OPERATING INSTRUCTIONS

ICR880/890 Generation 3

Camera systems

SICK
Sensor Intelligence.

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Contents

1 About these operating instructions

1.1 Purpose of this document

This document guides technical personnel through the mounting and operation of the ICR880/890 series camera systems with dynamic focus adjustment and the following variants of the system components:

- **System 1**

  ICD880 camera with standard lens (focal length 80 mm) and illumination unit ICI890-x2xxx or ICI890-x5xxx (length 750 mm)

- **System 2**

  ICD890 camera with standard lens (focal length 135 mm) and illumination unit ICI890-x1xxx or ICI890-x4xxx (length 900 mm)

- **System 3**

  ICD890 camera with standard lens (focal length 135 mm) and illumination unit ICI890-x0xxx or ICI890-x3xxx (length 1,100 mm)

All systems include a coordinating controller. Either an MSC800 or an SIC2000 can be used.

The camera systems available are outlined in chapter *3.1.3 Device types*.

These operating instructions contain information about the following topics related to the camera systems:

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

1.2 Description of software status

Software/Tool	Function	Status
ICR880/890 system	SICK firmware	From V. 3.x
SOPAS-ET*)	Configuration software (Windows-based)	From V. 2.38
*) Can run on a PC with a WindowsTM operating system		

Tab. 1: Description of software status

1.3 Target group

These operating instructions are intended for people that mount, connect, commission, operate, and maintain the camera systems.

Tasks	Target group
Mounting, electrical installation, maintenance, and replacement of system components	Qualified personnel, such as service technicians or industrial electricians
Commissioning and configuration	Expert personnel, such as technicians or engineers
Operation of the conveying system	Personnel qualified in running and operating the conveying system

Tab. 2: Target group

1.4 Information depth

This document contains all information required for on-site mounting, electrical installation, and commissioning of the ICR880/890 camera systems. The configuration of the camera systems for the application-specific reading situation and its respective operation for this purpose are carried out via the SOPAS-ET configuration software on a Windows PC. In the SOPAS-ET configuration software, there is an online help system available to support the configuration.

The mounting and electrical installation of the controller used, as well as the configuration of this controller, are described in the MSC800 or SIC2000 operating instructions.

When planning and using the camera systems, technical skills are required that are not covered by this document.

The official and legal regulations for operating the camera systems must be observed.

Additional information on the camera systems, volume measurement systems and 1D/2D code readers is available from SICK AG online at **www.sick.com**.

1.5 Abbreviations used

CAN	Controller area network (fieldbus log based on the CAN bus)
CMOS	Complementary metal-oxide-semiconductor
DOF	Depth of field
dpi	dots per inch (1 inch = 25.4 mm)
EEPROM	Electrically erasable programmable read-only memory (electrically erasable and programmable nonvolatile memory)
FIFO	First In First Out
FTP	File Transfer Protocol
HTML	Hypertext markup language (page description language used on the Internet)
ICD	Image capture device (camera)
ICI	Image capture illumination
ICR	Image code reader (high-end CMOS camera system)
JPEG	Joint photographic expert group (pixel-oriented file format for saving photos with high compression, compression procedure for Tiff formats)
LED	Light emitting diode
LIFO	Last In First Out
lpi	Lines per inch (1 inch = 25.4 mm)
MAC	Medium Access Control
MLG	Modular light grid
MSC	Modular system controller (MSC800)
MTBF	Mean time between failure
MTTR	Mean time to repair
OCR	Optical character recognition
RAM	Random access memory (direct-access volatile memory)
RoHS	Restriction of (the use of certain) hazardous substances
ROM	Read-only memory (read-only, nonvolatile memory)
SD	Secure digital card (digital, replaceable memory card)
SIC	Sensor Integration Cabinet (SIC2000)
SOPAS-ET	SICK Open Portal for Application and Systems Engineering Tool (PC software for Windows for configuration of the ICR880/890 system and the controller unit)
PLC	Programmable logic controller
TCP/IP	Transmission Control Protocol/Internet Protocol
UDP	User datagram protocol
VCS	Video Coding System
VMS	Volume measurement system

The simplified designations for system components outlined below are used in the document with the exception of text passages in which it is necessary to make a clear distinction between variants.

Detailed description	Simplified
ICR88x or ICR89x camera system	Camera system
ICD88x or ICD89x image capture device	Camera
ICI890 image capture illumination	Illumination
MSC800 modular system controller SIC2000 Sensor Integration Cabinet	Controller unit
SICK Open Portal for Application and Systems Engineering Tool	SOPAS-ET configuration software

1D codes generally designate bar codes, also referred to as “linear codes”. 2D codes generally designate stacked codes and matrix codes.

Chapter *9 Technical data* lists the types of codes that can be decoded by the camera system.

1.6 Symbols used

Some information in this document is emphasized as follows to facilitate quick access to this information.

Note Notes provide information about the features of a device, application tips, or other useful information.

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

► Instructions for taking action are indicated by an arrow. Carefully read and follow the instructions for action.

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

Information relating to the SOPAS-ET configuration software is indicated by the program symbol.

This symbol refers to supplementary technical documentation.

2 Safety

This chapter concerns your own safety and the safety of persons who use the camera systems.

► Please read this chapter carefully **before** you begin working with the camera system.

2.1 Qualified safety personnel

The camera system must only be mounted, operated, and maintained by properly qualified personnel.

The following qualifications are necessary for the various tasks:

Tasks	Qualification
Mounting and maintenance	▪ Practical technical training ▪ Knowledge of the current safety regulations in the workplace
Electrical installation and device replacement	▪ Practical electrical training ▪ Knowledge of current electrical safety regulations ▪ Knowledge of device control and operation in the particular application concerned (e.g., conveying system, mounting system)
Commissioning, configuration	▪ Basic knowledge of the Windows operating system used ▪ Basic knowledge of the design and setup (addressing) of Ethernet connections when connecting the camera system to Ethernet ▪ Basic knowledge of data transmission ▪ Basic knowledge of 1D/2D-code technology
Operation of the device for the specific application	▪ Knowledge concerning device control and operation in the particular application concerned (e.g., conveying system, mounting system, crane, etc.) ▪ Knowledge concerning the software and hardware environment of the particular application concerned (e.g., conveying system, mounting system, crane etc.) ▪ Knowledge of the mechanical and electrical parameters of the conveying line and properties of the conveying system that relate to control and operation ▪ Knowledge of the software and hardware environment for the particular application concerned (e.g., conveying line)

Tab. 3: Qualified safety personnel

2.2 Intended use

The ICR8xx camera system is an intelligent sensor for identifying and decoding 1D/2D codes of moving objects in a reading station. The codes can be read in any direction to the camera system (360°-reading). Together with the coordinating controller unit (either an MSC800 or an SIC2000) and other system components, the camera system forms an automatic reading system.

The controller unit supports single-side reading with a camera system (e.g., from above or from the side) and also multi-side reading with the corresponding number of camera systems.

The intended use of the camera system is outlined in the following description of the system components and their function:

- Depending on the model, the camera system consists of the ICD8xx camera and a coordinated variant of the ICI890 illumination unit, as well as the deflector mirror as an option. In a reading station, the camera is mounted together with the illumination as a unit in a frame in parallel opposite the deflector mirror. It is either mounted over the conveying line (reading from above), at the side (side reading), or under the conveying system (reading from below). When reading from below, the image is taken through a belt gap.
- Other SICK sensors, e.g., volume measurement systems, provide the camera system with information about auto-focusing via the controller unit.
- The camera transmits the read data – optionally with selectable diagnostics data – to the controller unit via the CAN interface.
- The read data is output to a higher-level host computer for further processing via the controller unit's physical data interfaces.
- The image information prepared by the camera systems can be transmitted to a customer server with a compatible Gbit interface via separate Gbit interfaces with a very high data transmission rate. The outstanding image quality also makes it suitable for use in OCR and video coding applications.
- The configuration and operation of the camera system are carried out, as standard, via a host Ethernet interface with the SOPAS-ET configuration software, which is installed on a standard PC provided by the customer.

Note

In the event of any other usage of or modification to the camera system, e.g., opening the camera or the illumination unit, even as part of the mounting or electrical installation process, or any other usage of or modification to SICK software, any claims against SICK AG under the warranty will be rendered void.

However, in order to quickly replace devices, the system components of the camera and illumination unit can be separated from one another.

The camera system must only be operated in the permitted ambient temperature range (see chapter *9 Technical data*).

2.3 General safety notes and protective measures

2.3.1 Safety notes and symbols

The following safety and hazard notes concern your own safety, the safety of third parties, and the safety of the device. For this reason, these notes must be observed.

HAZARD

Denotes an immediate hazard that may result in severe to fatal injuries.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of injury resulting from electrical current).

WARNING

Denotes a potentially dangerous situation that may result in severe to fatal injuries.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of injury resulting from falling components).

CAUTION

Denotes a potentially dangerous situation that may result in minor personal injury or possible material damage.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of damage to the eye by laser beams).

NOTE

Denotes a potential risk of damage or functional impairment of the device or the devices connected to it.

2.3.2 General safety notes

General, recognized safety-related rules and regulations were taken into account in the design and manufacture of the camera systems. However, risks for the user resulting from the device cannot be completely ruled out. The safety notes below must therefore be observed.

⚠ WARNING

Safety notes

Observe the following to ensure the safe use of the device as intended.

- The notes in these operating instructions (e.g., regarding use, mounting, or installation) must be observed.
- All official and statutory regulations must be observed when operating the device.
- The national and international legal specifications apply to the installation and use of the device, to the commissioning of said device, and to recurring technical inspections, in particular:
  - The accident prevention regulations and work safety regulations
  - Any other relevant safety regulations
- The manufacturer and user of the device are responsible for coordinating and complying with all applicable safety specifications and regulations in cooperation with the relevant authorities.
- The checks 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 device. The device operator must be instructed by qualified safety personnel and must read the operating instructions.
- Maintenance and repair work must only be done by trained and authorized SICK AG service technicians or qualified safety personnel of the customer.

⚠ WARNING

The device is not a safety device for human protection and therefore does not fulfill any safety standards.

Measures

▶ For safety applications, please contact SICK AG.

⚠ WARNING

Radio interference may result when using the camera system in a residential area.

Measures

▶ Use the camera system in industrial environments only.

2.3.3 Potential sources of danger

The camera system has been designed such that it can be operated safely. Protective devices reduce potential risks to the maximum possible extent. However, a certain level of risk will always remain.

Awareness of potential sources of danger caused by the device will help you to work in a safer manner and therefore prevent accidents.

That is why all persons involved with the transport and storage, mounting, commissioning and decommissioning, operation, and maintenance and repair must carefully read and observe the following safety notes.

In order to avoid danger, also follow the special warning information in the individual chapters as well as the current national accident prevention regulations, and any company work, operation, and safety regulations.

Danger due to electrical current

HAZARD

Risk of injury due to electrical current

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

Measures

- Current safety regulations must be observed when working on electrical devices.
- The power supply must be disconnected when attaching and detaching electrical connections.
- Select and implement wire cross-sections and their correct fuse protection at the beginning of the wire seen from the source of electricity in accordance with the applicable standards.

HAZARD

Risk of injury due to improper handling of live components

Improper handling of live devices may lead to severe personal injury or death by electric shock.

Measures

- Electrical installation and maintenance work must always be carried out by personnel authorized to do so.
- Do not touch any live parts.
- In the event of danger, immediately disconnect the system from the power supply.
- Always use original fuses with the specified current rating.
- All control cabinets must be securely closed during operation.
- Before opening the cabinet, disconnect the entire system from the power supply and secure it against being switched on again.
- Report any damaged cables to the maintenance team without delay.

Danger due to LED light

Caution

LED light beam

The ICI8x0 line illumination uses LEDs as light source.

Variants with red LEDs (ICI890-0x and ICI890-2x) conform to risk group RG1, variants with white LEDs (ICI890-3x), blue-white LEDs (ICI890-1x) and blue LEDs (ICI890-4x) conform to risk group RG2 according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09.

Risk group RG 1

The accessible radiation does not represent a risk due to the normal restrictions imposed by human behavior.

- Do not look into the light source.

Risk group RG 2

CAUTION – Possibly hazardous visible radiation emitted from the illumination unit.

The accessible radiation does not pose a hazard due to aversion responses from bright light sources or thermal discomfort and under consideration of the following behaviour.

- Do not look into the light source for extended periods of time during operation. May be harmful to the eyes.
- Do not point light sources at people and prevent light sources from reflecting off reflective surfaces onto people, particularly when mounting and commissioning the illumination unit.
- Do not open the housing of the illumination unit, as this does not deactivate the light source and may increase the level of risk.

Both risk groups

It is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, photosensitive epilepsy, impairment of color vision), particularly in low ambient light conditions.

CAUTION – Use of operating or adjusting devices or performance of procedures other than those specified herein may result in hazardous radiation exposure.

- Observe the current national regulations on photobiological safety of lamps and lamp systems.

The entire window area of the front screen is the outlet opening of the LED light beam.

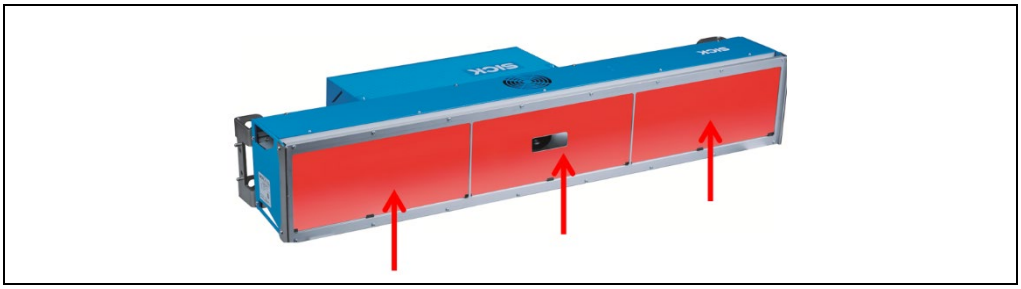


Fig. 1: LED light beams from the illumination unit

Maintenance

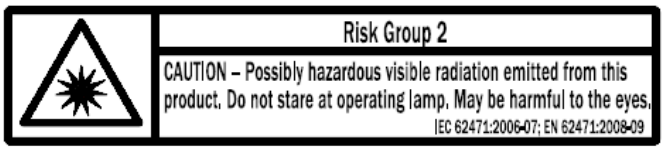
The illumination unit is maintenance-free. No maintenance is required in order to ensure compliance with LED risk group RG 1 or RG 2.

Safety measures for risk group RG 2

If directly looking into the beam for more than 0.25 seconds cannot be ruled out, eye protection is strongly recommended while handling the product (commissioning, adjustment, cleaning, etc.).

Warning label for risk group RG 2

Illumination units equipped with LEDs in risk group RG 2 feature the following warning label:



For the devices, the label is located on the exterior of the housing.

If the device itself is integrated into machinery, for example, in a way which obscures the warning label attached, additional clearly visible labels should be attached to the machinery close to where the light is emitted.

Radiated power

Depending on the model, the ICI890 illumination unit works with LEDs with the following wavelength:

- Red light: λ = 630 nm (amber).
- White light: λ = 400 nm to 750 nm
- Blue-white light: λ = 470 nm
- Blue light: λ = 449 nm

The ICI890 illumination unit works as follows:

- The reading pulse (pulse source) controls the switching on and off of the LED illumination during the read process. In read mode, the LEDs are switched on in pulse mode depending on the reading gate duration.
- In read mode, a time stage (illumination timeout) automatically switches off the illumination 3 seconds (default) after a continuous reading pulse has started, but does not end the reading pulse. The reading pulse must be ended with a corresponding clock signal. The next reading pulse switches the illumination back on.
- The illumination timeout can either be set or switched off in the range of 3 s ... 25 h. For safety reasons, the maximum switch-on time of the illumination is 3 seconds.

Mounting, maintenance, and repair

WARNING

Risk of injury due to falling components

A unit consisting of the illumination unit and camera weighs up to approximately 37 kg depending on the variant.

Measures

- Do not perform any mounting work alone.
- Ask a second person to hold the camera system during the mounting process.
- When replacing the illumination unit or the camera, individually remove the camera first and then the illumination unit.
- The components must be lifted from the bracket in accordance with ergonomic principles.
- Wear safety shoes.

WARNING

Risk of injury due to hot surface

The LEDs in the ICI890 illumination unit can get very hot, depending on the mounting situation, ambient temperature, and mode of operation.

Measures

- Do not touch the LEDs in the illumination unit with your hands during operation.
- Before commencing disassembly, switch off the device and allow it to cool down.

NOTE

Repair work on the camera system may only be performed by qualified and authorized service personnel.

NOTE

Claims under the warranty rendered void

Do not open the device housing.

If the device is opened, any warranty claims against SICK AG will be void.

Inserting a dongle for camera variants with a USB connection

Some special devices accompanying the camera also feature a side USB connection, which is covered by a screwed metal cap (1) in normal read mode.

The connection point has two USB ports (female connectors type A) and is used for inserting dongles.

The photo on the right shows the open USB connection with a dongle inserted (2).

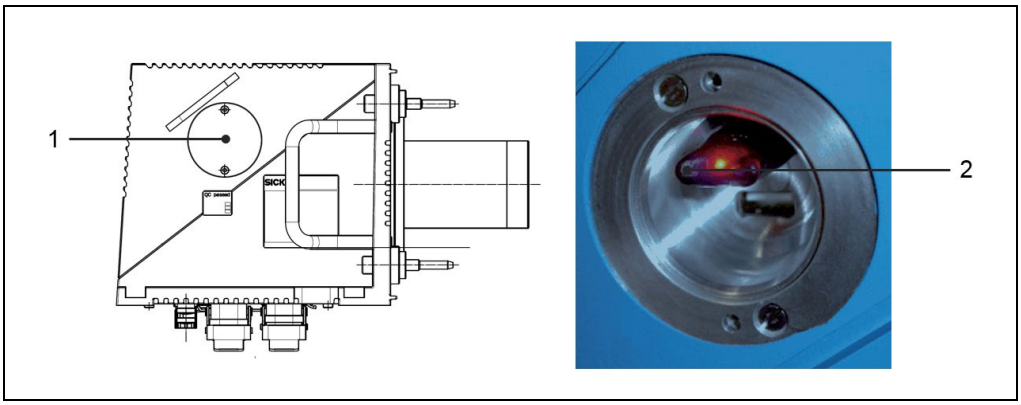


Fig. 2: Position of the optional USB connection on the side of the camera

Note Other USB-compatible devices must not be connected.

NOTE

Risk of damage due to improper USB connection

The camera electronics can be damaged by the improper use of the USB connection.

- The camera system must be disconnected from the power supply before inserting a dongle into one of the USB female connectors or removing it from a female connector.
- Before inserting or removing the dongle, perform electrostatic equipotential bonding between the respective person's body and the camera. During the operation, a grounding armband must be worn at the wrist.
- In read mode, the cover of the USB connection must be screwed down when operating the camera in order to comply with the EMC concept.

2.4 Protecting the environment

The camera system has been designed to minimize its impact on the environment.

Outside of the housing, the device contains no materials using silicon.

- Always act in an environmentally responsible manner at work. For this reason, please note the following information regarding disposal.

Disposal after final decommissioning

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

- Always dispose of unusable or irreparable devices in an environmentally safe manner in accordance with the relevant national waste disposal regulations.

The design of the camera system allows separation into recyclable secondary raw materials and hazardous waste (electronic scrap).

- Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are easy to dismantle.

Note The battery in the internal PC card of the camera must be removed before scrapping the device.

- Dispose of the battery separately in accordance with the RoHS directives (Europe).

3 Product description

This chapter provides information on the design, properties, and function of the camera system.

3.1 Camera system design

The camera system is an intelligent sensor for the automatic and non-contact identification and decoding of 1D/2D codes of moving objects in a reading station. The system consists of an ICD880/890 camera (1), an ICI890 LED illumination unit (2), and an optional deflector mirror (3).

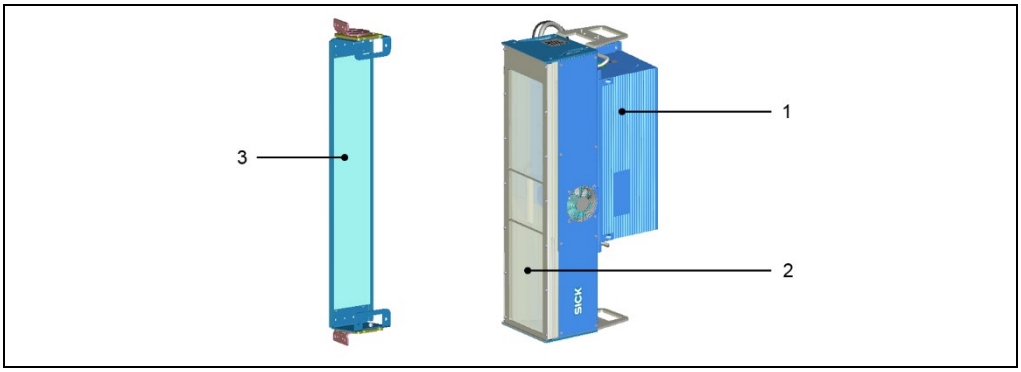


Fig. 3: Camera system design

The camera system is connected to a controller unit via CAN bus. The power supply unit for the controller unit provides the supply voltage.

