTEM STATUS, SYSTEM INFORMATION tab.

9 Technical data

9.1 RFMS Pro data sheet

Label/tag type	EPC Global Gen2 Class1
Typical conveying width	800 mm
Minimum conveying width	300 mm
Minimum distance between objects	400 mm
Transport speed	Up to 3 m/s
Maximum number of tags per object	Dependent on the object length in the direction of transport, materials, density of tags, etc.
MTTR	< 10 min. per component
MTBF	> 80,000 h per component
Operating voltage	100 V ... 264 V AC; 50 ... 60 Hz
Power consumption of complete system	Typically 50 W
Enclosure rating/protection class	IP 65, IP 54 (depending on the antenna type)
Ambient operating temperature	0 °C ... +40 °C
Storage temperature	-20 °C ... +70 °C
Interfaces	RS-232, -422, -485; Profibus; Ethernet (TCP/IP, FTP, EtherNet/IP)

Tab. 29: RFMS Pro data sheet

9.1.1 Modules data sheet

	Structural module	**Reader module**
Dimensions	1200 x 500 x 80 mm 1200 x 250 x 80 mm	1200 x 500 x 80 mm
Weight (kg)	Approx. 15 kg Approx. 9 kg	Approx. 17 kg
Integrated antenna	No	Yes
Integrated absorber panels	Yes	Yes

Tab. 30: RFMS Pro modules

9.1.2 MSC800 controller data sheet

Functions	Receives all digital signals, e.g., trigger and/or encoder. Combines the results read from the attached sensors, e.g., laser scanner or RFID reader. Calculates, filters, and assigns results to an object. Outputs results to the host interface. Outputs diagnostic data to the attached SVP diagnostic tool (optional).
Number of antennas per system	4
Number of bar code readers per system	8 - 12 (optional)
Optical indication on the device	26 x LED status and function indicators
"HOST" data interface	RS-232, RS-422/485, Ethernet, Profibus-DP Data output format is freely selectable
"HOST" data transmission rate	Serial: 300 ... 57,600 Bit/s Ethernet: 10/100 MBit/s PROFIBUS-DP: 12 MBAUD
"HOST" logs	SICK standard, all standard system integrator interfaces. Customization upon request
"Terminal" data interface	RS-232, 9,600 Bit/s, 8 data bits, no parity, 1 stop bit Ethernet TCP/IP
Switching inputs	16 (all inputs are displayed via one LED each) All inputs are optically isolated and protected against reverse polarity
Switching outputs	4 x PNP Imax = 30 mA, short-circuit proof, variable signal duration adjustable, 2 x volt-free relay contacts
Interfaces	1 x serial, AUX (9-pin D-SUB for serial diagnostics)2 x serial, host (wiring)3 x Ethernet, AUX or host (RJ-45)1 x PROFIBUS, host (9-pin D-SUB)
Power supply	100 ... 264 V AC/50 ... 60 Hz
Housing	Powder-coated metal housing
Spray/dust protection	IP 65 (to DIN 40 050)
Protection class	Class 1 (VDE 0106/IEC 1010-1)
Standardization	EN 60439-1;A1, EN 61140;A1, EN 61000-6-2, EN 61000-6-4, IEC 68-2-6, IEC 68-2-27
Weight	Approx. 15 kg
Operating temperature	0 to +50 °C
Storage temperature	-20 to +70 °C
Max. rel. air humidity	95%, non-condensing
Dimensions	300 mm x 400 mm x 155 mm

Tab. 31: MSC800 data sheet

9.1.3 RFU630 read/write device data sheet

Frequency range	Europe: 865.6 - 867.6 MHz USA/Canada: 902.75 - 927.25 MHz Australia: 923 - 928 MHz
Standards	EPC Gen2, ISO 18000-6B, and ISO 18000-6C
RF output	Up to +30 dBm, adjustable
Antenna connector	4 x, RP-TNC male connector (reverse polarity), impedance 50 Ω
Optical indicators	8 x LED, one multi-color on front
Data interfaces	Ethernet 10/100 MBit/s, RS-232, RS-422/485
Power connection	12 ... 30 V DC
Enclosure rating	IP 67
Weight	Approx. 3.5 kg
Rel. air humidity	90%, non-condensing
Dimensions	239 x 197 x 40 mm

Tab. 32: RFU630 read/write device data sheet

9.1.4 Antenna data sheet

Features	**ETSI**	**FCC**
Frequency	865 - 870 MHz	902 - 928 MHz
Gain	12 dBic	11 dBic
3 dB aperture angle	H 30°V 62°	H 30°V 63°
Impedance	50 Ω	
Polarization	Right circular	
Connector	N, jack (female), back	
Housing	Aluminum, polycarbonate	
Enclosure rating/protection class	IP 54	
Weight	2.8 kg	
Dimensions [W x H x D]	650 x 320 x 32 mm	630 x 320 x 40 mm

Tab. 33: Antenna data sheet

9.1.5 Photoelectric retro-reflective sensor data sheet

Sensing range	Typ. max./to reflector 7 m/PL80A
Sensitivity	Adjustable, by potentiometer, 270°
Light sender	Visible red light
Light spot diameter	40 mm at 2 m distance
Supply voltage	UV 10 ... 30 V DC
Switching output	PNP, complementary
Response time	500 µs
Connection type	Cable, 4-wire
M12 male connector	4-pin
Enclosure rating	IP 67
Ambient temperature (operation)	–40 °C ... +60 °C
Storage temperature range (without packaging)	–40 ... +75 °C
Weight with M12 male connector	Approx. 40 g