External sensors such as photoelectric sensors and incremental encoders are used for triggering and position detection. Sensors such as volume measurement systems and light grids provide the object distance required for auto-focusing. All external sensors are connected to the controller unit like the camera systems.

The controller unit processes the signals from the connected sensors and delivers the recorded read results to the higher-level host computer.

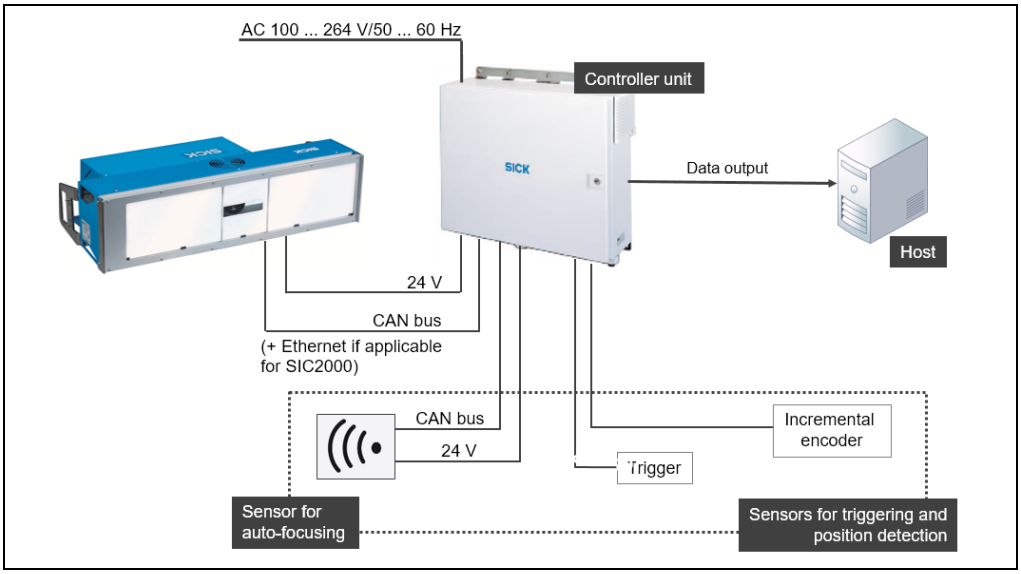


Fig. 4: Integrating the camera system

For additional information on the controller unit, please see the relevant operating instructions for the MSC800 or SIC2000.

3.1.1 Device view

Camera system (from above)

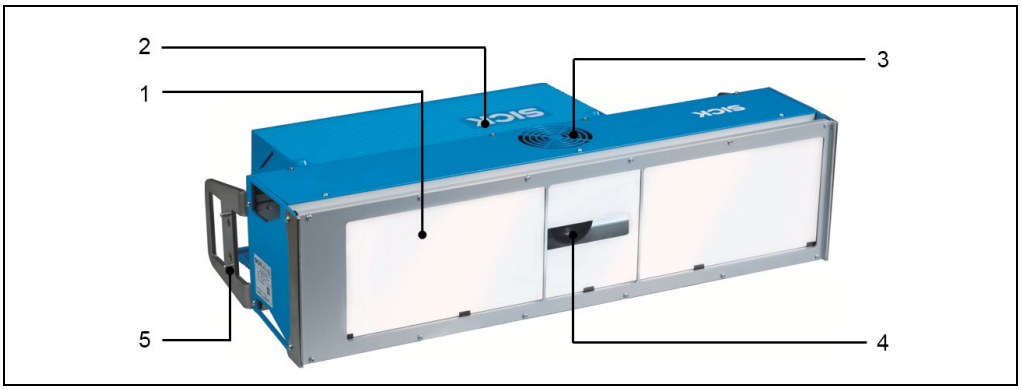


Fig. 5: View of camera system (from above)

No.	Meaning
1	ICI890 illumination unit
2	ICD880/890 camera
3	Air inlet opening for cooling the illumination unit
4	Reading window of the ICD880/890 camera
5	Alignment pins (4 x) for use in the 180° mounting bracket

Camera system (from below)

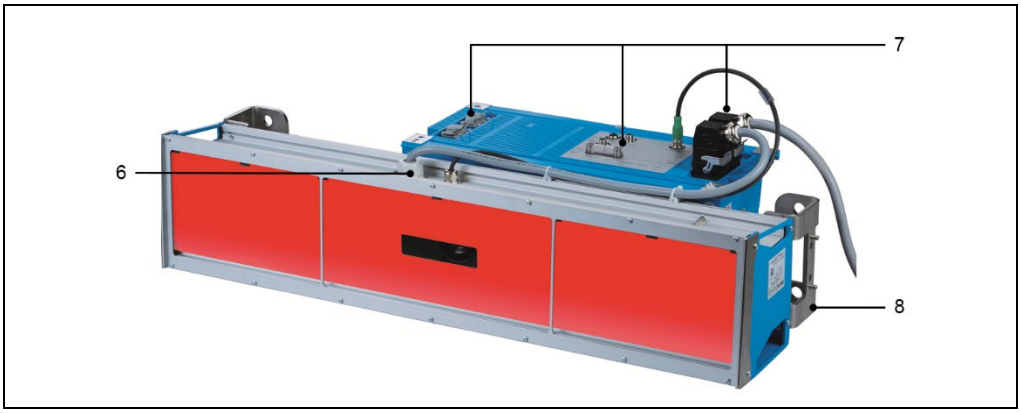


Fig. 6: View of complete camera (from below)

No.	Meaning
6	Electrical connections of the ICI890 illumination unit
7	Electrical connections of the ICD880/890 camera
8	Bracket for mounting bracket (2 x)

ICD880/890 camera (from below)

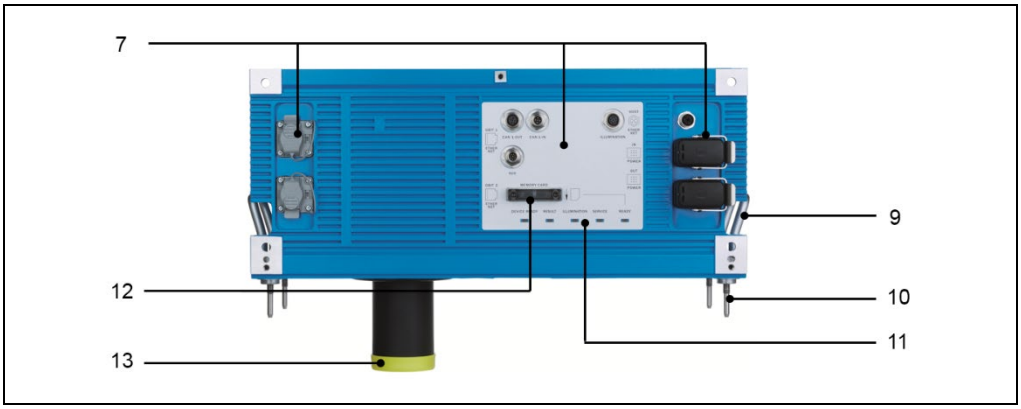


Fig. 7: View of camera (from below)

No.	Meaning
9	Grab handle for camera (2 x)
10	Threaded centering pin for mounting on the illumination unit
11	LEDs for status display (5 x)
12	SD memory card for parameter cloning
13	Protective lens tube

ICD890-xxxxxxxS03 camera

The ICD890-xxxxxxxS03 camera variants have three Gbit connections, which make it possible to connect the camera systems to the Ethernet network of the controller unit in line topology.

Fig. 8: View of ICD890-xxxxxxxS03 camera (from below)

No.	Meaning
14	Gbit connections with M12 plug connectors (3 x)

3.1.2 Scope of delivery

Item	Component	Comments
1	ICD880 or ICD890 camera with SD memory card	Model-dependent, depends on order
1	ICI890 illumination unit	Model-dependent, depends on order
1	Deflector mirror (optional)	Model-dependent, depends on order
4	180° mounting brackets with mounting accessories	For camera system and deflector mirror
1	Connecting cable	For the voltage supply of the camera system
1	Connecting cable	For the voltage supply of the ICI890 illumination unit via the camera
1	Connecting cable	For the control of the illumination unit via the camera
1	CAN data cable	For linking the camera system with the controller unit via the CAN bus
1	Termination resistor	For the termination of the CAN bus on the sides of the camera system
1	Device note, including the electrical connection diagram for initial information	Included in the device packaging for the camera system

Tab. 4: Scope of delivery for the ICR880/890 camera system

The following items are also required to integrate the camera system:

Item	Component	Comments
1	Controller unit (either an MSC800 or an SIC2000)	Model-dependent, without connecting cables
1	Sensor for determining the object distance to auto-focus the camera (with connecting cables and mounting set)	Application-specific
1	Read cycle sensor (photoelectric sensor) with connecting cable and mounting set	Reading trigger
1	Incremental encoder with connecting cable and mounting set	Used together with the trigger signal to determine the position of the object on the conveyor
1	Mounting frame	Optional (application-specific)

Tab. 5: Components for integrating the ICR880/890 camera system

Note Only use memory cards approved by SICK to ensure the reliable functioning of the SD memory card.

3.1.3 Device types

These operating instructions apply to all available device types of the camera and illumination unit.

Available device types of the camera are listed on the online product page. Associated illumination units (ICI890-0x, ICI890-1x, ICI890-2x, ICI890-3x, ICI890-4x) are listed on the product page in the accessories area:

- www.sick.com/ICD88x
- www.sick.com/ICD89x

When combined, the following camera systems are available:

Characteristic	System 1	System 2	System 3
System width	770 mm	950 mm	1,150 mm
Max. reading distance	1,400 mm	2,500 mm	3,300 mm
Depth of field	550 mm	1,100 mm	1,700 mm
Typ. conveyor coverage	≤ 600 mm	≤ 800 mm	≤ 1,300 mm
Typ. image resolution	200 dpi ... 270 dpi	200 dpi ... 250 dpi	150 dpi ... 200 dpi
Image output	Tracking, analysis, VCS	Tracking, analysis, OCR, VCS	Tracking, analysis, OCR, VCS

Tab. 6: Variants of camera systems

3.2 System requirements

3.2.1 Mounting requirements

- Typical space requirements above the highest object (for reading from above): application-specific
- Camera system must have a clear view of the objects
- Stable mounting frame with an adequate load capacity and suitable dimensions for the camera system (see chapter *9.6 Dimensional drawing of the ICR880/890 camera systems*)
- Four 180° mounting brackets for the camera system and the deflector mirror (in the scope of delivery)
- Shock and vibration-free mounting

Note A mounting frame made of 80 mm item aluminum profiles can be used to ensure simple mounting of the camera system. The 180° mounting brackets are adapted to these profiles.

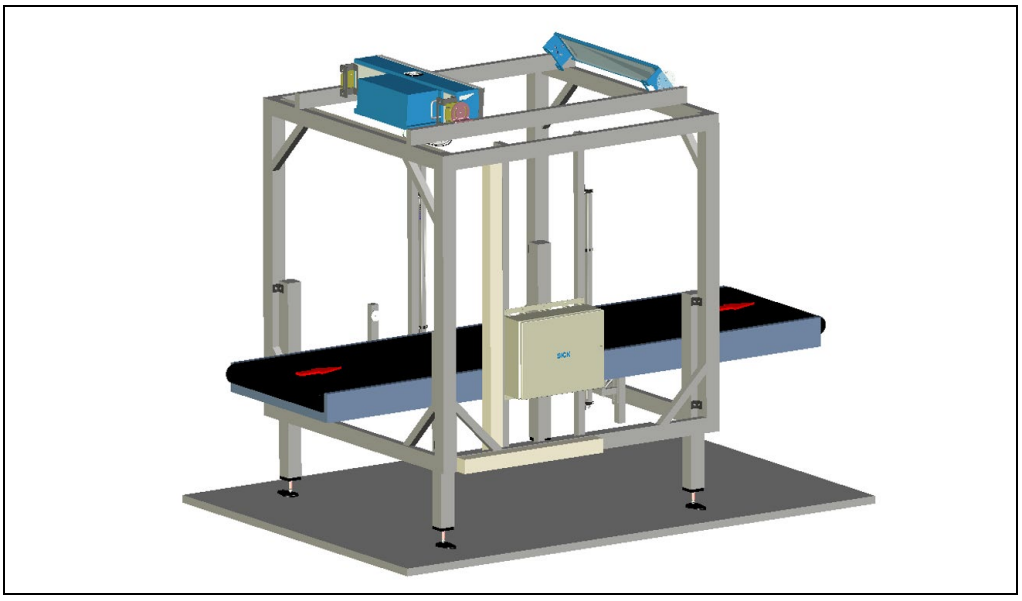


Fig. 9: Simple mounting of the camera system on the mounting frame (example)

3.2.2 Electrical installation requirements

To operate the camera system, the following are required:

- Supply voltage of the controller unit: AC 100 ... 264 V/50 ... 60 Hz
- Host computer **with** RS-232, RS-422 (RS-485 (MSC800 only)), Ethernet, PROFIBUS-DP (MSC800), or fieldbus (SIC2000) data interface for further processing of the recorded data.
- Connecting cables: see chapter *5.2.3 Pre-wired cables (overview)*.

3.2.3 Commissioning and configuration requirements

The system is configured via a configuration PC with the SOPAS configuration software installed.

The configuration PC is connected to the controller unit via Ethernet.

3.3 Product features and functions

ICD880/890 camera

- CMOS line with 8,192 pixels (standard device)
- Dynamic focus position switching
- ICD880: lens with focal length of 80 mm, ICD890: lens with focal length of 135 mm
- Model-dependent read ranges (e.g., ICD890 standard device: 1.4 m to 3.0 m)
- Model-dependent image resolution (e.g., ICD890 standard device: 170 dpi to 350 dpi)
- Scanning frequency max. 19.1 kHz (standard device)/max. 30 kHz (high-speed device)
- Option to adapt to code print quality
- Evaluation range of sensor can be limited
- Image output (grayscale values: ***.jpeg**, ***.tif**)

Safety and ease-of-use

- Rugged, compact metal housing, enclosure rating max. IP 64, CE marking
- LED risk group RG 1 or RG 2, shut-down of the ICI890 LED illumination unit in the event of a reading gate being active for an excessively long time or the output power being exceeded, minimum switch-on duration: 3 s
- Automatic self-test on system start
- Diagnostic tools for system setup and (remote) system monitoring
- Configurable output of reading diagnostic data in two reading results formats
- Operating data polling, in case of error, output of error code if required
- Test string function can be activated to signal that the device is ready for operation
- Password-protected configuration mode
- Configured parameter values also saved (cloning) on the SD memory card (can be removed when replacing the camera)
- Future-oriented thanks to firmware update (FLASH PROM) via data interface
- Future-oriented SOPAS-ET configuration software
- Wide supply voltage range
- Required maintenance or service work indicated via LED and system notification
- Camera or illumination unit can be individually replaced within ten minutes

Convenient configuration

- Configuration (online/offline) and display of the image memory content via SOPAS-ET configuration software (incl. help system)
- Status display via five LEDs

Operating modes

- Configuration mode
- Read operation

Reading operation mode

- Object tracking (max. ten objects per second, minimum gap of 50 mm)

Read cycle

- External read cycle via controller unit

1D/2D code assessment

- Data Matrix ECC200, PDF417, MaxiCode, Aztec code, QR code/all common bar codes
- Max. number of 1D codes: 50 per read cycle
- Max. number of 2D codes: 10 per read cycle
- Separation of identical codes of the same code type by code position
- Output sorting: code position, FIFO, LIFO, code length list
- Influence on the output string by filters or format masks

Data communication

- HOST ETHERNET configuration interface (via controller unit)
- AUX auxiliary data interface: fixed output format with special diagnostic functions, communication via RS-232 or Ethernet interface, application for configuration/diagnostics
- Two or three 1 Gbit Ethernet interfaces for fast image output

Electrical Interfaces

- AUX data interface: serial RS-232, Ethernet or CAN (transmission rate, data format, and protocol fixed)
- CAN interface for integration into the controller unit's CAN sensor network
- Ethernet interface (10/100 Mbit/s), TCP/IP and FTP and two 1 Gbit Ethernet interfaces, FTP or three 1 Gbit Ethernet interfaces, FTP (only for ICD890-xxxxxxxS03)
- Connection to PROFIBUS-DP via MSC800 or fieldbus via SIC2000

Connectivity (design)

- Data and function interfaces: industrial-standard M12 plug connectors
- Gbit Ethernet: Phoenix VARIOSUB RJ-45 female connectors, enclosure rating IP 67
- Gbit Ethernet: industrial-standard M12 plug connectors (only for ICD890-xxxxxxxS03)
- Voltage supply: Harting plug connectors

3.4 Operating principle of the reading system

The camera system is an intelligent sensor system for the automatic and non-contact identification and decoding of 1D/2D codes. In principle, the codes can be identified on any side of moving objects in a conveyor system.

Single-side reading

In the case of single-side reading, the codes are identified by a camera from above, below, or from the side. To facilitate the mounting and alignment of the camera system, the camera image is taken via a deflector mirror.

The camera system is operated in conjunction with a controller unit, by means of which the read results are output to the data interfaces.

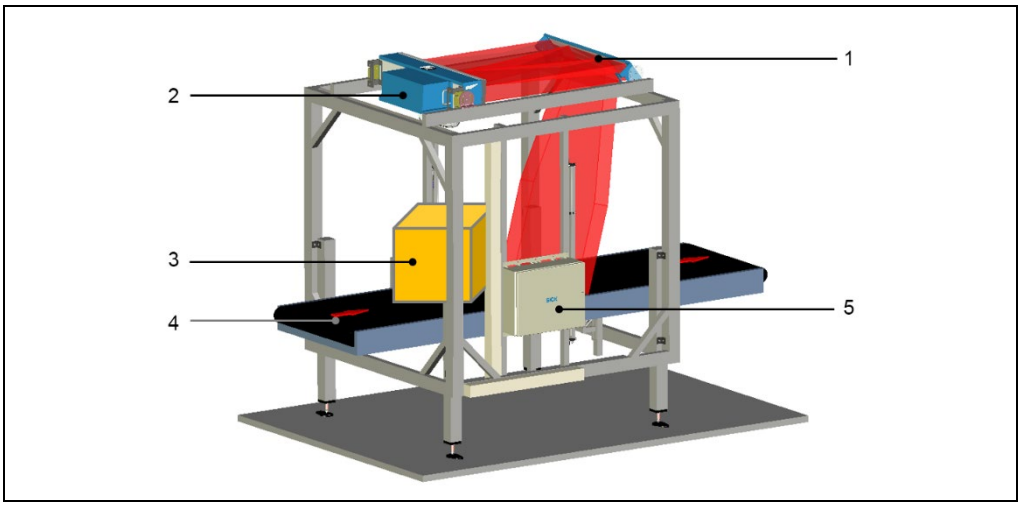


Fig. 10: ICR880/890 camera system on a conveyor system, single-side reading from above

No.	Meaning
1	Camera and illumination unit
2	Deflector mirror
3	Object
4	Direction of conveyor
5	Controller unit

External sensors provide information about the read cycle, the object distance, and the position of the object on the conveyor.

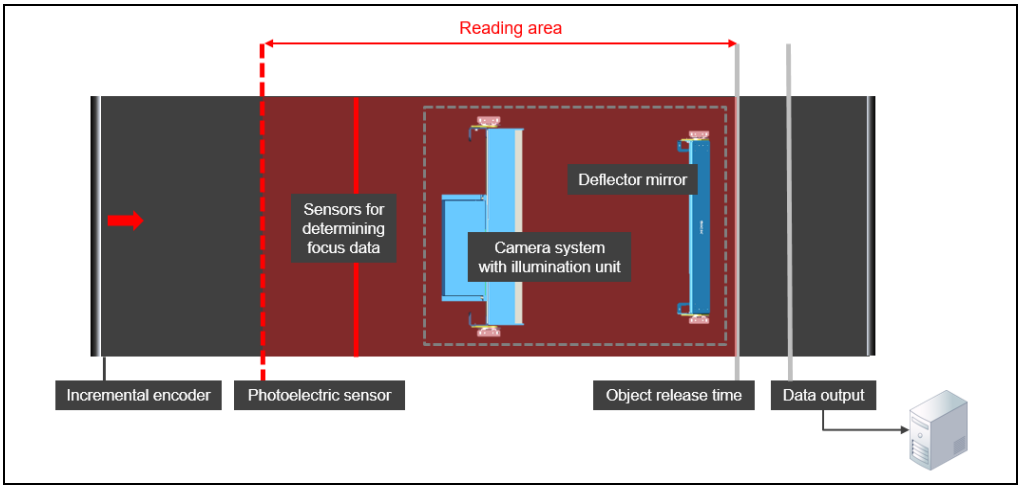


Fig. 11: Function of external sensors (read cycle, object distance, and conveyor speed)

Multi-side reading By combining several cameras in one reading system, it is possible to record several sides in one passage (multi-side reading).

3.4.1 Reading configuration

The camera identifies 1D/2D codes in lines with the aid of a CMOS line. The lines are continuously written into an image memory at high frequency. A two-dimensional object image is created by the continuous feed of the object on the conveyor system.

Note The camera system cannot detect any codes on stationary objects.

A moving 1D/2D code on the object is reproduced as a grayscale matrix in the image memory.