Tab. 34: Photoelectric retro-reflective sensor

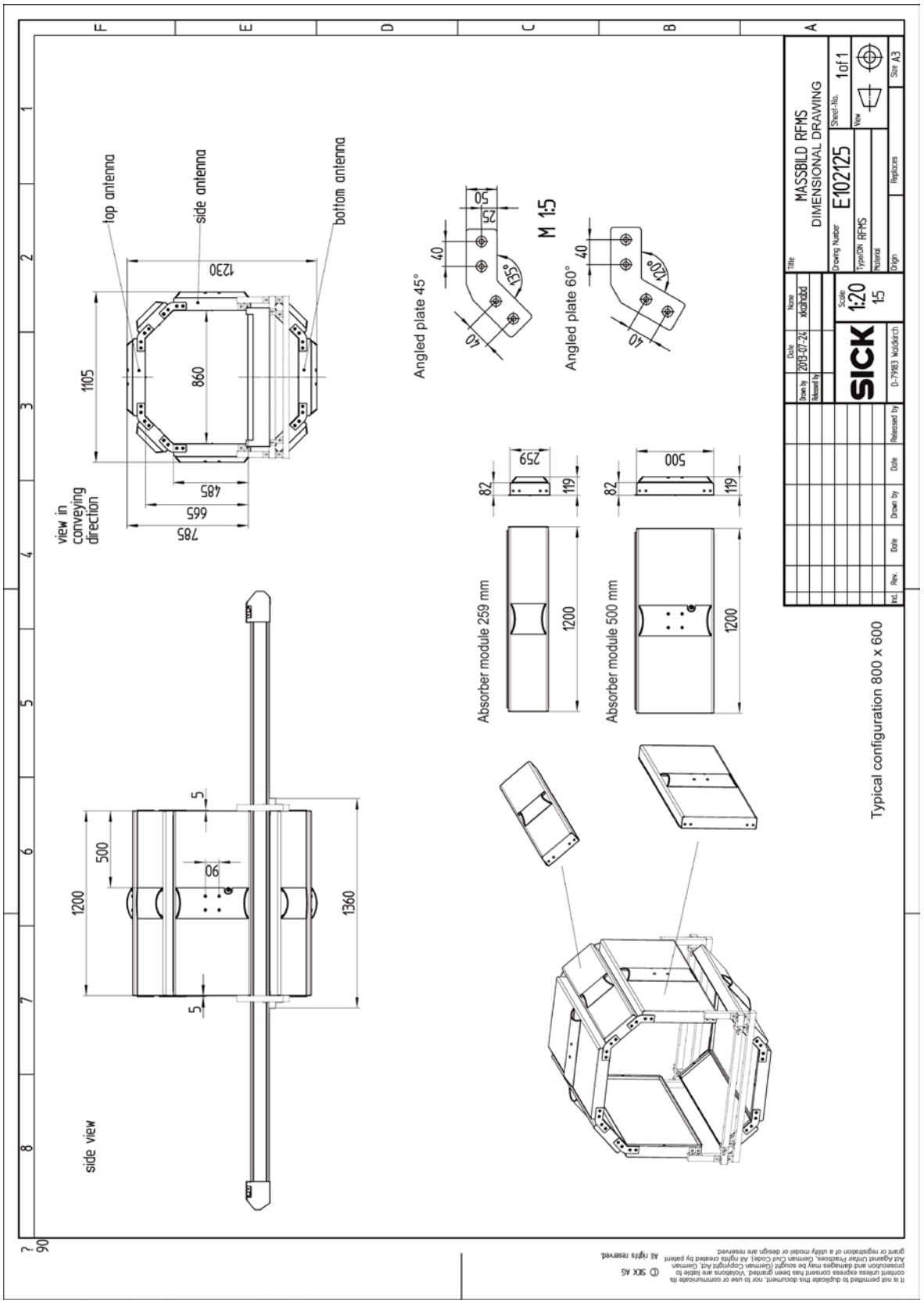
9.1.6 Measuring wheel encoder data sheet

Electrical interface	4.5 ... 32 V
Number of lines	30 (corresponds to 10 mm/increment)
Reference signal	Number 1 Position 90° electr., logically gated with A and B
Error limits	± 0.03°
Signal	HTL
Supply voltage	4.5 ... 30 V DC
Enclosure rating	IP 65 acc. to IEC 60529
Mass	0.5 kg
Working temperature range	–20 ... +100 °C
Storage temperature range (without packaging)	–40 ... +100 °C
Rel. air humidity	90%, non-condensing
Dimensions [W x H x D]	220 x 288 x 86 mm