To decode the codes, contrast variations on the image are evaluated. The threshold can be adapted to the ambient conditions. For faster evaluation, the evaluation range can be restricted perpendicularly to the conveyor direction (code position).

3.4.2 Object trigger control

The camera system needs a suitable signal (trigger) to start a read process. As standard, the start signal is issued via an external read-cycle sensor (photoelectric sensor). As soon as an object has passed the read-cycle sensor, a time window (“internal reading gate”) is opened in the camera system for the read process.

Alternatively, a command triggers the read process via a data interface or the CAN-SENSOR network.

3.4.3 Focus control

For dynamic focusing (focus control), the camera needs continuous information about the distance to the object surface. External sensors for measured value acquisition, such as volume measurement systems and light grids, supply this information. The information from the sensors is processed by the controller unit and forwarded to the camera systems.

3.4.4 Illumination control

To be captured by the camera, the area to be read must be illuminated by a powerful LED illumination unit. Depending on the model, the illumination unit produces a narrow, red, blue-white, white or blue illumination area.

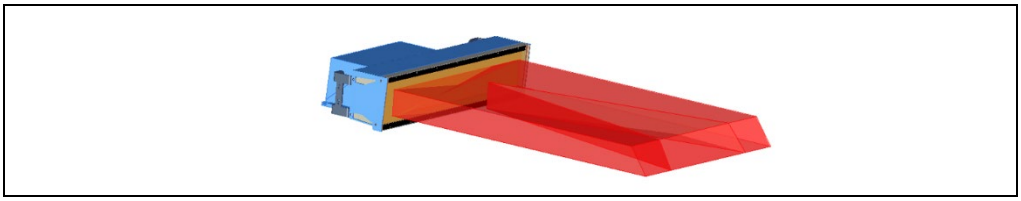


Fig. 12: Diagram of illumination unit with illumination area

If a deflector mirror is used, the light is deflected onto the reading field.

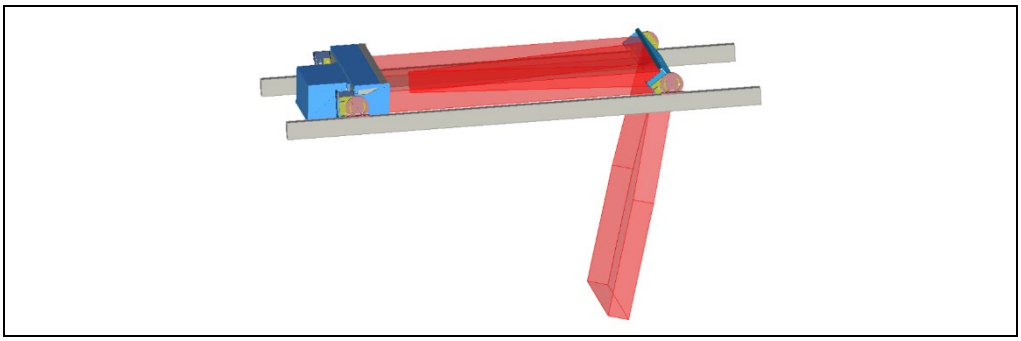


Fig. 13: Deflector mirror principle of operation

The illumination unit is controlled by the camera and can be switched on continuously or for the duration of the internal reading gate.

If, due to an error, the reading gate is not ending (e.g., the conveyor system stops), the illumination unit automatically switches off after the adjustable time-out (switch-off delay). To avoid confusion, the illumination unit must be switched on for at least three seconds.

3.4.5 Position and alignment

Depending on the arrangement of the camera system on the mounting frame, the position and inclination angle of the camera and deflector mirror must be set.

To avoid total internal reflection, the emitted light must not hit directly perpendicular to the bar code, but rather tilted at an angle of approx. 15° (β = Skew) relative to vertical. This prevents the interference of surface reflections (total internal reflection).

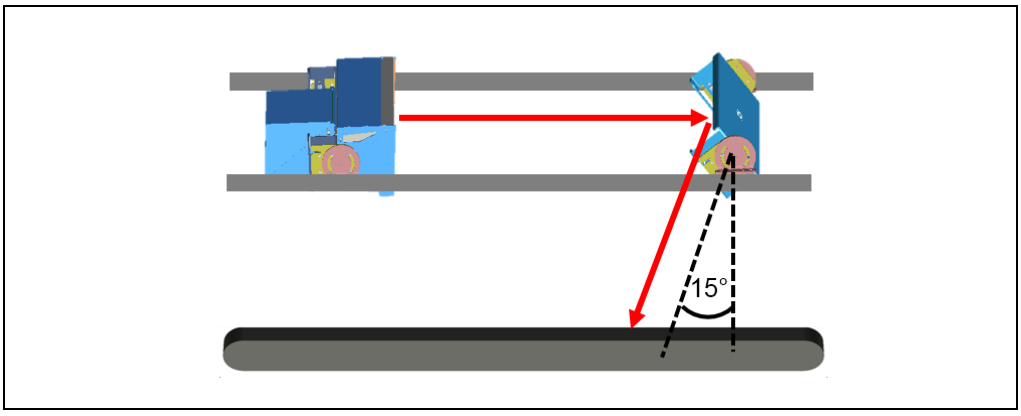


Fig. 14: Inclination angle of the camera system

3.4.6 Increment configuration

To control the time frequency of the camera, the camera system needs information about the conveyor speed. An external incremental encoder provides pulses, from which the current conveyor speed is determined.

The conveyor speed is derived from the number of pulses and the resolution of the external incremental encoder.

3.4.7 Image request

The image taken can be issued for further processing via the Gbit Ethernet interfaces, regardless of the decoding result. Hence an analysis is possible, for example, in the case of a failed decoding process.

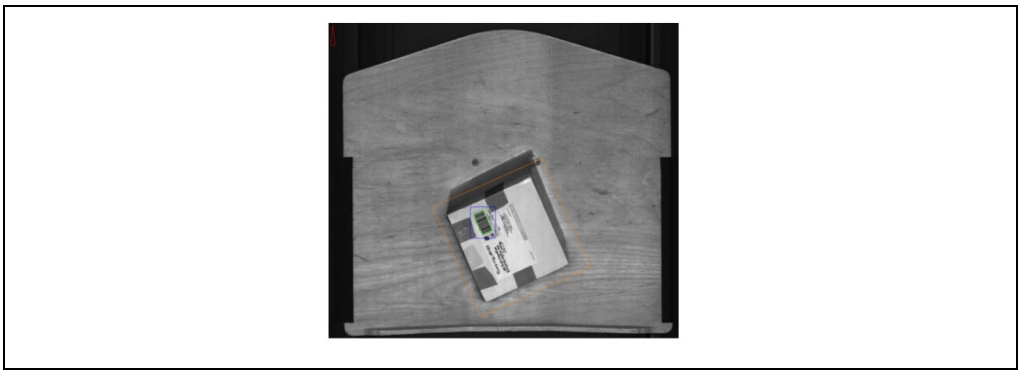


Fig. 15: Captured image for analysis (example)

In the case of successful data processing (decoding), the mark of the corresponding image areas can be issued.

Decoding

The camera system analyzes the image taken. The system graphically displays the results of this analysis:

- Blue rectangle: regions of interest
- Green rectangle: successful decoding

3.4.8 Code configuration

The ICR880/890 camera system can decode the following code types:

Type		Type	
1D codes	▪ Codabar ▪ Code 39 ▪ UPC/EAN family ▪ 2/5 interleaved ▪ Code 93 ▪ Code 128 family	**2D codes**	▪ Data Matrix EEC200 ▪ MaxiCode ▪ Aztec code (optional) ▪ PDF417 ▪ QR code

Tab. 7: Code types

3.4.9 Network

The camera system is operated via the controller unit as standard. Data is also output via this controller.

The camera systems and the controller unit are networked via CAN bus.

In addition to connecting the sensors to the CAN network, the SIC2000 controller unit also enables parallel integration into an Ethernet network. If the performance of the CAN network is not sufficient, the bandwidth can be increased and a higher throughput can be achieved via the Ethernet network.

3.4.10 Data interfaces

The following data interfaces are available on the camera system:

Interface	Connection	Function
CAN bus	CAN 1 (out/in)	Networking of one or more camera systems with the controller unit
Ethernet (alternative to controller unit)	HOST ETHERNET *(not for ICD890-xxxxxxxS03)*	▪ Output of the read result of the AUX interface (AUX port) ▪ Configuration/read diagnostics with SOPAS-ET configuration software ▪ Output of the read result of the host interface (host port)
Serial auxiliary interface (alternative)	AUX (RS-232)	Configuration/read diagnostics. Not designed as a permanent data output interface (process interface) for the read result.
PC Ethernet	GBIT ETHERNET	Provision of image data of current read for further processing

Tab. 8: Function of data interfaces

3.5 Configuration with SOPAS-ET

The SOPAS-ET configuration software can be used to configure the operating principle of the camera system in line with the customer requirements.

The software is installed on a PC, which is generally connected to the camera system via the controller by means of Ethernet.

You can define various settings, including:

- Configuration of the **code position** and the **symbol contrast**.
- Configuration of the image resolution perpendicular to the conveyor direction (digital zoom in dpi) and in the conveyor direction (dynamic scanning frequency in lpi).
- Configuration of the **trigger source**.
- Configuration of the **camera focusing** (default position and source of the distance measurement).
- Configuration of the **illumination mode** and time-out for the illumination unit.
- Configuration of the **position** and **inclination angle** of the camera and the deflector mirror.
- Configuration of the **increment source** and the resolution/speed.
- Configuration of the **image format** and the **scaling/quality**.
- Configuration of the code types for 1D and 2D codes.
- Configuration of the **network parameters**.
- Configuration of the data interfaces.

You can learn how to connect to SOPAS-ET and configure the camera system in chapter *6 Commissioning and configuration*).

3.6 Operating elements and displays

3.6.1 Operator interface

The camera system is configured according to the application via the SOPAS-ET configuration software. For this purpose, the software runs on a PC, which must be connected to one of the data interfaces of the controller unit.

Commissioning and diagnostics in the event of faults are carried out exclusively via the SOPAS-ET configuration software. In normal operation, the system operates fully automatically. There are no other operating elements on the camera system.

Parameter set on the SD memory card

The configured parameter values are saved as a parameter set in the internal EEPROM of the camera and on the SD memory card of the camera (cloning). Should the camera need replacing, the memory card enables the convenient and fast transmission of the parameter set to the new device (see also chapter *7.2 Replacing a camera system or component*).

Fig. 16: SD memory card for parameter set

No.	Meaning
1	Removed cover
2	SD memory card
3	Slot for the SD memory card

3.6.2 Camera LEDs

Five LEDs are located on the electrical connections on the underside of the camera which display the operational status of the camera, the status of the reading results, the output state of the illumination, the required maintenance or service activity, as well as data transmission to the serial main data interface.

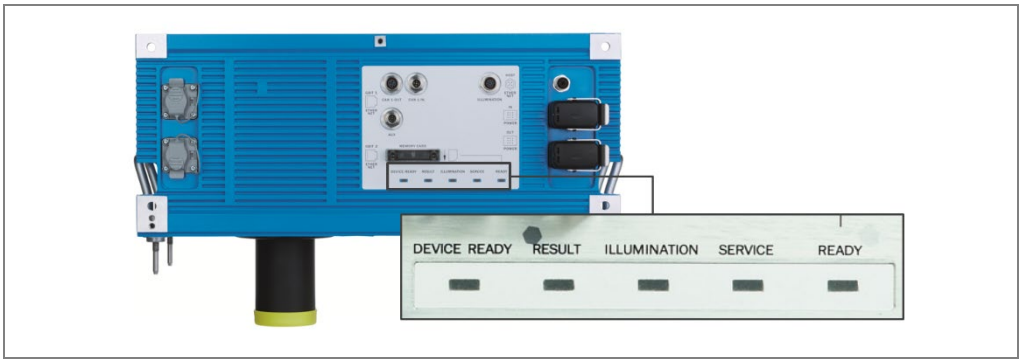


Fig. 17: LEDs on the camera

The LEDs have the following meanings:

LED	Color	Meaning
DEVICE READY	Green	▪ Lights up constantly after switching on and completion of successful self-test. ▪ Lights up constantly in read mode. ▪ Goes out when switched to the configuration mode.
RESULT	Green	▪ Lights up in read mode when a configured condition is fulfilled. Default: successful read process (good read), 100 ms.
ILLUMINATION	Green	▪ Lights up in read mode when the illumination unit of the camera is switched on (depending on the reading pulse).
SERVICE	Red	▪ Flashes when system maintenance is necessary. ▪ Lights up permanently when system service is necessary.
READY	Yellow	▪ Lights up permanently when the camera has detected the SD card.

Tab. 9: Meaning of the LEDs

4 Mounting

4.1 Overview of the mounting steps

This chapter describes the mounting steps for the components of the camera system.

To mount the components, a suitable **mounting frame** is required at the mounting location. The mounting frame must be constructed according to the specifications of a project-specific dimensional drawing.

The mounting procedure usually takes place in the following order:

- Mounting and alignment of the deflector mirror
- Mounting and alignment of the illumination unit and camera

NOTE

Claims under the warranty rendered void

Do not open the housing of the camera or illumination unit.

If the device is opened, any warranty claims against SICK AG will be void.

4.2 Preparing for the mounting procedure

4.2.1 Getting the components and accessories ready

The following components of the camera system must be laid out for the mounting procedure:

- Deflector mirror with protective film
- ICI890 illumination unit with protective cap
- ICD880 or ICD890 camera with yellow protective cap

The following accessories are included with delivery and must be laid out for the mounting procedure:

- 2 x 180° mounting brackets for deflector mirror incl.
  - 2 clamping screws each
  - 2 screws with 2 sliding nuts each for mounting on the mounting frame
- 4 x fixing screws for deflector mirror
- 2 x 180° mounting brackets for the ICI890 illumination unit incl.
  - 2 clamping screws each
  - 2 screws with 2 sliding nuts each for mounting on the mounting frame
- 4 x fixing screws for the ICI890 illumination unit

4.2.2 Tools and auxiliary equipment

- Project-specific dimensional drawing
- Key for hexagon socket (6 mm) appropriate for all screws
- Measuring tape
- Protractor

4.2.3 Selecting the mounting location

The general requirements for the mounting location are described in detail in chapter *3.2.1 Mounting requirements*.

The project-specific details regarding the positioning of the components as well as the distances, angles, etc., are outlined in a dimensional drawing. These details must be observed during mounting.

Terminal compartment

During the mounting procedure, ensure that the terminal compartment of the camera on the device underside is freely accessible.

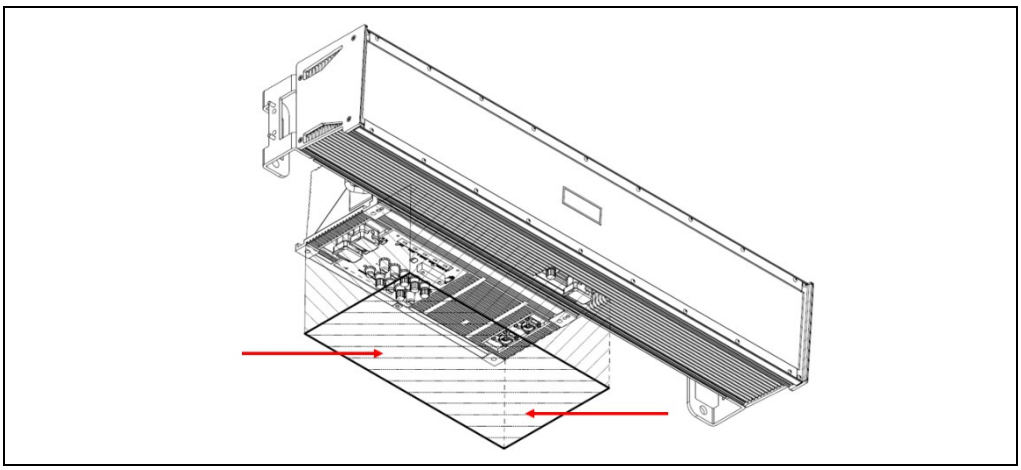


Fig. 18: Terminal compartment for camera and illumination unit

Terminal compartment required:

L x W x H: 496 mm x 250 mm x 210 mm

4.2.4 Placement on the conveyor system

The exact placement of the components on the mounting frame depends on project-specific requirements and on the number of camera systems used.

Single-side reading

The following diagram visualizes single-side reading from above. The camera system and deflector mirror are mounted above the conveyor system.

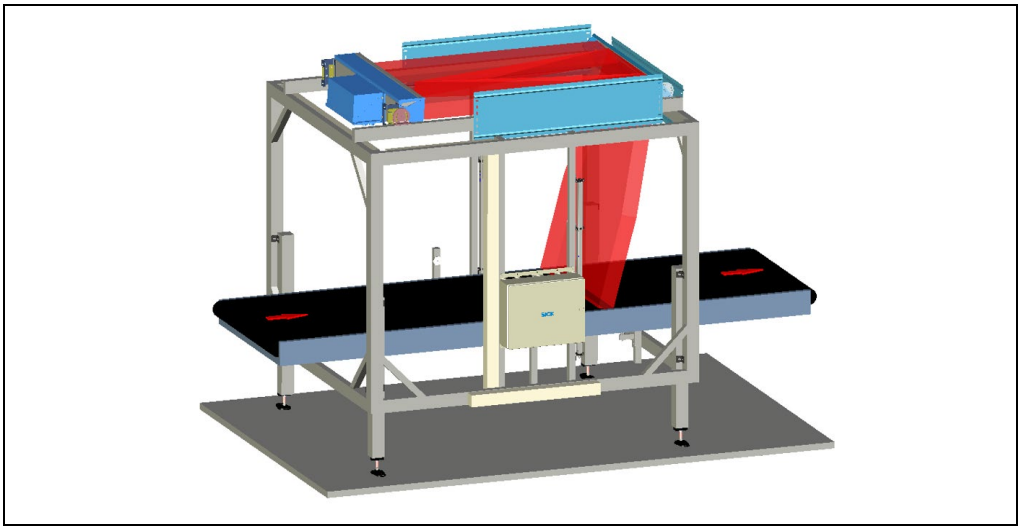


Fig. 19: Single-side reading from above: placement of the camera system above the conveyor system

Multi-side reading

In the following diagram, three camera systems have been combined with each other for multi-side reading.

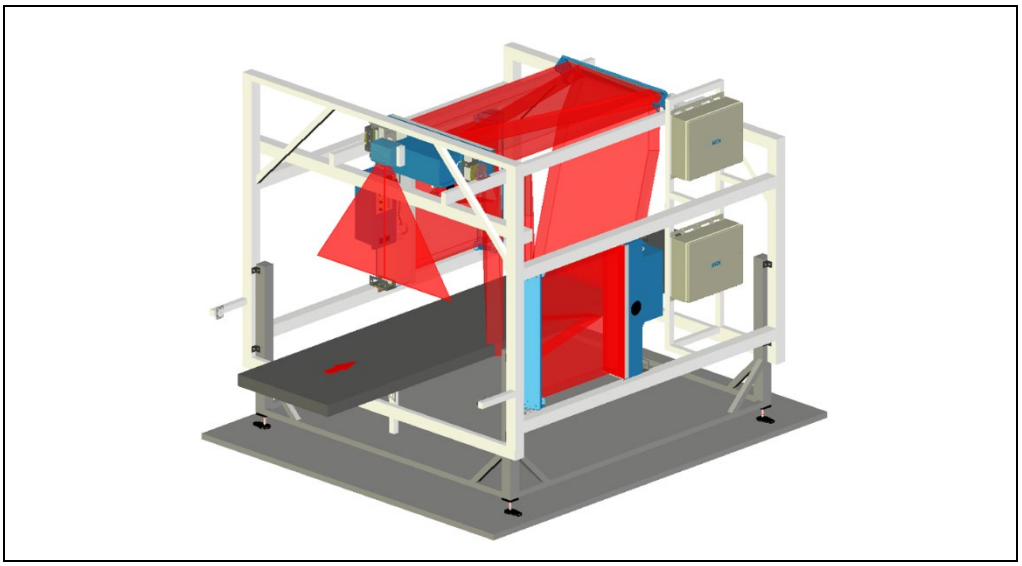


Fig. 20: Multi-side reading: placement of several camera systems with VMS4xx/5xx on conveyor system

For dynamic focusing, the camera needs continuous information about the distance to the object surface. In the example of a volume measurement system mounted above the conveyor, the distance values are determined and forwarded to the camera systems via the controller unit.

Underside reading

The camera system and deflector mirror can also be mounted underneath the conveyor for code detection. The code is detected through gaps between two conveyor belts.