Tab. 35: Measuring wheel encoder data sheet

9.2 RFMS Pro dimensional drawings

9.2.1 Complete system



9.2.2 MSC800 controller dimensional drawing

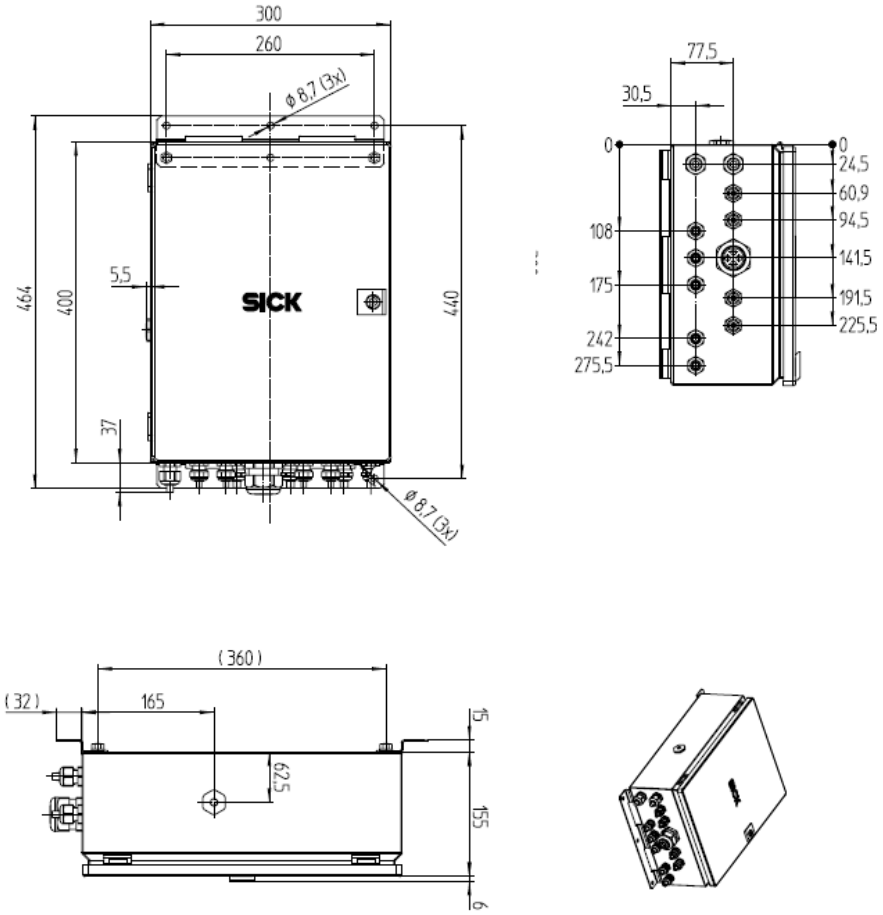


Fig. 84: MSC800 controller dimensional drawing

9.2.3 RFU630 read/write device dimensional drawing

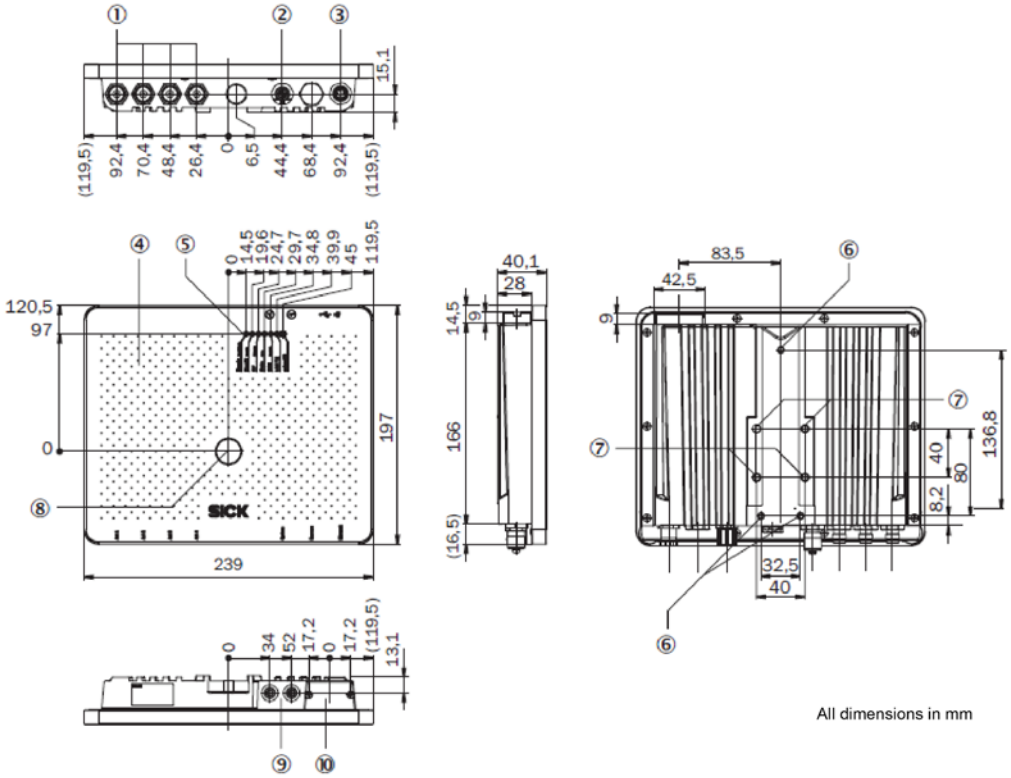


Fig. 85: RFU630 read/write device dimensional drawing

9.2.4 Photoelectric retro-reflective sensor dimensional drawing

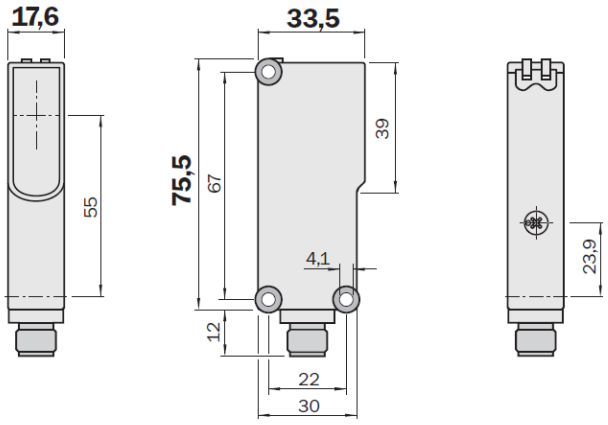


Fig. 86: Photoelectric retro-reflective sensor dimensional drawing

9.2.5 Measuring wheel encoder dimensional drawing

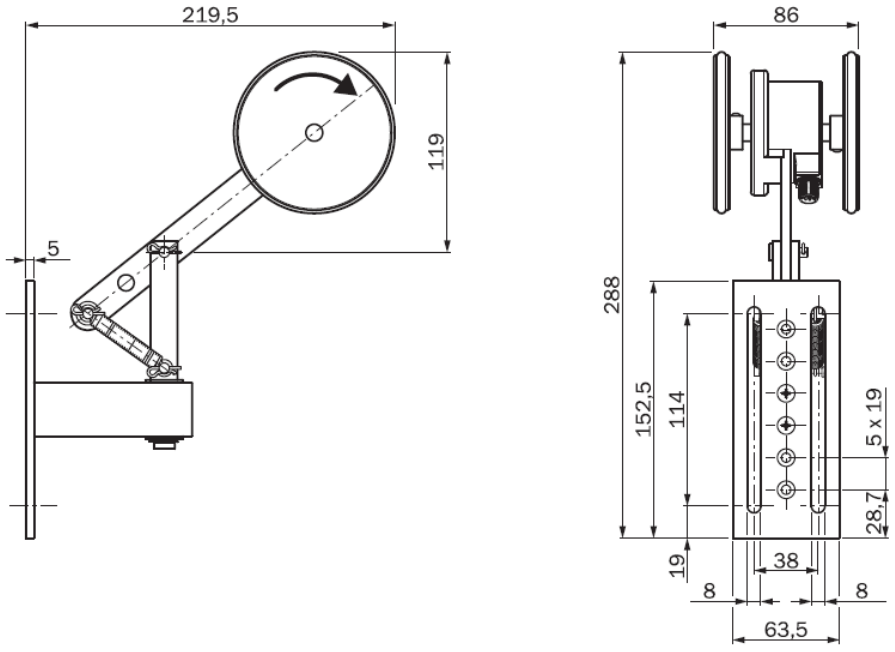
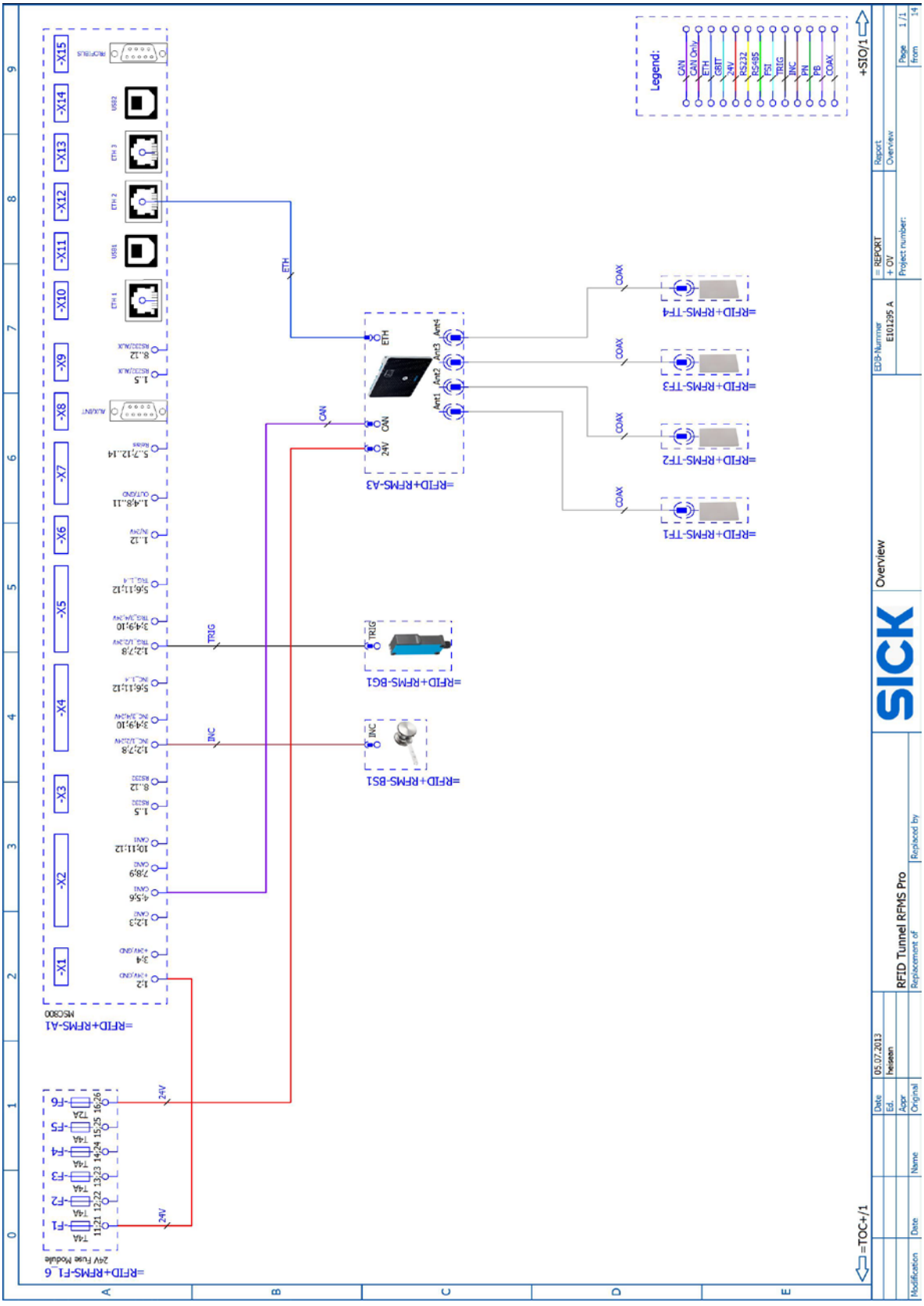