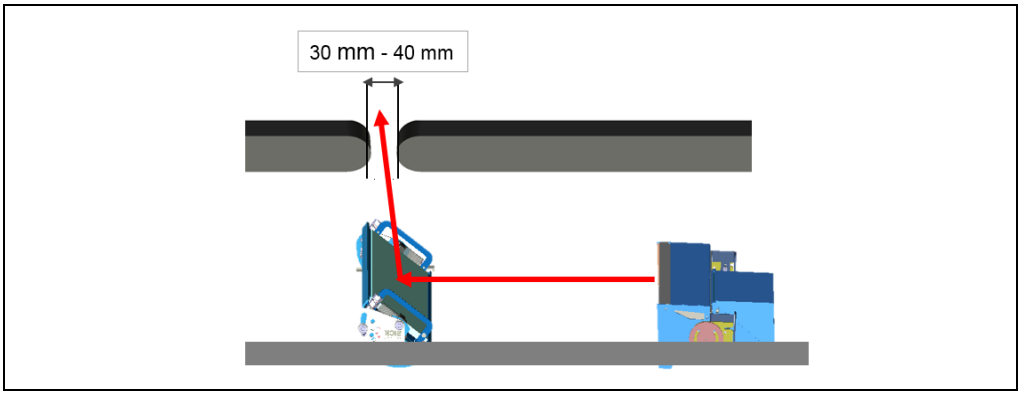


Fig. 21: Underside reading: placement of the camera system underneath the conveyor

In addition, the deflector mirror can be equipped with a **cleaning unit**. This prevents an increased risk of contamination of the deflector mirror due to the almost horizontal mounting position underneath the belt.

The **cleaning unit** consists of a vent duct directly fixed to the mirror holder and featuring an end-to-end vent slot, fan and pipe. The air is blown into the round pipe and exits via the vent slot transversely over the surface of the deflector mirror, thereby blowing off any dirt particles on the surface of the deflector mirror.

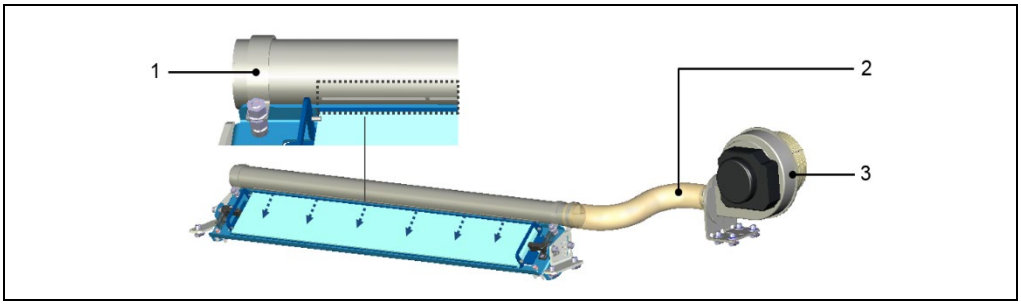


Fig. 22: Cleaning unit for underside reading

No.	Meaning
1	Vent duct with end-to-end vent slot
2	Pipe
3	Fan

Notes on configuration

As a general rule, every unit made up of the illumination unit and the camera is always mounted together with a deflector mirror. Both the front side of the illumination unit and the mirror surface must be aligned exactly parallel to each other and at a right angle to the conveyor system.

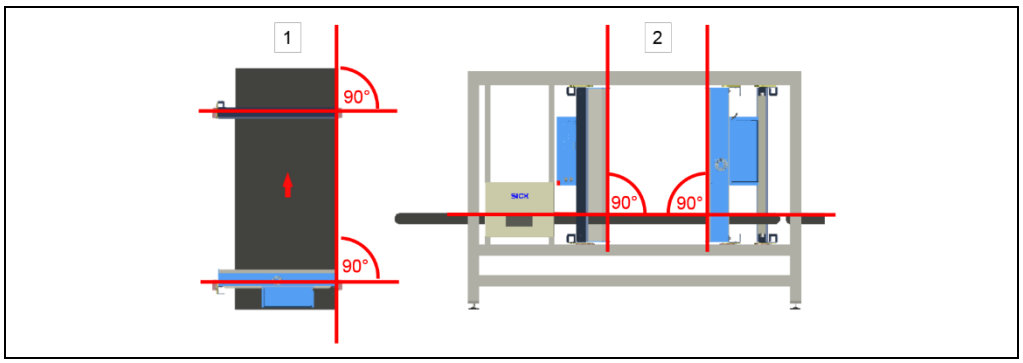


Fig. 23: Alignment of the camera system and deflector mirror

No.	Meaning
1	Placement for reading from above/below (view from above)
2	Placement for reading from the side (view from the side)

4.3 Mounting and adjustment

The position of the components on the mounting frame is project-specific and is stated on a dimensional drawing. During the mounting procedure, the specifications must be observed as accurately as possible as, to some extent, the values have an influence on the configuration of the camera system.

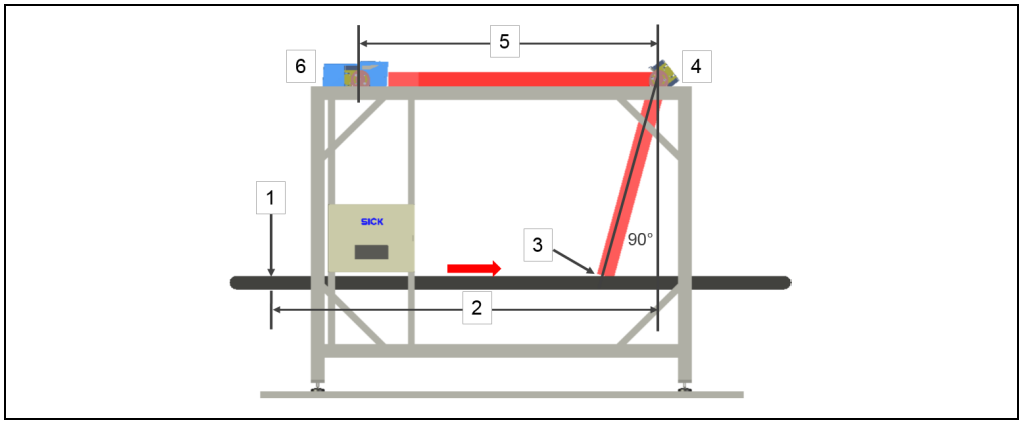


Fig. 24: Position of the components of the camera system

No.	Meaning
1	Reference point
2	Distance from the deflector mirror to the reference point
3	Reading point
4	Deflector mirror
5	Distance from the illumination unit and camera to the deflector mirror
6	Illumination unit with camera

4.3.1 Mounting brackets

To facilitate alignment, the unit consisting of the illumination unit, camera, and deflector mirror are attached to the mounting frame by means of two 180° mounting brackets each.

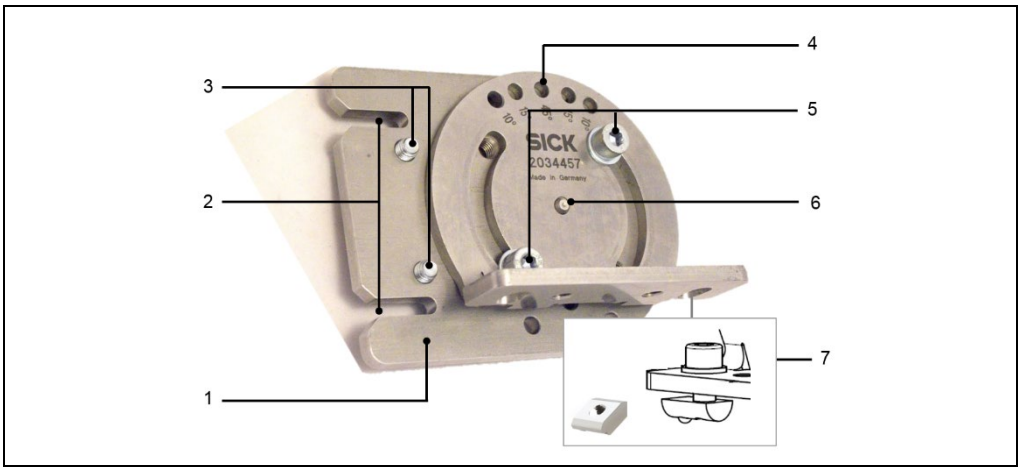


Fig. 25: 180° mounting bracket for camera system and deflector mirror

No.	Meaning
1	Mounting plate for holding the deflector mirror or camera system
2	Grooves for the alignment pins of the illumination unit/deflector mirror
3	Bore holes for fixing screws
4	Hole pattern for the fine adjustment of the deflector mirror
5	Clamping screws for adjusting the inclination angle
6	Center of rotation
7	Screws with sliding nuts for mounting on the mounting frame

The mounting frame consists of a mounting plate for holding the deflector mirror or camera system with two fixing screws and a hole pattern for fine adjustment.

The mounting bracket is tightly screwed onto the mounting frame using two sliding nuts.

Loosening and tightening the clamping screws enables the inclination angle of the brackets to be set between 0° and 180°. For this purpose, the clamping screws can be screwed into different threaded holes on the circular path of the hole pattern.

Tip It is advisable to secure the clamping screws opposite to each other (offset by 180°).

4.3.2 Mounting the deflector mirror

Mount the deflector mirror on the frame in accordance with the technical diagram using the two 180° mounting brackets supplied.

The position of the deflector mirror is based on the distance to the reference point in the direction of the conveyor (perpendicular over the pivot point of the bracket) and the inclination angle to the conveyor level. The deflector mirror must be mounted parallel to the level of the conveyor.

NOTE

Damage to the deflector mirrors

Do not remove protective foil of the deflector mirror until mounting is complete

Mounting the mounting brackets

1. Screw a 180° mounting bracket onto both sides of the mounting frame such that the two brackets are aligned with each other using two screws and two sliding nuts (1) on each profile.
2. By means of the grooves, vertically position the mounting plate (3) of the mounting brackets and tighten the clamping screws (2).

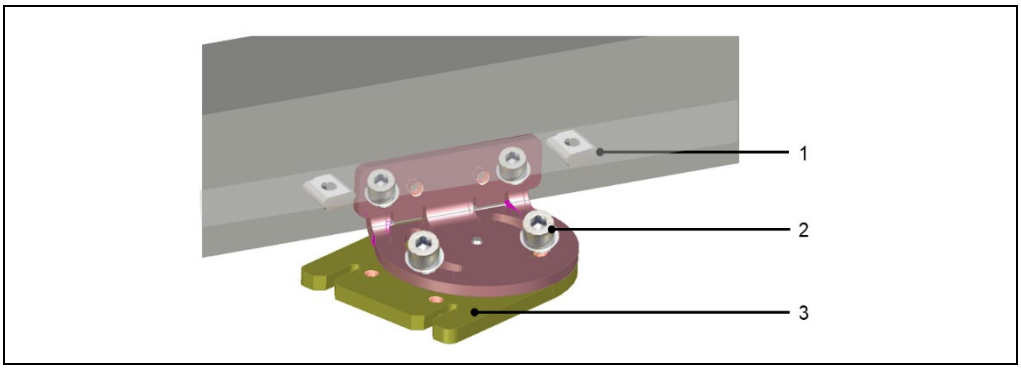


Fig. 26: Mounting the deflector mirror: attaching the 180° mounting bracket

Inserting the deflector mirror

1. Insert the deflector mirror into the mounting bracket. The handles point upwards.
2. Secure the deflector mirror to both 180° mounting brackets using two fixing screws each.

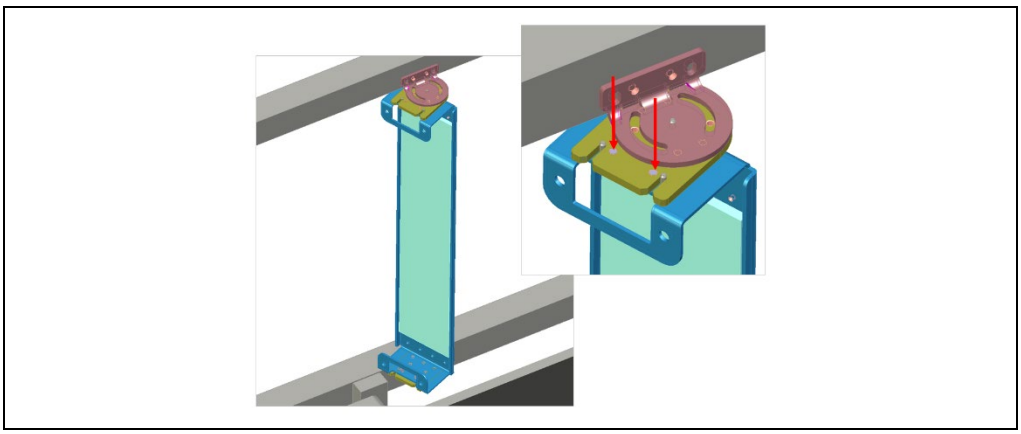


Fig. 27: Mounting the deflector mirror: inserting the deflector mirror

3. Loosen the clamping screws on the brackets or completely remove these for the time being if necessary.

Aligning the deflector mirror

1. Align the deflector mirrors in the mounting bracket to the angular dimension required with the aid of the five-part hole pattern or a protractor in accordance with the technical diagram. In the majority of applications, the hole pattern covers the adjustments needed.

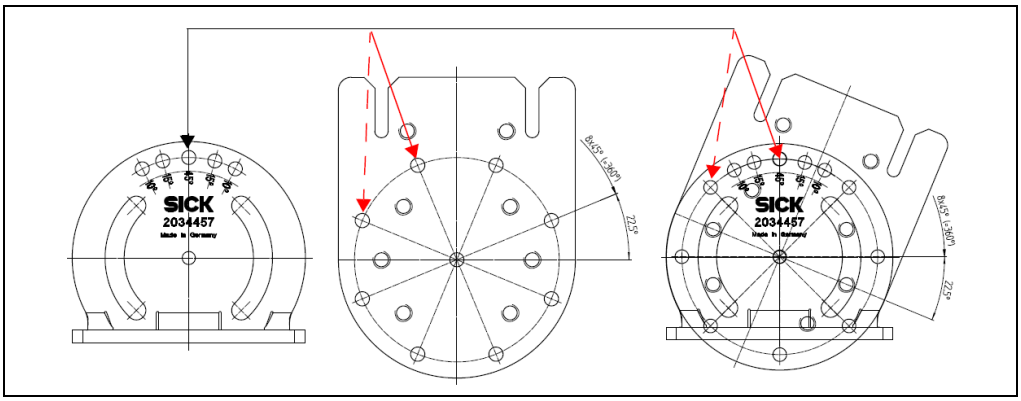


Fig. 28: Mounting the deflector mirror: using the hole pattern

2. If necessary, lock the angle set in one of the two mounting brackets using a ball locking bolt.

Locking the deflector mirror in place

1. Screw the clamping screws into the appropriate threaded holes and then tighten them.
2. Remove the protective film from the deflector mirror.

4.3.3 Mounting the camera system

Mount the illumination unit on the frame in accordance with the technical diagram by means of the two 180° mounting brackets supplied. The position of the illumination unit is based on the distance to the deflector mirror. The illumination unit must be aligned parallel to the deflector mirror.

Then insert the camera into the illumination unit and secure.

⚠ *WARNING*

Risk of injury due to falling components

A unit consisting of the illumination unit and camera weighs up to approx. 37 kg.

Measures

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

➢ Ask a second person to hold the components during mounting.

➢ Wear safety shoes.

Mounting the mounting brackets

1. Screw a 180° mounting bracket onto both sides of the mounting frame such that the two brackets are aligned with each other using two screws and two sliding nuts (1) on each profile.
2. By means of the grooves, **vertically** position the mounting plate (3) of the mounting brackets and tighten the clamping screws (2).

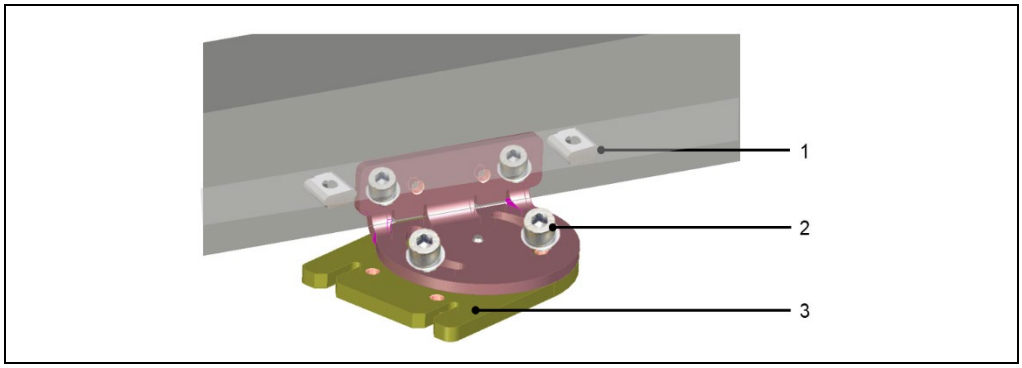


Fig. 29: Mounting the camera system: securing the 180° mounting bracket

Inserting the illumination unit without the camera

1. Insert the illumination unit into the grooves of the 180° brackets using the alignment pins.

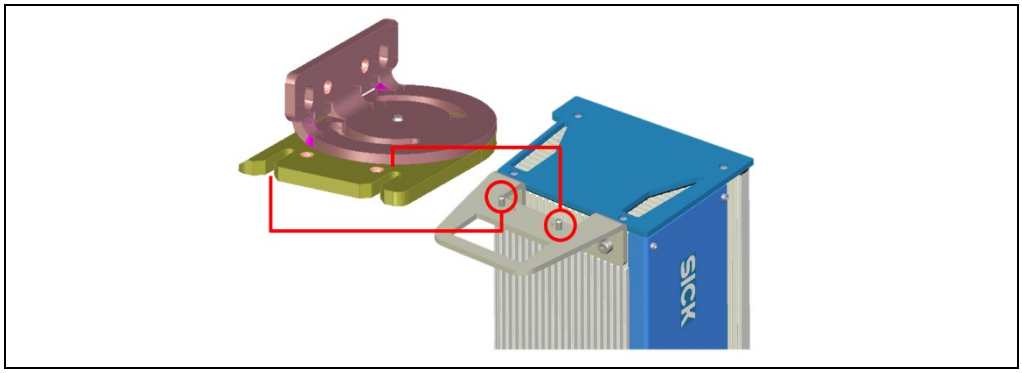


Fig. 30: Mounting the camera system: inserting the illumination unit without the camera

2. Secure the illumination unit to the two 180° brackets using two fixing screws in each case.

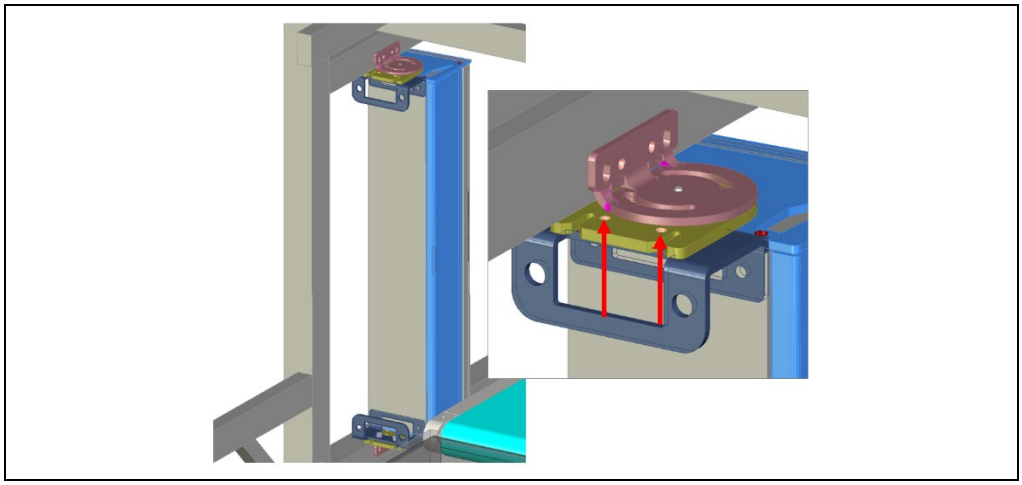


Fig. 31: Mounting the camera system: securing the illumination unit

Inserting the camera

1. Remove the protective cap on the illumination unit.
2. Ensure that the sealing ring on the illumination unit is sitting correctly (1).
3. Remove the yellow protective cap on the camera (2).

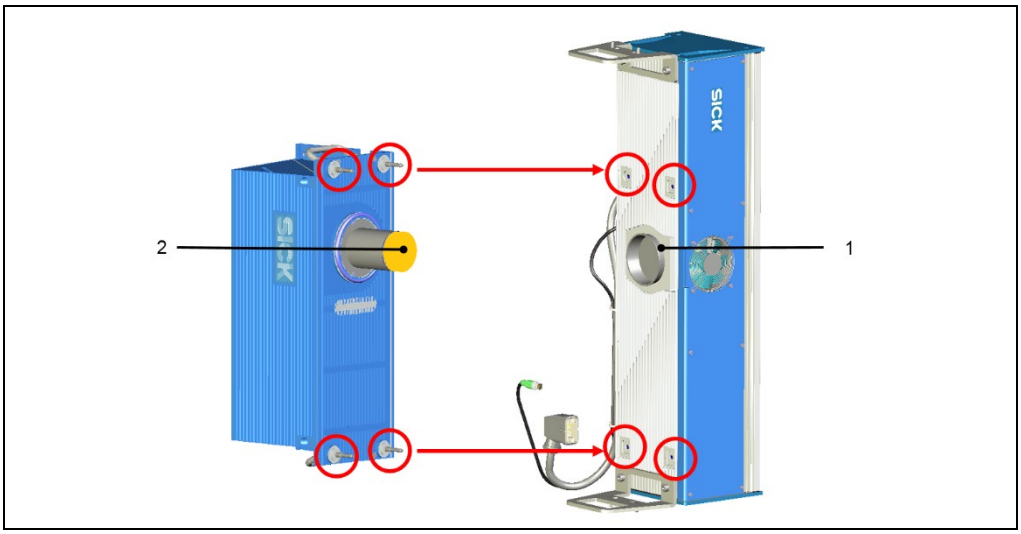


Fig. 32: Mounting the camera system: inserting the camera

4. Attach the camera to the illumination unit on the correct side and carefully insert the object protection tube into the opening of the illumination unit.
5. Fix the screw in the fitting (round hole).

Fig. 33: Mounting the camera system: inserting the screw into the fitting

6. Screw the camera onto the illumination unit with the four hexagon socket screws (centering pin with thread).

Aligning the camera system

1. Loosen the clamping screws on the 180° mounting brackets.
2. Horizontally align the unit consisting of the illumination unit and the camera to an angle of 0°, i.e., parallel to the conveyor.
3. Tighten the clamping screws.

4.4 Dismantling

⚠ WARNING

Risk of injury due to falling components

A unit consisting of the illumination unit and camera weighs up to approximately 37 kg depending on the variant.

Measures

- Do not perform any mounting work alone.
- Ask a second person to hold the camera system during the mounting process.
- When replacing the illumination unit or the camera, individually remove the camera first and then the illumination unit.
- The components must be lifted from the bracket in accordance with ergonomic principles.
- Wear safety shoes.

The process of dismantling the individual components is described in chapter *7.2 Replacing a camera system or component*.

Note

- Before dismantling the camera, clean the cooling fins on the illumination unit and camera (see chapter *7.1.3 Cleaning the deflector mirror*).

This prevents dirt from falling into the housing of the illumination unit.

Follow the instructions in chapter *7.3 Disposal* for environmentally friendly disposal on final decommissioning.

5 Electrical installation

5.1 Typical connection variants

The following chapter shows three typical connection variants for different system configurations and device types.

5.1.1 Connecting a camera system to a controller unit

The camera system is connected to the controller unit via the CAN interface.

The HOST ETHERNET interface is required to configure the camera system. The configuration PC with the SOPAS-ET configuration software is usually connected to the camera system temporarily via the Ethernet interface.

The Gbit Ethernet interfaces enable rapid image transmission to an image server.

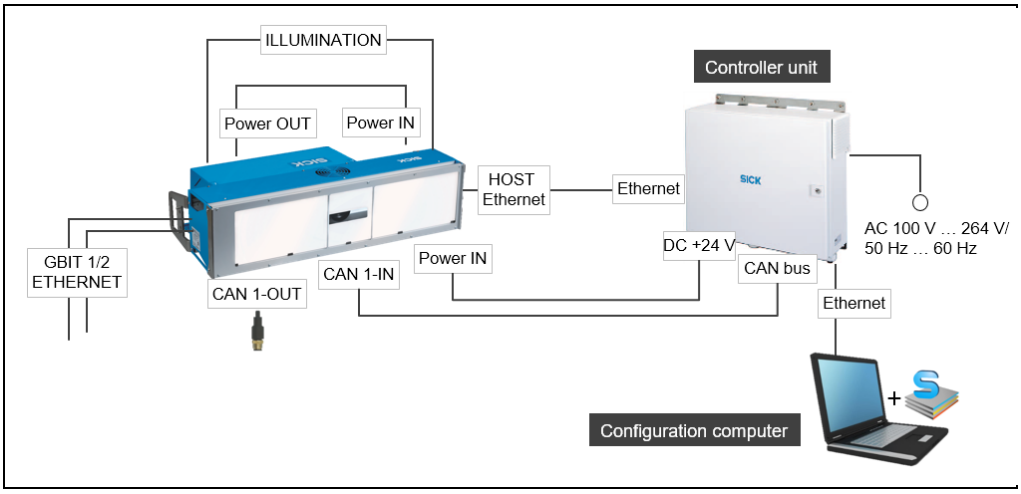


Fig. 34: Connection principle of a camera system and controller unit

Connection (camera)	Function	Connect to
POWER OUT	Voltage supply of the illumination unit	POWER IN connection of the illumination unit
ILLUMINATION	Control of the illumination unit	ILLUMINATION connection of the illumination unit
POWER IN	DC 24 V voltage supply	Connection to internal power supply unit of the controller unit
CAN 1-IN	Internal CAN sensor network	Connection to CAN bus of the controller unit
CAN 1-OUT	Termination resistor	–
HOST Ethernet	Data interface for configuration	Connection to Ethernet interface of the controller unit
GBIT 1/2 ETHERNET	Image transmission	Server for image representation (optional)

Tab. 10: Connection principle of a camera system (single-side reading)

You can find detailed information about the connections on the controller unit in the operating instructions for the MSC800 and SIC2000.

5.1.2 Connecting several camera systems to a controller unit

Several camera systems can be connected to the controller unit via CAN bus.
For configuration, the camera systems are usually connected to an Ethernet switch via the HOST ETHERNET interface. The configuration PC with the SOPAS-ET configuration software then accesses the camera systems temporarily via Ethernet.

The Gbit interfaces of the camera systems can be connected to the Ethernet switch for rapid image transmission.

The power required for the camera systems is provided by additional power supply modules.

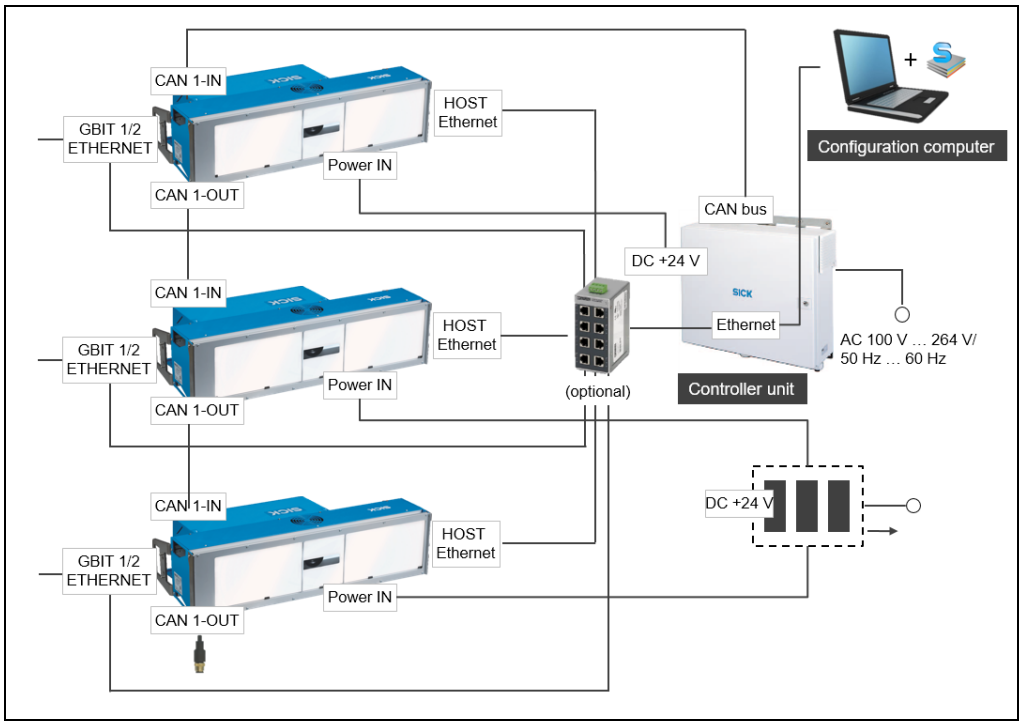


Fig. 35: Connection principle of several camera systems (multi-side reading)

Connection (camera)	Function	Connect to
POWER OUT	Voltage supply of the illumination unit	POWER IN connection of the illumination unit
ILLUMINATION	Control of the illumination unit	ILLUMINATION connection of the illumination unit
POWER IN	DC 24 V voltage supply	Connection to internal power supply unit of the controller unit
CAN 1-IN	Internal CAN sensor network	Connection to CAN bus of the controller unit or to CAN-OUT of the next camera system
CAN 1-OUT	Internal CAN sensor network	Connection to CAN 1-IN of the next camera system or termination resistor
HOST Ethernet	Data interface for configuration	Connection to Ethernet interface of the controller unit via Ethernet switch
GBIT 1/2 ETHERNET	Image transmission	Server for image representation (optional)

Tab. 11: Connection principle of several camera systems (multi-side reading)

5.1.3 Connecting several camera systems in line topology

Devices of the ICD890-xxxxxxxS03 variant have three Gbit interfaces. This makes it possible to connect to the Ethernet network of the controller unit in line topology. An Ethernet switch is not required for configuration. A HOST ETHERNET interface is no longer available on these devices.

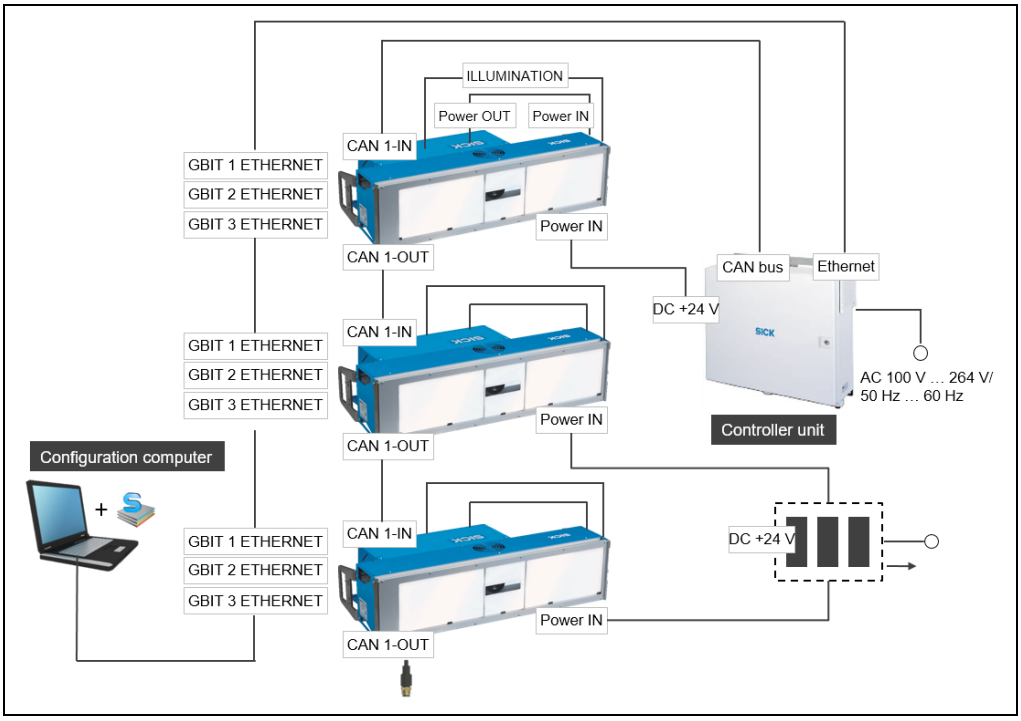


Fig. 36: Connection principle of several camera systems in line topology

Connection (camera)	Function	Connect to
POWER OUT	Voltage supply of the illumination unit	POWER IN connection of the illumination unit
ILLUMINATION	Control of the illumination unit	ILLUMINATION connection of the illumination unit
POWER IN	DC 24 V voltage supply	Connection to internal power supply unit of the controller unit
CAN 1-IN	Internal CAN sensor network	Connection to CAN bus of the controller unit or to CAN-OUT of the next camera system
CAN 1-OUT	Internal CAN sensor network	Connection to CAN 1-IN of the next camera system or termination resistor
GBIT 1/3 ETHERNET	Image transmission, data interface for configuration	Connection to Ethernet interface of the controller unit
GBIT 2 ETHERNET	Image transmission	Server for image representation (optional)

Tab. 12: Connection principle of several camera systems (multi-side reading)

5.2 Electrical connections and cables

NOTE

Prerequisites for enclosure rating IP64

At the time of delivery, provide all electrical connections of the camera and the illumination with corresponding protective caps.

To maintain enclosure rating IP 64, all electrical connections unused during operation must be provided with protective caps. The plug connectors must be firmly fastened or engaged to the connections used.

The same applies for the EMC requirements (ESD) according to CE.

The protective caps have the following colors:

- M12 plug connectors: yellow (male connectors) and black (female connectors)
- RJ-45 connections: gray, fastened to the device with a catch strap (cannot get lost)
- Voltage supply: black

⚠ WARNING

Radio interference may occur in residential areas

Radio interference may result when used in residential areas.

Measures

► Only use the camera systems in industrial environments.

5.2.1 Electrical connections on the ICD880/890 camera

Standard system

The electrical connections on the underside of the camera system consist of:

- Seven M12 plug connectors mounted on the camera housing (on and next to the aperture)
- Two Harting plug connectors for the voltage supply as well as
- Two RJ-45 connections (enclosure rating IP 67) for Gbit Ethernet.

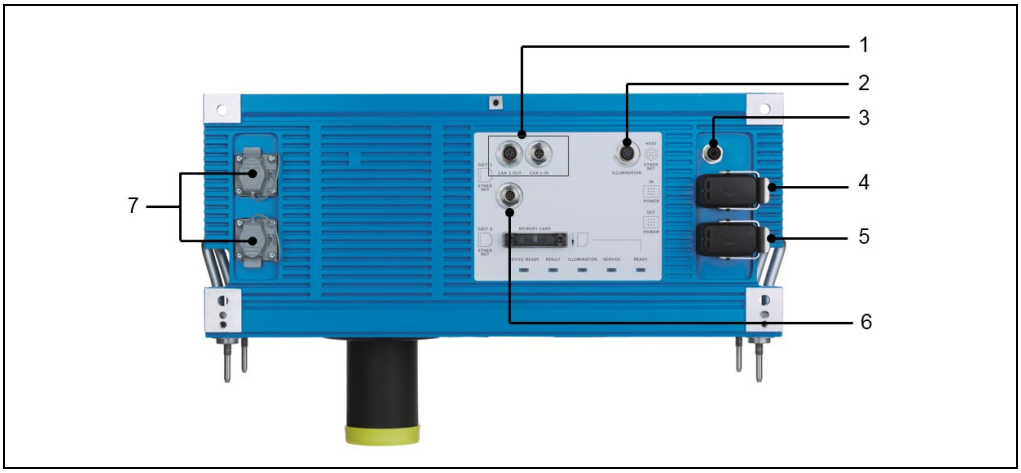


Fig. 37: Camera – position of the electrical connections (standard system)

The following interfaces are controlled via the connections on the underside of the camera:

No.	Connection	Design	No. of pins	Function
1	CAN 1-OUT	M-12	5, female connector	Output for CAN-SENSOR network 1
	CAN 1-IN	M-12	5, male connector	Input for CAN-SENSOR network 1
2	ILLUMINATION	M-12	8, female connector	Control data interface for the illumination unit
3	HOST ETHERNET	M-12	5, female connector	Communication interface (10/100 Mbit/s)
4	POWER IN	Harting HanQ8	8, male connector	Input for DC 24 V voltage supply
5	POWER OUT	Harting HanQ8	8, female connector	DC 24 V output for the illumination unit
6	AUX	M-12	8, male connector	Auxiliary data interface (RS-232)
7	GBIT 1 ETHERNET	RJ-45	8, female connector	Image data output, channel 1
	GBIT 1 ETHERNET	RJ-45	8, female connector	Image data output, channel 2

Tab. 13: Camera – function of the electrical connections

Special devices

In the case of some camera variants, two USB ports (female connectors, type A) are additionally accessible via the optional connection on the side covered by a round metal cap. These ports are for inserting dongles only. In normal read mode, the metal cap must be screwed down.

ICD890-xxxxxxxS03

Devices of the ICD890-xxxxxxxS03 variant have three Gbit Ethernet connections with M12 plug connector. The HOST ETHERNET connection is not available here.

Fig. 38: Camera – ICD890-xxxxxxxS03 electrical connections

No.	Connection	Design	No. of pins	Function
1 3	GBIT 1 Ethernet GBIT 3 ETHERNET	M12	8, female connector	Connection to configuration PC with SOPAS-ET via Ethernet Image data output, channel 1 and 3

No.	Connection	Design	No. of pins	Function
2	GBIT 2 ETHERNET	M12	8, female connector	Image data output for OCR

Tab. 14: Camera – ICD890-xxxxxxxS03 electrical connections

5.2.2 Electrical connections on the ICI890 illumination unit

The ICI890-xxx0x illumination unit features a Harting HanQ plug connector for the voltage supply and a M12 plug connector for the control cable. Connect the camera and illumination unit via the cables pre-installed within the illumination unit.

The ICI890-xxx1x illumination unit comes with an M12 plug connector for the voltage supply and the control cable. Connect the M12 connection of the ICI890-xxx1x illumination to the Harting HanQ connection of the camera via an adapter (part number: 2098253).

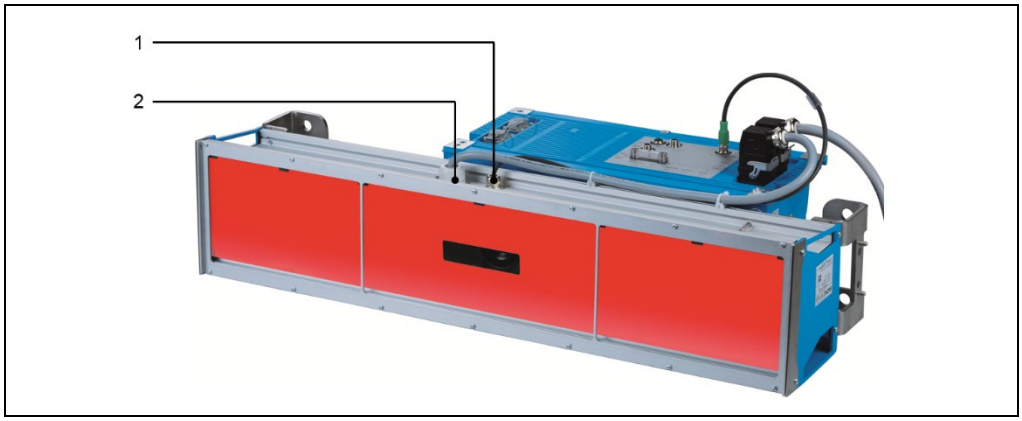


Fig. 39: Illumination unit – electrical connections

The following interfaces are controlled via the connections on the ICI890-xxx0x illumination unit:

No.	Design	No. of pins	Function
1	M-12	8, male connector	Control data interface for the camera
2	Harting HanQ8	8, male connector	Input for DC 24 V voltage supply

Tab. 15: Illumination unit ICI890-xxx0x – electrical connections

The following interfaces are controlled via the connections on the ICI890-xxx1x illumination unit:

No.	Design	No. of pins	Function
1	M-12	8, male connector	Control data interface for the camera
2	M-12	5, male connector	Input for DC 24 V voltage supply

Tab. 16: Illumination unit ICI890-xxx1x - electrical connections

5.2.3 Pre-wired cables (overview)

Interface from camera to	Cable part no.	Carried out by	Length	Cable ends		Enclosure rating
				Camera	External	
AUX (RS-232, RS-422/485)	6028420	Connecting cable for PC, TPU/PUR outer sheath	10 m	8-pin M12 female connector	Open	IP 65

Interface from camera to	Cable part no.	Carried out by	Length	Cable ends		Enclosure rating
				Camera	External	
CAN-SENSOR network	6021164	CAN data cable	1 m	5-pin M12 female connector	5-pin M12 male connector	IP 65
CAN-SENSOR network	6021165	CAN data cable	3 m	5-pin M12 female connector	5-pin M12 male connector	IP 65
CAN-SENSOR network	6021168	CAN data cable	5 m	5-pin M12 female connector	5-pin M12 male connector	IP 65
CAN-SENSOR network	6021166	CAN data cable on controller unit	5 m	5-pin M12 female connector	Open	IP 65
CAN-SENSOR network	6021175	CAN data cable on controller unit	10 m	5-pin M12 female connector	Open	IP 65
CAN-SENSOR network	6021167	CAN termination resistor	–	5-pin M12 male connector	–	IP 65
Ethernet	6029775	Cross-over cable for Gbit Ethernet, CAT6	10 m	RJ-45 male connector	RJ-45 male connector	IP 65/20
HOST Ethernet	6030928	Patch cable for HOST Ethernet (10/100 Mbit/s)	3 m	4-pin M12 male connector	RJ-45 male connector	IP 65/20
HOST Ethernet	6029630	Patch cable for HOST Ethernet (10/100 Mbit/s), CAT5	10 m	4-pin M12 male connector	RJ-45 male connector	IP 65/20
Voltage supply	2039398	Connecting cable for voltage supply	10 m	8-pin Harting HanQ female connector	Open	IP 65
Voltage supply	2084850	Connecting cable for voltage supply	4 m	8-pin Harting HanQ female connector	Open	IP 65
Voltage supply	2084851	Connecting cable for voltage supply	5 m	8-pin Harting HanQ female connector	Open	IP 65
Voltage supply	2084852	Connecting cable for voltage supply	10 m	8-pin Harting HanQ female connector	Open	IP 65
Voltage supply	2084853	Connecting cable for voltage supply	15 m	8-pin Harting HanQ female connector	Open	IP 65
Ethernet	6054376	Cross-over cable for Gbit Ethernet, CAT6 ICR to controller unit	0.5 m	8-pin M12 female connector	RJ-45 male connector	
Ethernet	6049726	Cross-over cable for Gbit Ethernet, CAT6 ICR to controller unit	1 m	8-pin M12 female connector	RJ-45 male connector	
Ethernet	6049727	Cross-over cable for Gbit Ethernet, CAT6 ICR to controller unit	2 m	8-pin M12 female connector	RJ-45 male connector	
Ethernet	6049728	Cross-over cable for Gbit Ethernet, CAT6 ICR to controller unit	5 m	8-pin M12 female connector	RJ-45 male connector	
Ethernet	6049729	Cross-over cable for Gbit Ethernet, CAT6 ICR to controller unit	10 m	8-pin M12 female connector	RJ-45 male connector	

Interface from camera to	Cable part no.	Carried out by	Length	Cable ends		Enclosure rating
				Camera	External	
Ethernet	6049730	Cross-over cable for Gbit Ethernet, CAT6 ICR to ICR	2 m	8-pin M12 female connector	M12 male connector	
Ethernet	6059942	Cross-over cable for Gbit Ethernet, CAT6 ICR to ICR	5 m	8-pin M12 female connector	M12 male connector	

Tab. 17: Cables for connecting the camera system

All cables listed are suitable for the temperature range of 0 °C to +40 °C.