Fig. 87: Measuring wheel encoder dimensional drawing

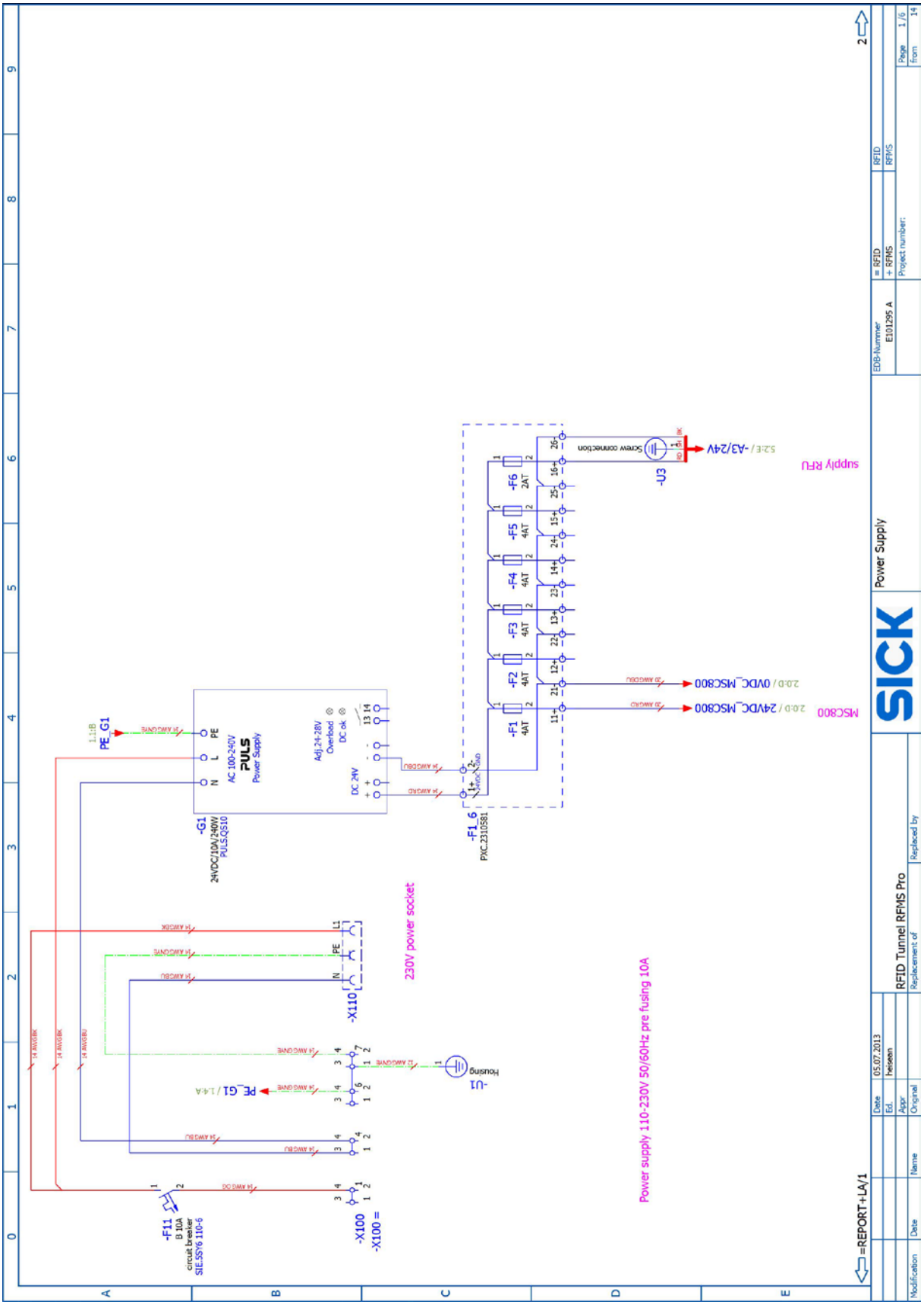
9.3 Circuit diagrams

9.3.1 Overview

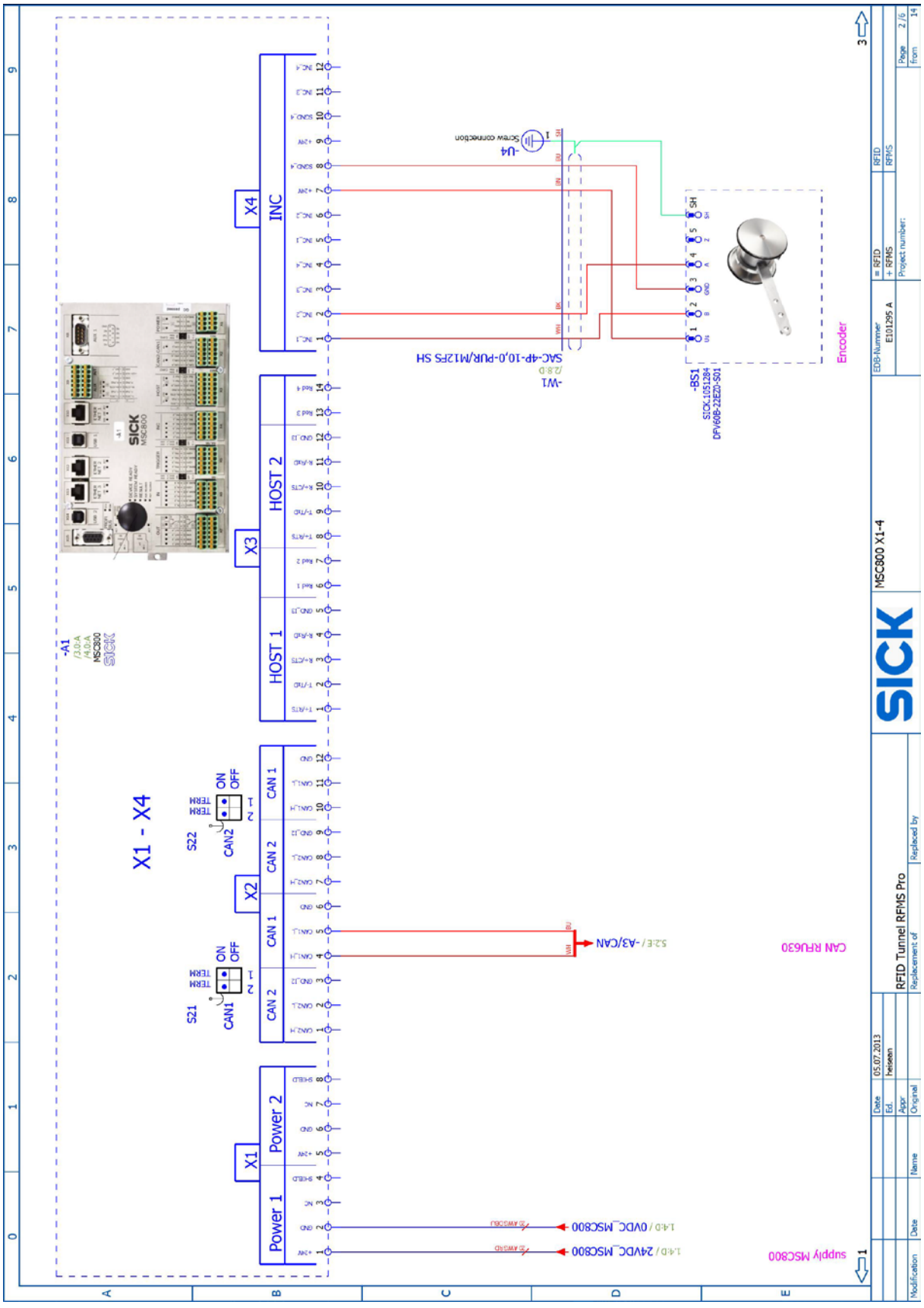


9.3.2 Control cabinet

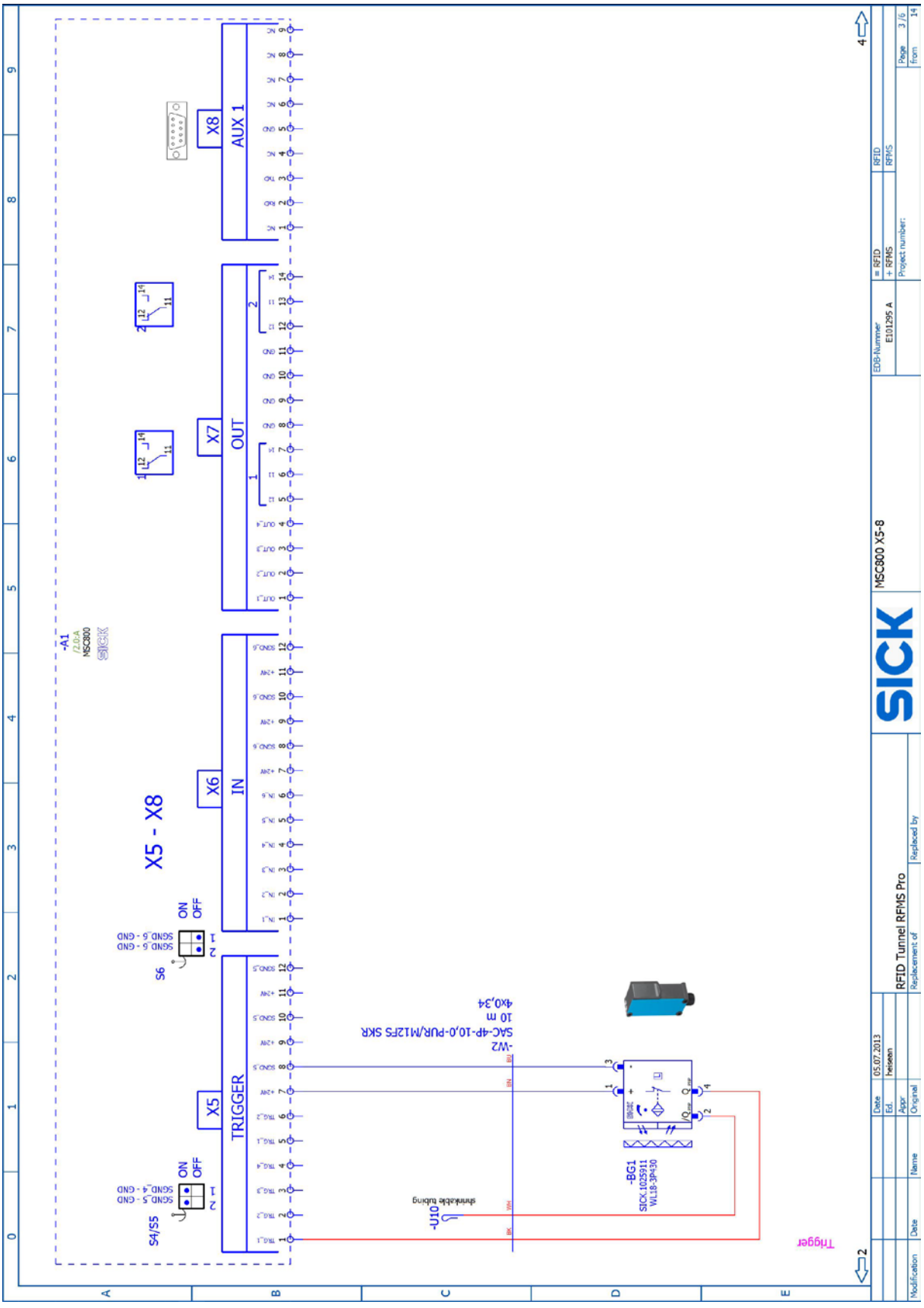
Power supply