For information on the assignment of wire colors for cables with open cable end, please see chapter *5.3.9 Pin assignment of wire colors of assembled cables with open end*.

5.3 Performing the electrical installation

HAZARD

Risk of injury due to electrical current

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

Measures

- Current safety regulations must be observed when working on electrical devices.
- The power supply must be disconnected when attaching and detaching electrical connections.

Note

To ensure that the male connectors connected are seated securely and that the requirements for enclosure rating IP 64 are fulfilled on the camera system, the knurled nuts/coupling nuts of the M12 plug connectors must be tightened and the Harting plug connectors for the voltage supply must be secured using the fixing bracket.

- Wire all connections provided by the customer using shielded copper conductors.
- Observe the wire cross-sections required:
  - Switching inputs/outputs: at least 0.25 mm^2
  - Data interfaces: at least 0.22 mm^2
- Lay all of the cables such that there is no risk of people tripping over them and the cables are protected against damage.

Recommendation

- Equip open wire ends of flexible cables that are attached to screw terminals with suitable ferrules.

However, for secure contacting, do not use ferrules when attaching wire ends to spring-loaded terminals.

5.3.1 Connecting the voltage-supply cable and control cable for the illumination unit

The intra-system connection between the camera and the illumination unit is achieved using two short cables included with delivery.

ICI890-xxx0x: Connecting the voltage supply cable

1. Insert the voltage-supply cable on the camera into the 8-pin Harting POWER OUT HanQ8 female connector and secure the plug connector.
2. Push the other end of the cable onto the corresponding 8-pin Harting HanQ8 male connector for the illumination unit and secure the plug connector.

ICI890-xxx1x: Connecting the voltage supply cable

Connect the M12 connection of the ICI890-xxx1x illumination to the Harting HanQ connection of the camera via an adapter (part number: 2098253).

Connecting the control cable for the illumination unit

1. Insert the control cable on the camera into the 8-pin ILLUMINATION M12 female connector and secure the plug connector.
2. Push the other end of the cable onto the corresponding 8-pin M12 male connector for the illumination unit and secure the plug connector.

5.3.2 Connecting the camera system to the controller unit's voltage supply

Requirements for the voltage supply

In order to operate, the camera system requires a supply voltage of DC 24 V ± 10% (protective extra-low voltage in accordance with standard IEC 60364-4-41 (VDE 0100 (part 410)), as is supplied as standard by the power supply unit in the controller unit.

Note The wire cross-section for the voltage supply to the camera system must be at least 3 mm^2. In order to ensure the short-circuit/overload protection of the incoming supply cable, the cable must be protected according to the wire cross-sections used.

The following standards must be observed:

- DIN VDE 0100 (part 430),
- DIN VDE 0298 (part 4), or
- DIN VDE 0981 (part 1).

Connecting the camera system to the controller unit's voltage supply

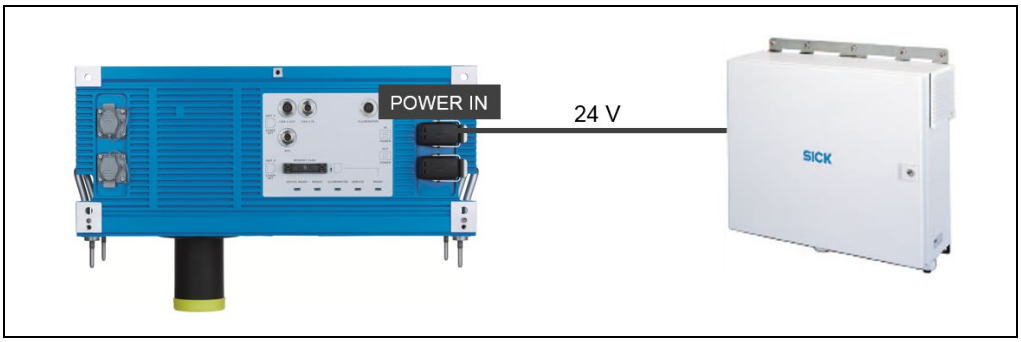


Fig. 40: Connecting the camera system to the controller unit's voltage supply

1. Make sure that the voltage supply for the controller unit is switched off.
2. Fold back the protective cap on the POWER IN connection on the camera and push the Harting HanQ8 plug connector onto the male connector.
3. Connect the free cable end in the controller unit to the terminal strip for the supply voltage (for terminal assignment, see chapter *5.3.9 Pin assignment of wire colors of assembled cables with open end*).

Note The supply voltage remains switched off for further installation work.

5.3.3 "AUX" data interface

General requirements of the data interfaces

The AUX data interface (auxiliary data interface) of the camera system can be operated as an RS-232 design or re-directed to the Ethernet interface.

The following table shows the recommended maximum cable lengths depending on the interface design and the data transmission rate.

Interface type	Data transmission rate	Distance to the target computer (host)
AUX (RS-232)	Up to 19.2 kBd 38.4 kBd ... 115.2 kBd	max. 10 m max. 3 m
Ethernet	10/100 Mbit/s	max. 100 m
Gbit Ethernet	100 Mbit/s ... 1 Gbit/s	max. 100 m
1) With the corresponding cable termination as per specification		

Tab. 18: Maximum cable lengths

Recommendation

- Use shielded data cables (twisted pair wires).
- To avoid interference factors, do not lay data cables over a longer route in parallel with voltage supply cables and motor cables, e.g., in cable channels.

Wiring the AUX data interface

NOTE

Damage to the interface module

If the AUX data interface is wired incorrectly, then electronic components in the camera system could become damaged.

Measures

- Wire the data interface correctly.
- Carefully check the wiring prior to switching on the camera system.

- Connect data interface to the PC in an EMC-compliant manner with a shielded cable. Please note the maximum cable lengths (see above).
- Wire the RS-232 version as follows.

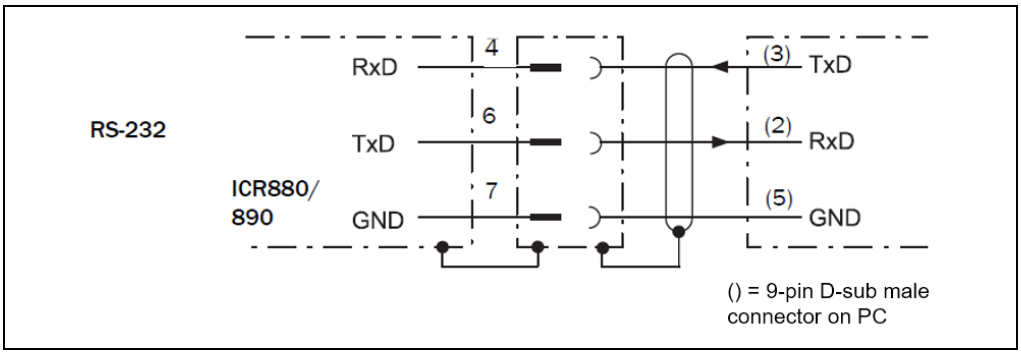


Fig. 41: Wiring the AUX data interface

For more information on pin assignment, see chapter *5.3.9 Pin assignment of wire colors of assembled cables with open end*.

5.3.4 "CAN 1-IN"/"CAN 1-OUT" data interface

General requirements of the CAN interface

The SICK-specific CAN-SENSOR network is based on the CAN bus. It is set up in line topology.

The following table shows the maximum permitted length of the CAN bus depending on the data transmission rate selected.

Data transmission rate	Maximum data cable length
10 kbit/s	4,976 m
20 kbit/s	2,476 m
50 kbit/s	976 m
100 kbit/s	576 m
125 kbit/s	476 m
250 kbit/s[1)]	226 m
500 kbit/s	76 m
1) Default in the ICR880/890 system	

Tab. 19: CAN bus: maximum lengths of cable depending on the data transmission rate

The following table shows the maximum permitted total length of all stub cables depending on the data transmission rate. This total length must not be exceeded. Each individual stub cable must be a maximum of 6 m long.

Data transmission rate	Maximum total of all stub cables
125 kbit/s	156 m
250 kbit/s	78 m
500 kbit/s	39 m

Tab. 20: CAN bus: maximum lengths of stub cables depending on the data transmission rate

The required wire cross-section for the data cable depends on the total length of the network. The following table shows the overview as per ISO 11898.

Length of cable	Required wire cross-section (data cable)
0 m ... 40 m	≥ 0.25 mm^2
40 m ... 300 m	≥ 0.34 mm^2
300 m ... 600 m	≥ 0.5 mm^2
600 m ... 1,000 m	≥ 0.75 mm^2

Tab. 21: CAN bus: required wire cross-section depending on the data cable length

Wiring the “CAN 1-IN”/“CAN 1-OUT” data interface

One end of the cable for connecting the camera system to the controller unit has an M12 plug connector and the other is open. The CAN network must be terminated with a resistor.

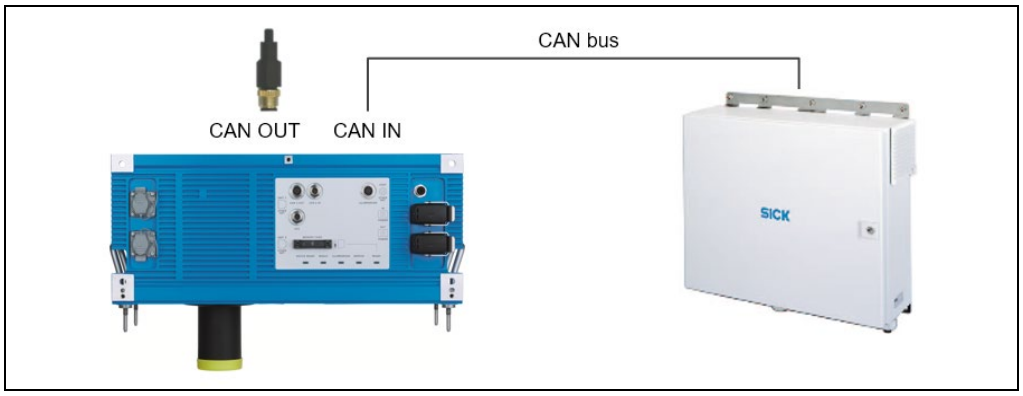


Fig. 42: Wiring the “CAN 1-IN”/“CAN 1-OUT” data interface

1. Screw the M12 plug connector on the camera onto the CAN 1-IN male connector.
2. Connect the free cable end in the controller unit to the terminal for the CAN connection (for terminal assignment, see chapter *5.3.9 Pin assignment of wire colors of assembled cables with open end*).
3. Attach the termination resistor to the CAN 1-OUT connection of the camera.

Connecting several camera systems in conjunction with other sensors

For multi-side reading, the camera system works together with other camera systems and external sensors. The camera systems are synchronized with one another via the CAN bus. The cables for connecting the camera systems to one another feature an M12 plug connector on both sides.

A cable with an M12 plug connector and an open end is used for the connection to the CAN bus of the controller unit (see above).

The order of the camera systems in the linear bus structure depends on the project-specific number of sensors and their positions on the mounting frame.

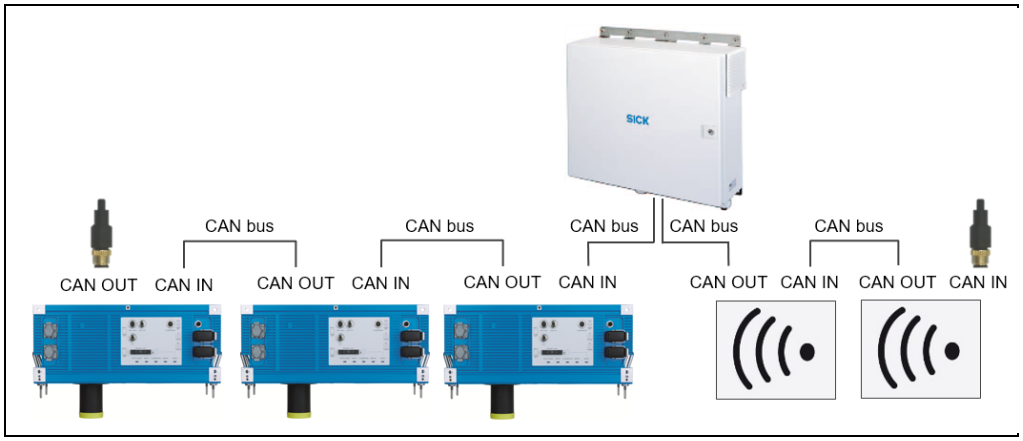


Fig. 43: Connecting several camera systems in conjunction with other sensors

Note The signals for the read cycle and increment are transmitted by the controller unit to the connected sensors via the CAN bus.

5.3.5 Wiring the “HOST ETHERNET” Ethernet interface

The HOST ETHERNET Ethernet interface of the camera system has several functions:

- Output of the read result of the HOST data interface via TCP/IP as an alternative to the serial RS-232 interface design.
- Output of the data from the AUX data interface (reading result + reading diagnostic data) via TCP/IP as an alternative to the serial RS-232 interface design.
- Access to the camera system with the SOPAS-ET configuration software.

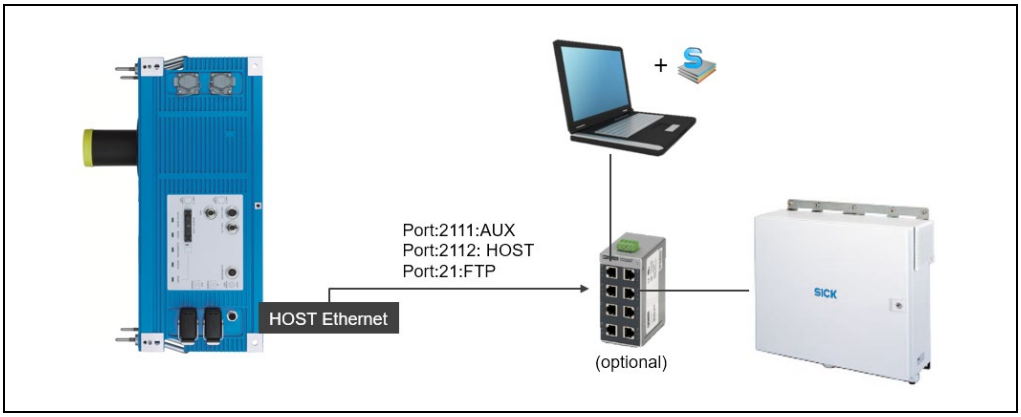


Fig. 44: Wiring the “HOST ETHERNET” Ethernet interface

Connecting the ETHERNET HOST interface

► Use the standardized data cable (patch cable) to connect the camera system to the Ethernet network via an Ethernet switch.

5.3.6 Wiring the Gbit Ethernet interfaces

The two Gbit Ethernet interfaces are used for rapid image output to an image server which also has two Gbit Ethernet interfaces.

Connecting the “GBIT 1 ETHERNET” and “GBIT 2 ETHERNET” interfaces

► Use a standardized data cable (patch cable) to connect the camera system to the Gbit Ethernet network. The cable has an RJ45 plug connector on both sides.

Alternatively, it is possible to use a cross-over cable to connect the camera directly to the Ethernet card of the PC (point-to-point connection).

ICR890-xxxxxxxS03 device variant

The ICD890-xxxxxxxS03 device variant has three Gbit interfaces. The GBIT 1 ETHERNET and GBIT 3 ETHERNET Gbit interfaces can be used for image transmission and as configuration interfaces, whereas the GBIT 2 ETHERNET interface can only be used for rapid data transmission.

- A cable with an M12 plug connector on one side and an RJ45 male connector on the other side is used for connection to the Ethernet network.
- To connect the camera systems to one another in line topology, a cable with two M12 plug connectors is used.

5.3.7 Special devices: connecting a dongle

Some special devices accompanying the camera also feature a side USB connection, which is covered by a screwed metal cap (1) in normal read mode.

The connection point has two USB ports (female connectors type A) and is used for inserting dongles.

The photo on the right shows the open USB connection with a dongle inserted (2).

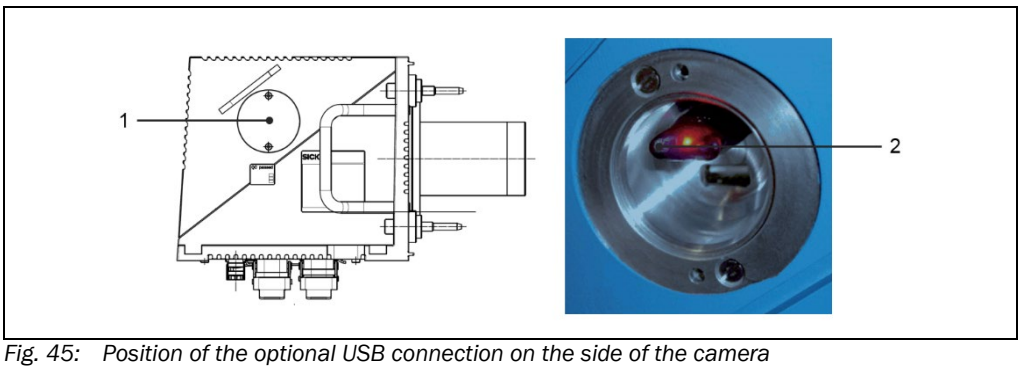


Fig. 45: Position of the optional USB connection on the side of the camera

Note Other USB-compatible devices must not be connected.

NOTE

Risk of damage due to improper USB connection

The camera electronics can be damaged by the improper use of the USB connection.

- ▶ The camera system must be disconnected from the power supply before inserting a dongle into one of the USB female connectors or removing it from a female connector.
- ▶ Before inserting or removing the dongle, perform electrostatic equipotential bonding between the respective person's body and the camera. During the operation, a grounding armband must be worn at the wrist.
- ▶ In read mode, the cover of the USB connection must be screwed down when operating the camera in order to comply with the EMC concept.

Inserting a dongle

1. Make sure the supply voltage for the camera system is switched off.
2. Perform equipotential bonding between body and camera.
3. Remove the metal cap from the USB connection.
4. Insert the dongle in the free USB female connector.
5. Switch on the supply voltage to the camera system.
6. The camera detects a functional dongle when it is booted up. The LED in the dongle lights up when the dongle is functioning correctly.
7. Put the metal cap back onto the USB connection.

System information regarding dongles

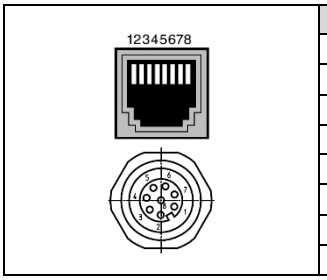
If the SOPAS-ET configuration software is connected to the camera system, it shows the corresponding dongle as a connected PC device in the status information with a green status symbol.

If the dongle is removed from the camera when the power is off, the status symbol is grayed out the next time it is booted up.

5.3.8 Pin assignment of the connecting cables

When delivered, all connections are equipped with protective caps.

“GBIT 1”/”GBIT 2”/“GBIT 3” connections (Ethernet, max. 1 Gbit/s)



Pin	Ethernet Signal	Function
1	A+	Sender+
2	A–	Sender–
3	B+	Receiver+
4	C+	Sender+
5	C–	Receiver–
6	B–	Receiver–
7	D+	Sender+
8	D–	Receiver-

Tab. 22: Pin assignment of the 8-pin RJ-45 female connectors/M12 “GBIT1”/“GBIT2”/“GBIT3” plug connectors

“CAN 1-OUT” connections (CAN-SENSOR networks)

Pin	CAN signal	Function
1	Shield	Shielding
2	CAN_V+	24 V supply voltage
3	CAN_GND	Ground
4	CAN_H	CAN bus (IN/OUT)
5	CAN_L	CAN bus (IN/OUT)

Tab. 23: Pin assignment of the 5-pin M12 “CAN 1-OUT” (A-coded) female connectors

“CAN 1-IN” connections (CAN-SENSOR networks)

Pin	CAN signal	Function
1	Shield	Shielding
2	CAN_V+	24 V supply voltage
3	CAN_GND	Ground
4	CAN_H	CAN bus (IN/OUT)
5	CAN_L	CAN bus (IN/OUT)

Tab. 24: Pin assignment of the 5-pin M12 “CAN 1-IN” (A-coded) male connectors

“ILLUMINATION” connection (control data interface for illumination unit)

Pin	Signal	Function
1	N. c.	–
2	LAMP_ON+	Illumination unit ON/OFF
3	N. c.	–
4	N. c.	–
5	RD+/TD+ (RS-485)	Sender+/receiver+
6	RD–/TD– (RS-485)	Sender–/receiver–
7	GND	Ground
8	N. c.	–

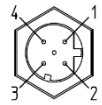
Tab. 25: Pin assignment of the 8-pin M12 “ILLUMINATION” (A-coded) female connector

“AUX” connection (auxiliary data interface)

Pin	Signal	Function
1	N. c.	–
2	N. c.	–
3	N. c.	–
4	RxD (RS-232)	Receiver
5	N. c.	–
6	TxD (RS-232)	Sender
7	GND	Ground
8	Shield	Shielding

Tab. 26: Pin assignment of the 8-pin M12 “AUX” (A-coded) male connector

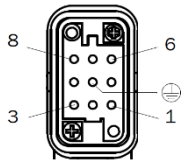
“HOST ETHERNET” connection (Ethernet 10/100 Mbit/s)



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

Tab. 27: Pin assignment of the 4-pin M12 “HOST ETHERNET” (D-coded) female connector

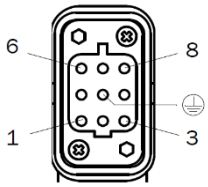
“POWER IN” connection (voltage supply IN)



Pin	Signal	Function
1	+24 V DC (camera)	Supply voltage IN
2	GND (ICI890_1)	Ground
3	+24 V DC (ICI890_1)	Supply voltage IN
4	N.c.	–
5	N.c.	–
6	GND (camera)	Ground
7	+24 V DC (ICI890_2)	Supply voltage IN
8	GND (ICI890_2)	Ground
	PE	Protection earth

Tab. 28: Pin assignment of the 8-pin Harting “POWER IN” HanQ8 male connector

“POWER OUT” connection (voltage supply OUT for illumination unit)

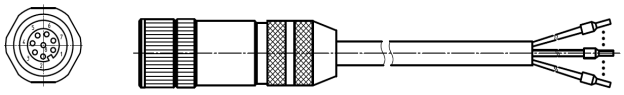


Pin	Signal	Function
1	N.c.	–
2	GND (ICI890_1)	Ground
3	+24 V DC (ICI890_1)	Supply voltage OUT
4	N.c.	–
5	N.c.	–
6	N.c.	–
7	+24 V DC (ICI890_2)	Supply voltage OUT
8	GND (ICI890_2)	Ground
	PE	Protection earth

Tab. 29: Pin assignment of the 8-pin Harting “POWER OUT” HanQ8 female connector

5.3.9 Pin assignment of wire colors of assembled cables with open end

Cable for “AUX” connection (standard)

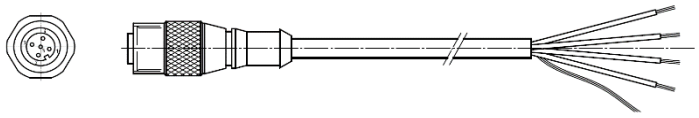


Female connector

Pin	Signal	Wire color
1	N. c.	White
2	N. c.	Brown
3	N. c.	Green
4	RxD (RS-232)	Yellow
5	N. c.	Gray
6	TxD (RS-232)	Pink
7	GND	Blue
8	Shield	Red

Tab. 30: Wire colors of cable for “AUX” connection (standard)

Cable for “CAN 1-IN” connection

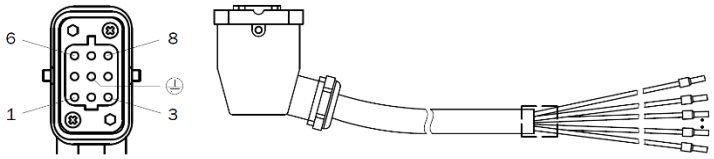


Female connector

Pin	Signal	Wire color
1	Shield	–
2	CAN_V+	Red
3	CAN_GND	Black
4	CAN_H	White
5	CAN_L	Blue

Tab. 31: Wire colors of cable for “CAN 1-IN” connection

Cable for “POWER IN” connection (standard)

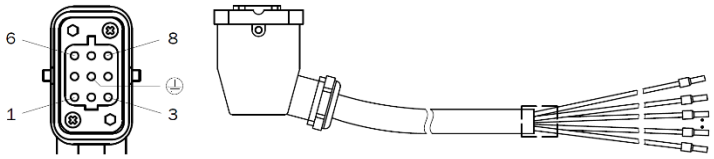


Female connector

Pin	Signal	Wire color (numbers printed on wires)
1	+24 V DC (camera)	Wire 1: black
2	GND (ICI890_1)	Wire 4: black
3	+24 V DC (ICI890_1)	Wire 3: black
4	N.c.	–
5	N.c.	–
6	GND (camera)	Wire 2: black
7	+24 V DC (ICI890_2)	Wire 5: black
8	GND (ICI890_2)	Wire 6: black
	PE	Green-yellow

Tab. 32: Wire colors of cable for “POWER IN” connection (standard)

Cable for “POWER IN” connection (ICI890-3xxxxx)



Female connector

Pin	Signal	Wire color (numbers printed on wires)
1	+24 V DC (camera)	Wire 1: black
4	N.c.	–
5	N.c.	–
6	GND (camera)	Wire 2: black
7	+24 V DC (ICI890_2)	Wire 5: black
8	GND (ICI890_2)	Wire 6: black
	PE	Green-yellow

Tab. 33: Wire colors of cable for “POWER IN” connection (ICI890-3xxxxx)

6 Commissioning and configuration

Commissioning of the camera systems and diagnostics during operation are carried out using the SOPAS-ET configuration software.

WARNING

Do not commission without testing by qualified safety personnel

Before you commission the Asset Monitoring System for the first time, you must have it checked and approved by qualified safety personnel.

► Observe the notes provided in chapter *2 Safety*.

NOTE

Do not switch off the voltage supply during the configuration!

If you switch off the voltage supply during the configuration, you will lose all parameters that have already been configured.

6.1 Starting up the camera system

The camera system does not have an external power switch. The controller unit supplies it with power.

► Connect the voltage supply via the controller unit.

The camera systems connected to the controller unit are started up and checked for operational readiness in a self-test.

The **Device Ready** LED on the camera system lights up green after the self-test.

Fig. 46: Checking the operational readiness

6.2 Connecting the configuration PC

6.2.1 Establishing a connection with the configuration PC

The camera systems are adjusted to the measuring and reading situation on site using the SOPAS-ET configuration software. The configuration software is installed on a PC, which is connected to the controller unit via an Ethernet cable.

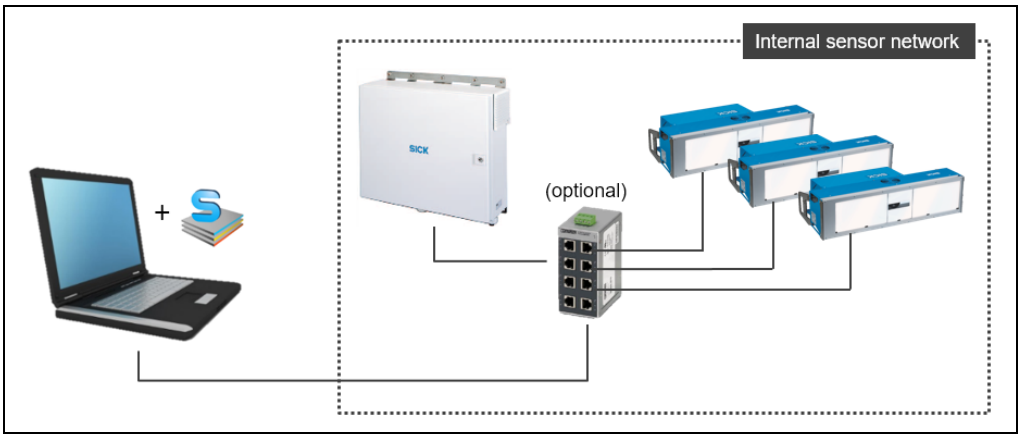


Fig. 47: Establishing a connection between the configuration PC and the controller

Connecting the configuration PC

- Connect the configuration PC to the controller unit with an Ethernet cable.

  It is also possible to establish the connection using an Ethernet switch, to which both the controller unit and the configuration PC are connected.

Note Upon delivery, the default IP address for the camera systems is 192.168.0.1.

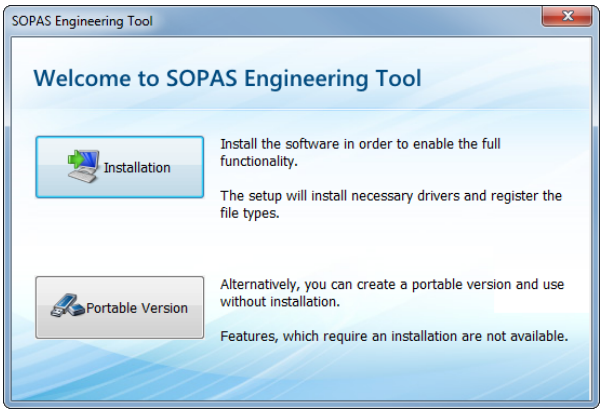
The IP address is altered during configuration.

- Make sure that the configuration PC is in the number range of the controller unit.
- If not, change the IP address of the configuration PC accordingly.

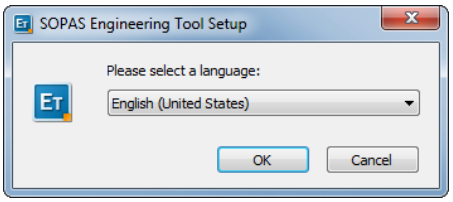
6.2.2 Installing SOPAS-ET

Install the latest version of the configuration software from the SICK homepage on the configuration PC.

1. Open the www.sick.com website in the browser.
2. Enter SOPAS-ET in the search field and start the search.
3. Download the latest version of the **SOPAS Engineering Tool** software and save this in a temporary directory on the configuration PC.
4. Start the installation by double-clicking the **setup.exe** file.



5. Select the **Installation** installation type. The installation is prepared.
6. Select the user language of the wizard.



7. Click **OK** to confirm. The Setup Wizard opens.

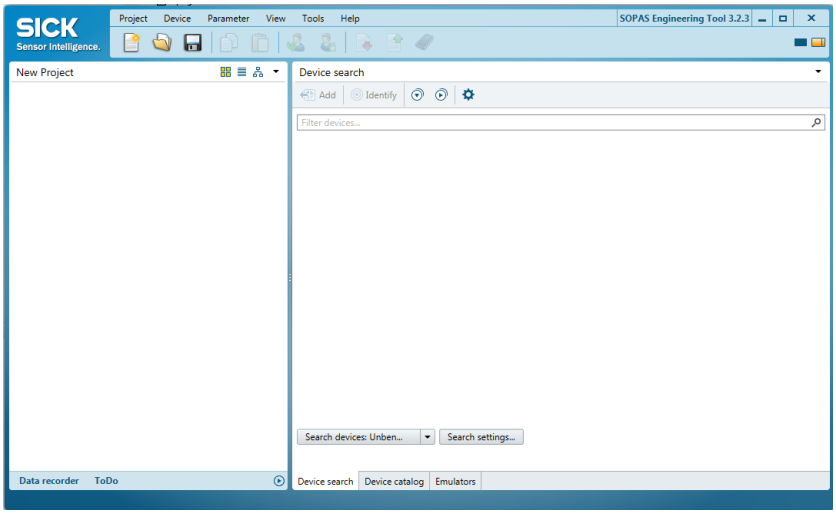
8. Follow the Setup Wizard and perform the installation. Depending on the configuration, a program group is created and an icon is placed on the desktop.

6.2.3 Starting SOPAS-ET

You have connected the configuration PC to the camera system(s) via the controller unit's Ethernet interface.

► Launch SOPAS. The corresponding icon is located in the Windows start menu and on the desktop by default.

The initial screen is displayed. A new **project** is automatically created in SOPAS-ET.



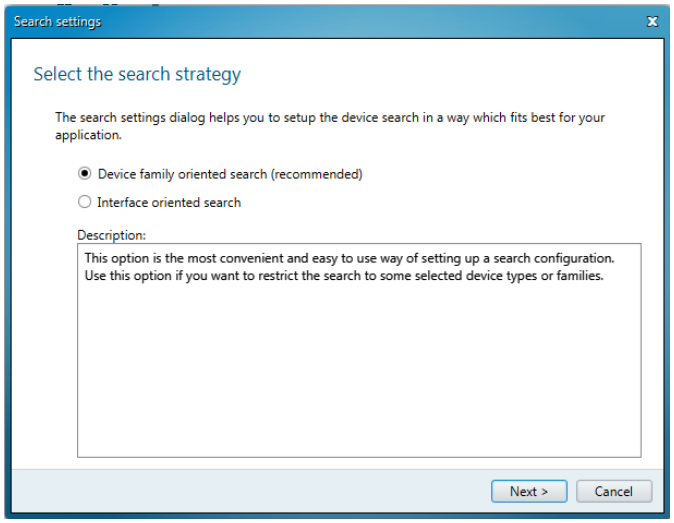
One or more devices are combined and edited in a single project.

6.2.4 Starting the device search

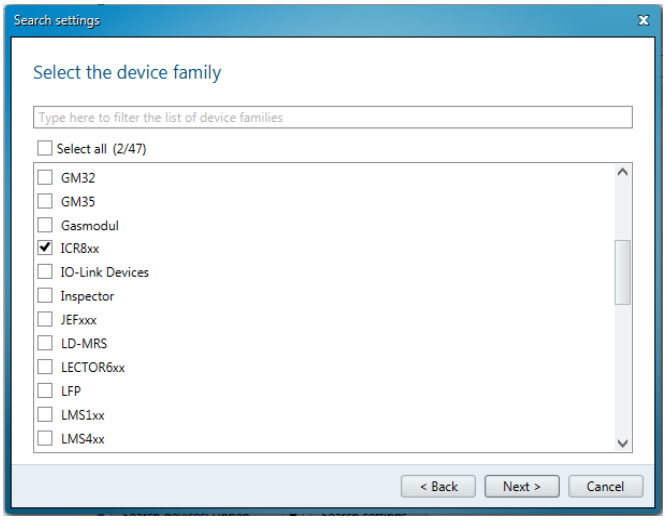
Use the device search to add the camera systems to a project.

Configuring the device search

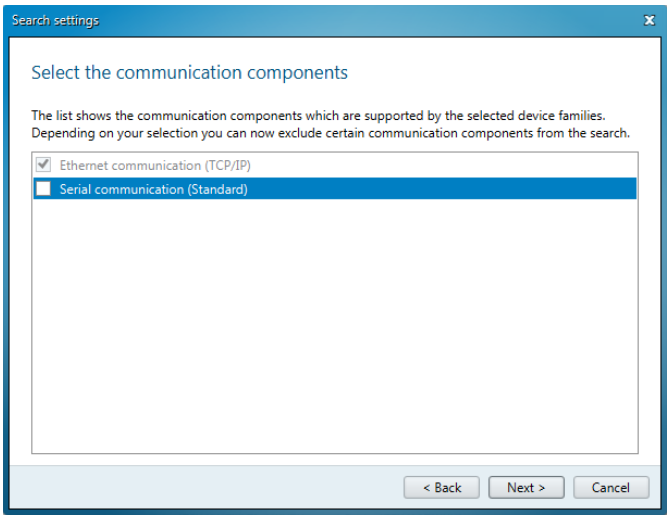
1. Click the **Search settings** button. The Connection Wizard starts. This helps you to establish a link with a connected device.
2. Select the **Device family oriented search** option and click **Next** to confirm.



3. Select the device family from the list (in this case, ICR8xx). This restricts the search for connected devices to devices from that family. Click **Next** to confirm your selection.

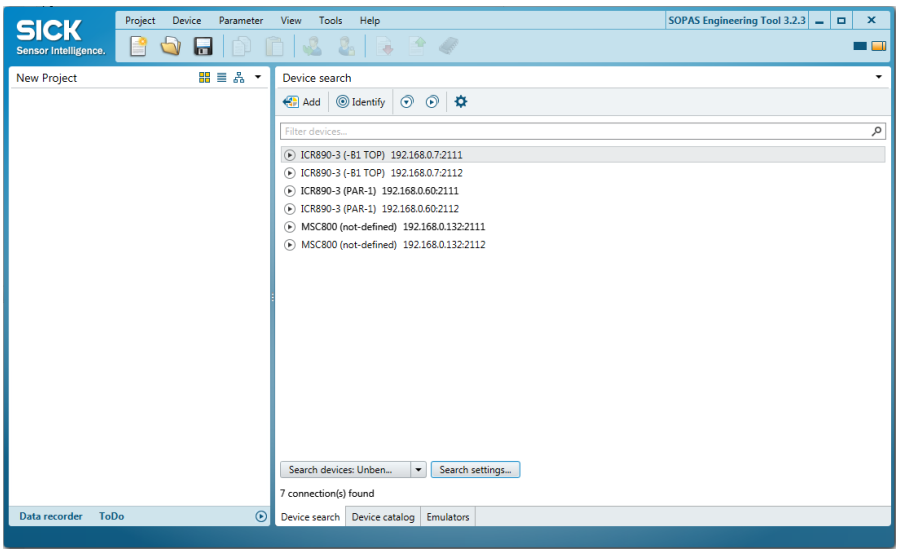


4. Specify which interface is to be used for the configuration work. If, as shown in the example, the configuration is to take place using an Ethernet cable, place a check in the check box labeled **Ethernet communication (TCP/IP)**.



5. Confirm the following pages of the wizard by pressing **Next** each time and click **Complete** to finish configuring the search settings.

If the number ranges for the configuration PC and the camera system correspond, then the camera systems are detected and displayed in the device list on the right-hand side.



Note The camera systems use two ports (like all SICK devices). Ports are part of the network address and can be used to establish various connections between the devices. Port **2112** is freely configurable but port **2111** is a fixed port for outputting data. It is used for device configuration.

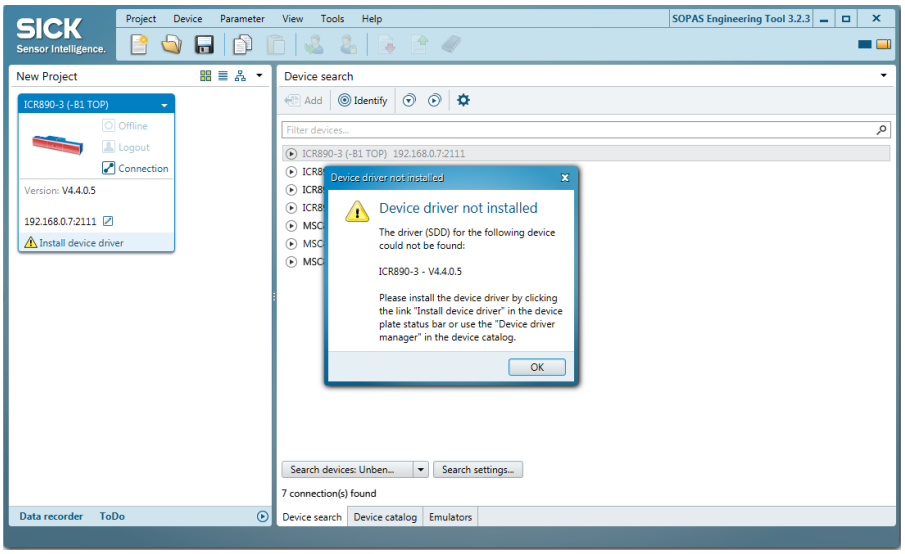
6.2.5 Transferring the camera system to a SOPAS project

Add the detected camera systems to the SOPAS project.

1. In the list, select the camera system with the port **2111**.
2. Click the **Add** icon to transfer the device into the project.

   Alternatively, you can transfer by double-clicking on the list entry or dragging and dropping.

The transferred camera system is displayed in the left-hand window as a **tile**.



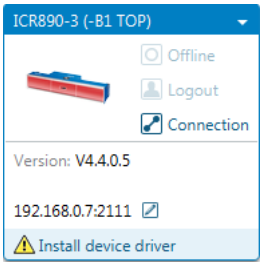
Note A notification will appear if the device drivers for the camera system are not yet known in the SOPAS project.

6.2.6 Loading device drivers into the SOPAS project

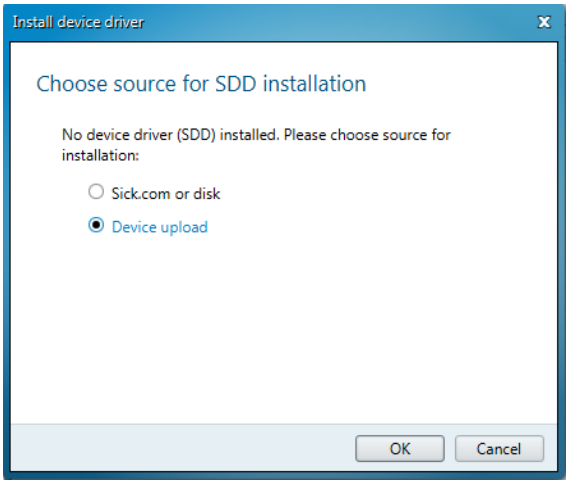
Install the device driver for the controller. The device drivers can be transferred directly from the device to SOPAS-ET.