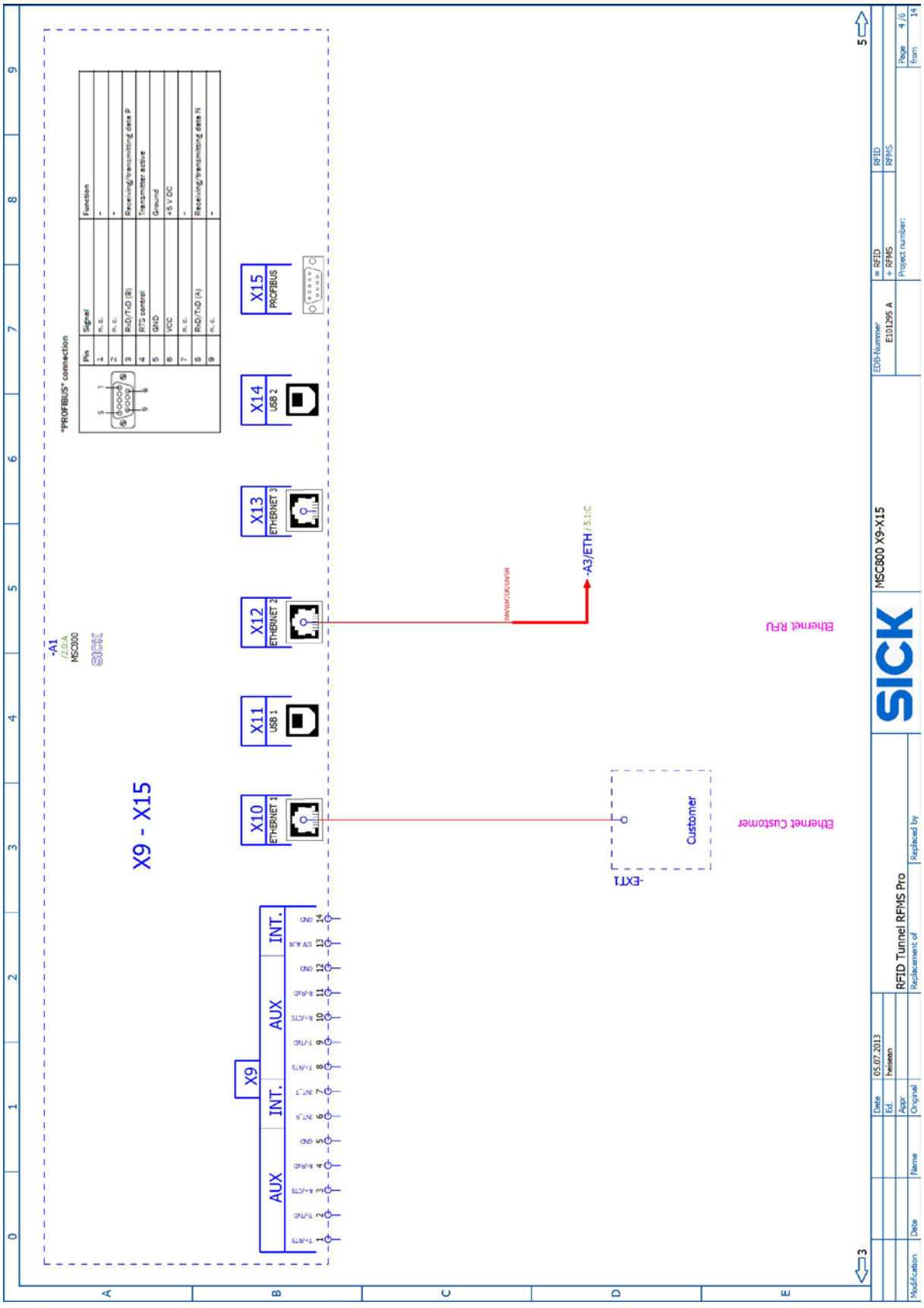
MSC800 X1-4


X4
INC
X3
HOST 2
HOST 1
X2
CAN 1
CAN 2
X1
Power 2
Power 1
X1 - X4
S22
S21
CAN2
CAN1
ON
OFF
TERM
-A1
MSC800
-U4
Screw connection
-W1
SAC-4P-10,0-PUR/M12FS SH
-BS1
SICK:1051284
DFV60B-22EZ0-S01
Encoder
-A3/CAN
CAN RFU630
0VDC_MSC800
24VDC_MSC800
supply MSC800
SICK
MSC800 X1-4
RFID Tunnel RFMS Pro
EDB-Nummer
E101295 A
Project number:
Page 2/6
from 14
Date
Ed.
Appr.
Name
Modification
05.07.2013
heissen
Original
Replacement of
Replaced by

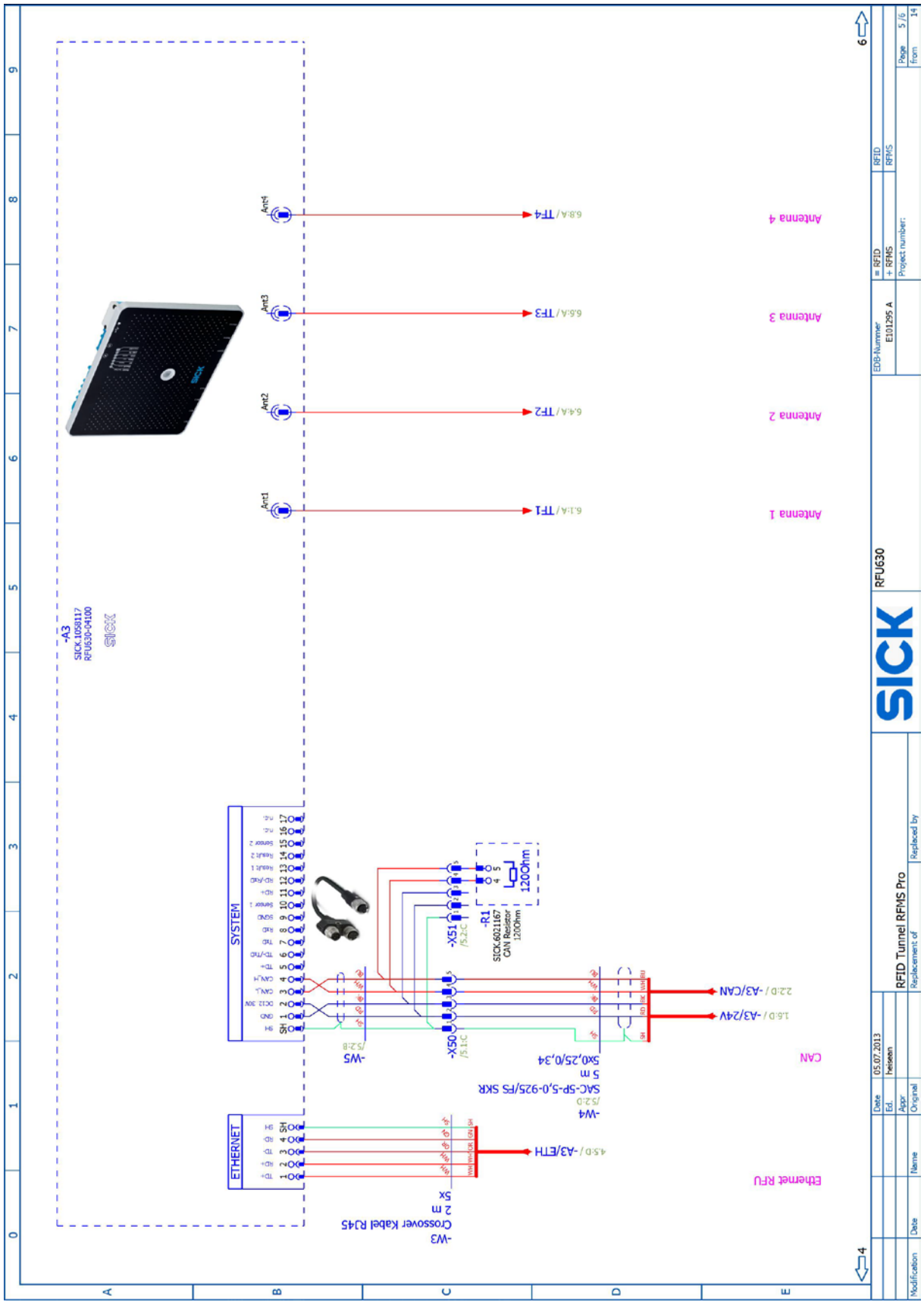
MSC800 X5-8


X8
AUX 1
X7
OUT
X6
IN
X5
TRIGGER
X5 - X8
S6
S4/S5
ON
OFF
-A1
MSC800
-BG1
SICK.1025911
WL18-3P430
-W2
SAC-4P-10,0-PUR/M12FS SKR
10 m
4x0,34
-U10
Trigger
MSC800 X5-8
RFID Tunnel RFMS Pro
SICK

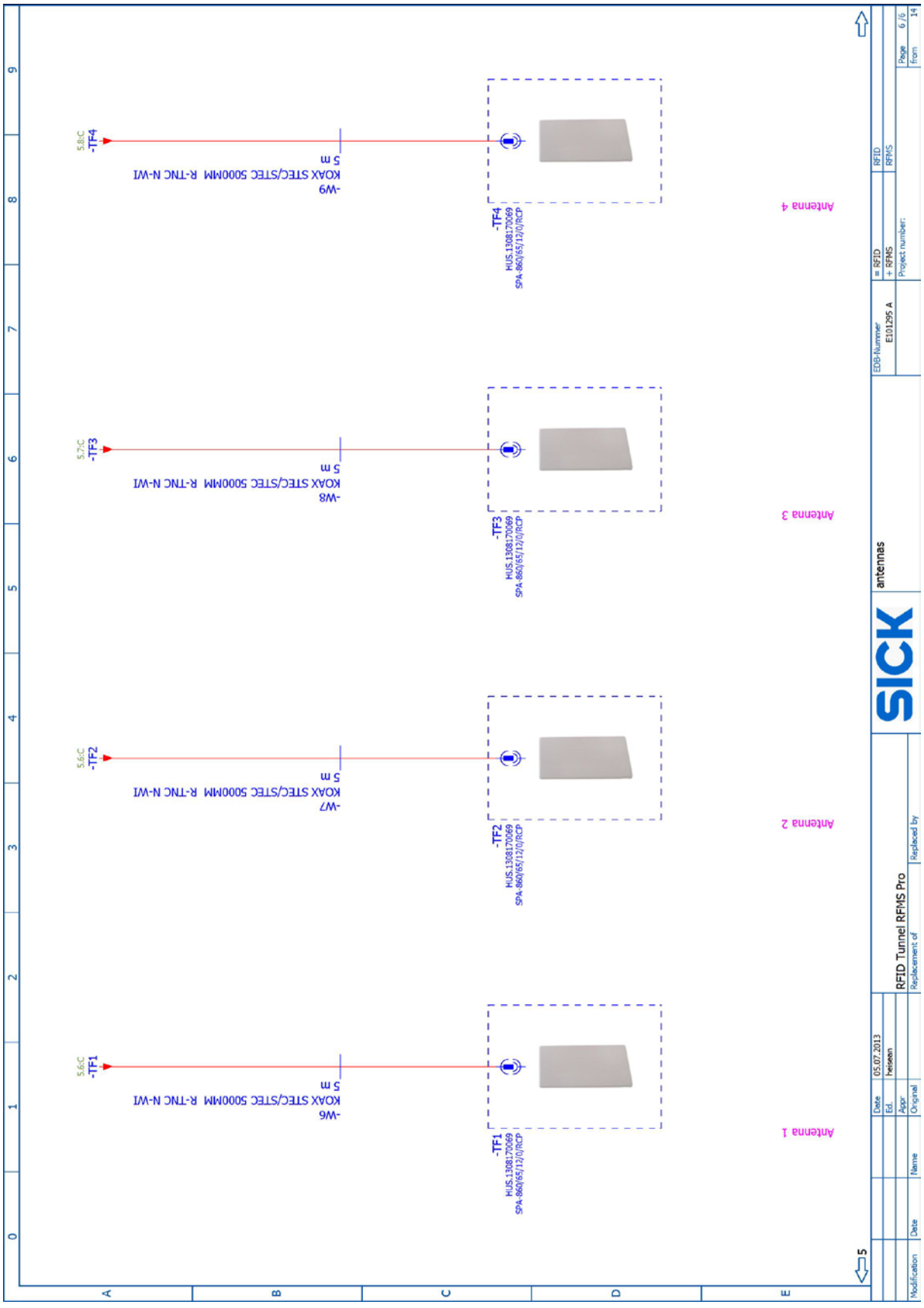
MSC800 X9-X15



9.3.3 RFU630 read/write device



RFU630 read/write device antennas



10 Appendix

10.1 List of tables

10.2 List of figures

10.3 Keywords index

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