Getting started

1. Press **OK** to confirm you have seen the notification.
2. Click **Install device driver** in the tile.

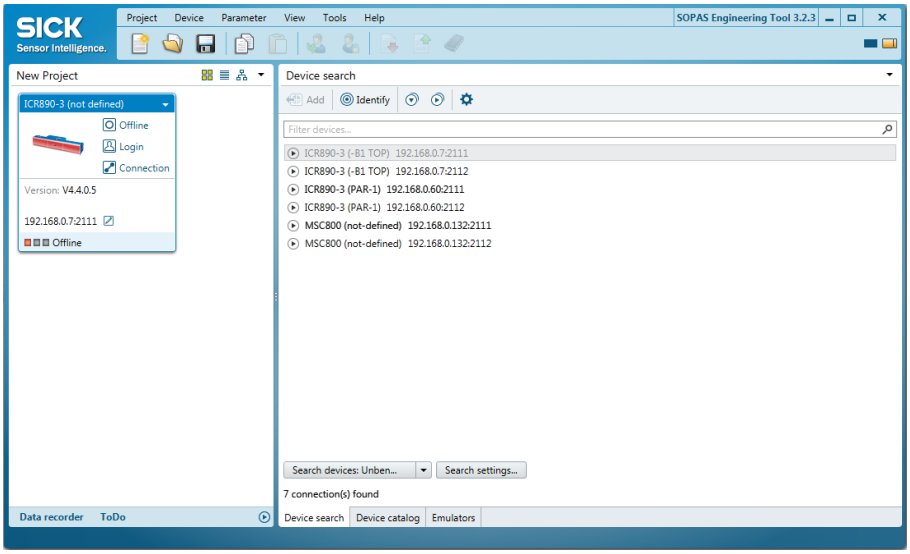


3. You will be asked where you want to get the device drivers from. Load the device drivers from the device and select the **Device upload** option.



4. Click **OK** to confirm. The device drivers are downloaded and installed in the SOPAS project.

   It can be inferred from the tile of the controller that the camera system is now recognized by the configuration PC but is not yet connected to the system, meaning that it is still **offline**.

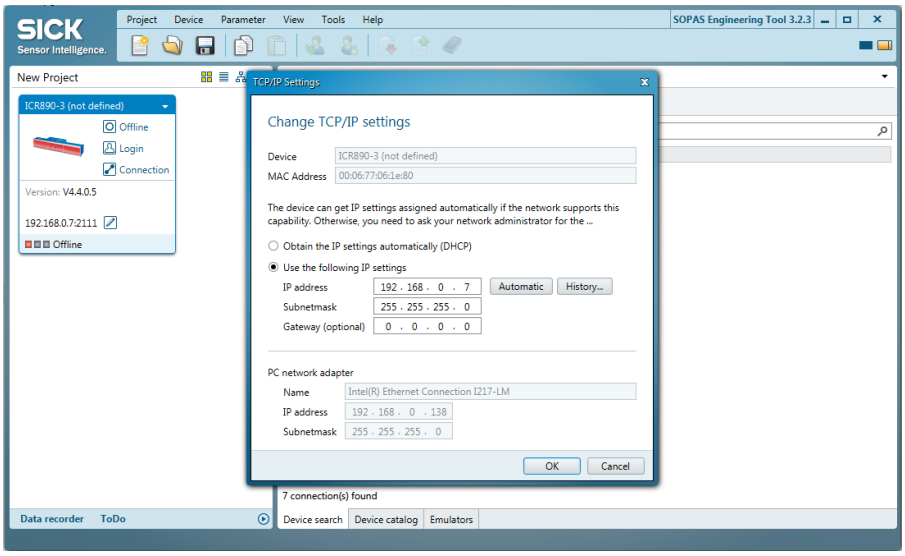


6.2.7 Changing the IP address

Now change the camera system's IP address. The IP address set at the factory is displayed in the tile.

1. In the device tile, click the pen icon next to the IP address.

   The **TCP/IP Settings** window opens.



2. Under the **Use the following IP settings** option, define the IP address that is to be used to access the camera system in the customer network.
3. Click **OK** to save the entry.

Result

The altered IP address is displayed in the device tile.

If the configuration PC and the camera system are in the same number range, the connection to the altered camera system IP address can be established directly.

Procedure in the event of deviating address ranges

If the address range of the camera system now deviates from the IP address of the configuration PC, proceed as follows:

1. Adjust the IP address of the configuration PC to the altered address range of the camera system.
2. Delete the device tile in the SOPAS project.
3. Perform a new device search in SOPAS-ET. The camera system is found with its new IP address and displayed in the device list.
4. Select the camera system with the port 2111 in the device list and transfer it into the SOPAS project by clicking **Add**.

   The transferred camera system is displayed in the left-hand window as a **tile**.

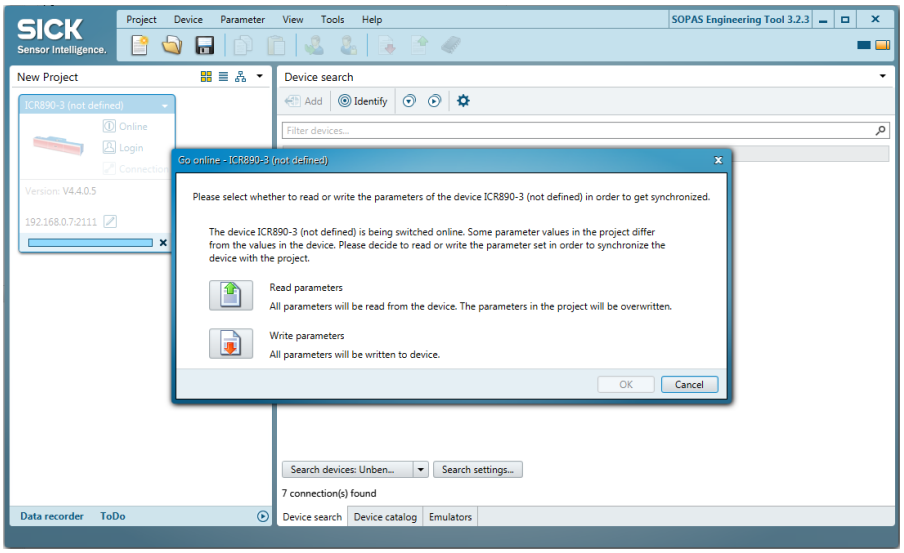
6.2.8 Setting the camera system to online

Establish a connection between the SOPAS project and the camera system. This connection will make it possible to subsequently read camera system parameters and configuration data in the SOPAS project or write these to the camera system from SOPAS-ET.

During the initial commissioning, the standard parameters saved on the camera system at the factory are transferred to the SOPAS project and then adapted to the requirements of the relevant application there.

1. Click the **Offline** button in the tile.

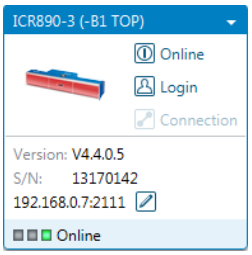
   Alternatively, you can open the context menu and select the **Go online** command there.
2. You are prompted to synchronize the camera system's device data with the device data of the SOPAS project.



3. As the standard parameters are currently only available in the camera system and are not yet in the SOPAS project, click the **Read parameters** option.

The connection between the camera system and the configuration PC is now established. The standard parameters are transferred from the camera system into the SOPAS project.

Online appears in the tile. The LED lights up green.

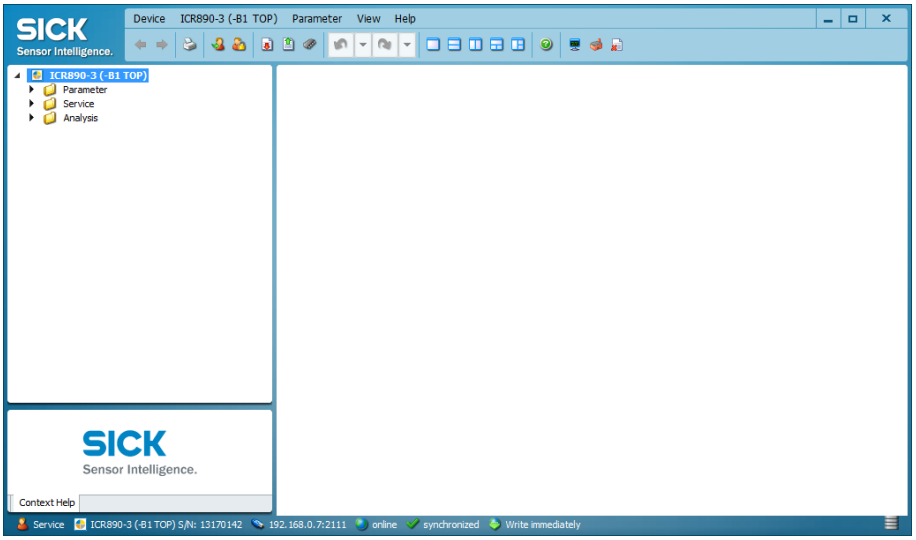


6.3 Configuring the camera system in SOPAS-ET

Now open the SOPAS-ET configuration interface.

► To do so, double-click on the tile in the project tree.

All configurable parameters of the camera system are compiled together in a corresponding device description for the SOPAS-ET configuration software. The project tree of the device description is used as an aid for configuration.



6.3.1 Logging into the device

To be able to access all of the camera system's parameters in the SOPAS-ET configuration software, you must log into the device using the **Service** user level.

After the first start-up, the configuration software works with the **Maintenance Technician** user level (= operator level).

1. Select the **Device** → **Login** command in the menu bar.

2. In the Login dialog window, select the **Authorized Client** user level and enter the default password **client**.
3. Click **Login** to confirm your entry.

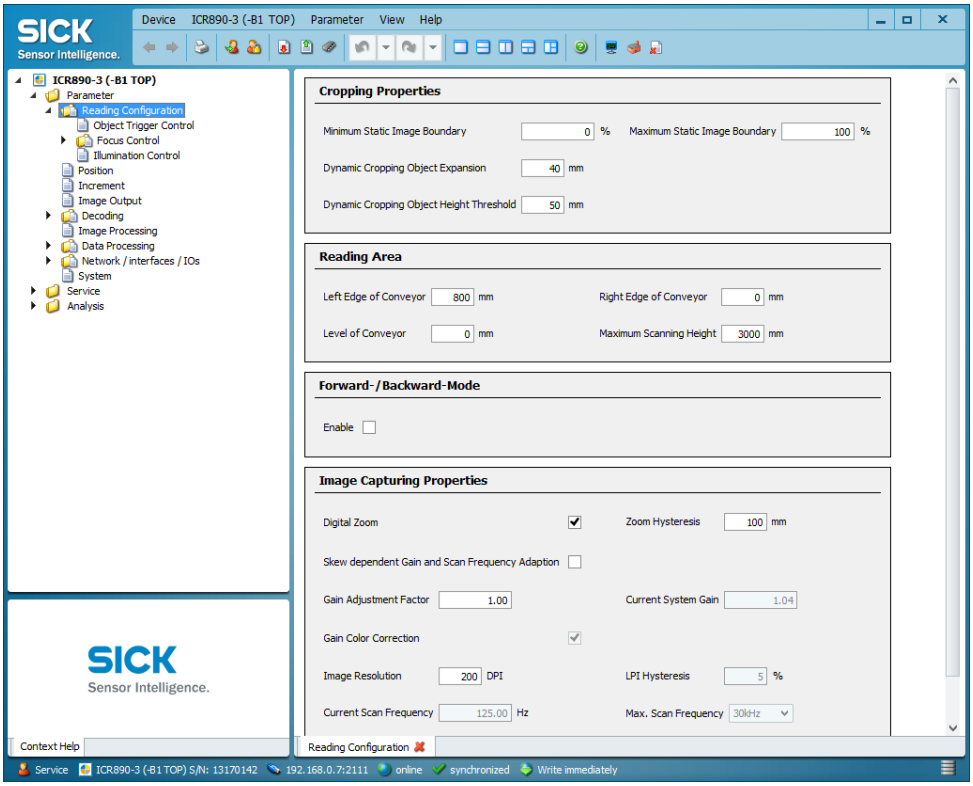
   The parameters that were previously shown grayed out in the windows are now accessible.

6.3.2 Configuring the parameters

You can open the individual functional areas of the configuration via the project tree structure.

1. Click the plus symbol to expand the tree.
2. Select a functional area in the project tree.

The right-hand side shows the input fields with the loaded standard parameters.



Using diagnostic tools

If necessary, use the diagnostic tools “read diagnosis” and “event monitor” for online presentation and recording of the output states of switching inputs and outputs as well as data transmissions to the host.

6.3.3 Saving the parameters permanently

All parameters which you enter in SOPAS-ET are transferred to and executed on the connected camera system with the **Immediate Download** option. However, the data is only saved **temporarily** in the camera system.

Saving the configuration permanently

To retain the changes after the camera system is restarted, the configuration must be permanently saved in the camera system.

1. To do this, go to the SOPAS toolbar and click the **Permanently Save Parameters** icon. The configuration is transferred to the camera system and saved there permanently.
2. The configuration that is saved permanently in the device is loaded whenever the camera system is restarted.

Saving the configuration on the PC

You can also save the configured and displayed settings in a configuration file on your PC in the format ***.spr**. The settings within this file can be loaded subsequently (if required) and transferred to the camera system.

1. Go to the project window toolbar and click the **Save Project** button.
2. Select a directory and file name and then confirm your choice.

Printing the configuration

You can also print the current parameter set.

1. Select the **Device → Print/Print preview** command in the menu bar.

   The SOPAS-ET configuration software displays a preview of all parameter values in table form.
2. Print the parameters using the printer icon. The current settings for the project are printed in table form on several pages.

TIP In order to save the current parameter set as a PDF, go to the **Device** menu bar and select the **Print/Save as PDF file** command.

6.3.4 Restarting the camera system

Once you have configured all parameters, we recommend restarting the camera system. This means you can be sure that all parameters are active.

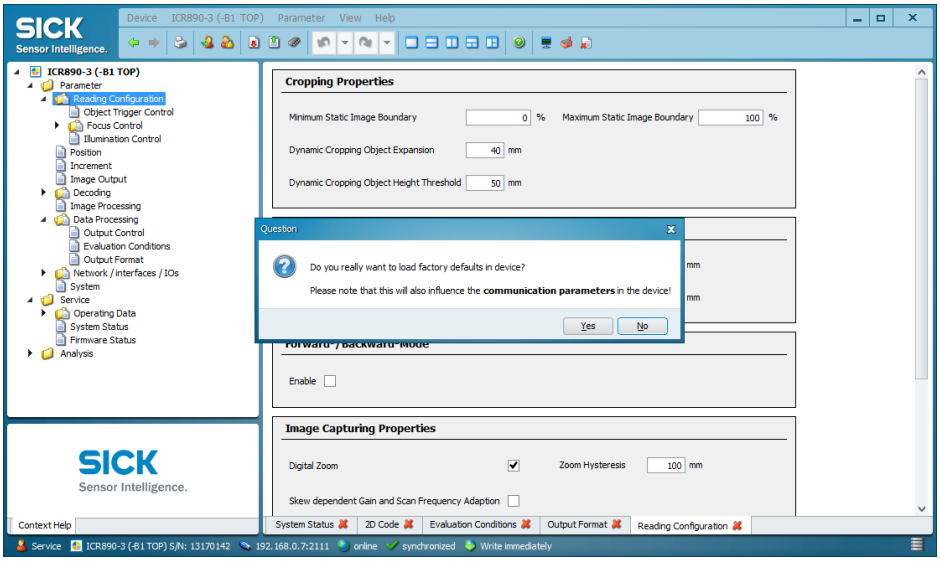
1. Disconnect the controller unit's power supply unit from the voltage supply.
2. Reconnect the voltage supply. The camera system starts.

6.4 Restoring the default

The values of the default are permanently saved both in the camera system and in the database of the SOPAS-ET configuration software and can be restored at any time. This means that you can discard all changes in the parameter set again.

Requirements The SOPAS-ET configuration software is connected to the camera system online.

1. In the menu bar under **ICR8xx**, select the **Parameter → Load factory default** command.



2. Press **Yes** to confirm the prompt.

7 Maintenance and care

The camera system operates maintenance-free. No maintenance is required in order to ensure compliance with LED risk group RG 1 or RG 2.

NOTE

Repair work on the individual components may only be performed by qualified and authorized service personnel.

NOTE

Claims under the warranty rendered void

Do not open the device housing.

If the device is opened, any warranty claims against SICK AG will be void.

Checking the incremental encoder

When using an incremental encoder, the position of the friction gear on the drive technology must be checked regularly.

- Ensure that the incremental encoder is in contact with the drive systems and components and that the friction gear does not slip as it turns.

7.1 Cleaning the camera system

The optical reading performance of the camera system is weakened by scratches or streaks on the front screen. To achieve the full optical reading performance of the camera system, the front screen must be regularly checked for contamination or damage. This is especially true in harsh operating environments (dust, abrasion, humidity, fingerprints, etc.).

The external deflector mirror is a front surface mirror. This means that cleaning affects the optical effective area itself.

- That is why you should not clean the deflector mirror unless it is necessary.

7.1.1 Cleaning the front screen

Caution

LED light beam

The ICI8x0 line illumination uses LEDs as light source.

Variants with red LEDs (ICI890-0x and ICI890-2x) conform to risk group RG1, variants with white LEDs (ICI890-3x), blue-white LEDs (ICI890-1x) and blue LEDs (ICI890-4x) conform to risk group RG2 according to IEC 62471-1: 2006-07/EN 62471-1: 2008-09.

Risk group RG 1

The accessible radiation does not represent a risk due to the normal restrictions imposed by human behavior.

- Do not look into the light source.

Risk group RG 2

CAUTION – Possibly hazardous visible radiation emitted from the illumination unit.

The accessible radiation does not pose a hazard due to aversion responses from bright light sources or thermal discomfort, and when the following behavior is observed:

- Do not look into the light source for extended periods of time during operation. May be harmful to the eyes.
- Do not point light sources at people and prevent light sources from reflecting off reflective surfaces and onto people, particularly when mounting and commissioning the illumination unit.
- Do not open the housing of the illumination unit, as this does not deactivate the light source and may increase the level of risk.

Both risk groups

It is not possible to entirely rule out temporary, disorienting optical effects on the human eye (e.g., dazzle, flash blindness, afterimages, photosensitive epilepsy, impairment of color vision), particularly in low ambient light conditions.
CAUTION – Use of operating or adjusting devices or performance of procedures other than those specified herein may result in hazardous radiation exposure.

- Observe the current national regulations on photobiological safety of lamps and lamp systems.

Safety measures for risk group RG 2

If directly looking into the beam for more than 0.25 seconds cannot be ruled out, eye protection is strongly recommended while handling the product (commissioning, adjustment, cleaning, etc.).

NOTE

Reduced reading performance due to scratches or streaks on the front screen

The front screen of the illumination is made of plastic. The opening for the camera inside the front screen consists of special glass.

- Do not use aggressive cleaning agents.
- Do not use abrasive cleaning agents.
- Avoid scratching and chafing motion on the front screen.

Clean the front screen.

Recommendation

Static charges cause dust particles to stick to the front screen.

You can reduce this effect by using a SICK anti-static plastic cleaner and a SICK lens cloth.

- ▶ Switch off the device during cleaning.
- ▶ Use a clean, soft brush to remove dust from the front screen.
- ▶ If necessary, clean the front screen with a clean, damp, lint-free cloth, and a mild anti-static screen-cleaning fluid (see arrow in figure above).

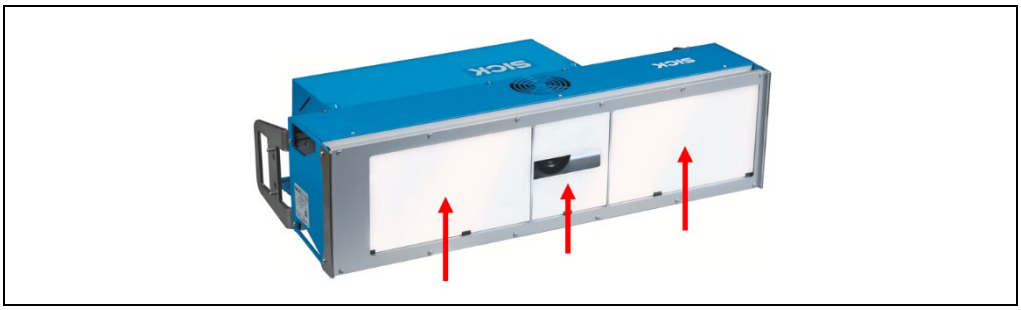


Fig. 48: Camera system: cleaning the front screen

Note

If the front screen is scratched or damaged (cracked, broken), it must be replaced.

- ▶ Contact SICK Service to arrange this.

7.1.2 Cleaning the air inlets and outlets

To ensure sufficient cooling of the illumination unit, care must be taken to keep the air inlets and outlets clean.

- ▶ Use a soft brush to clear any dust from the air inlet on the ventilator and the air outlets on both narrow sides.

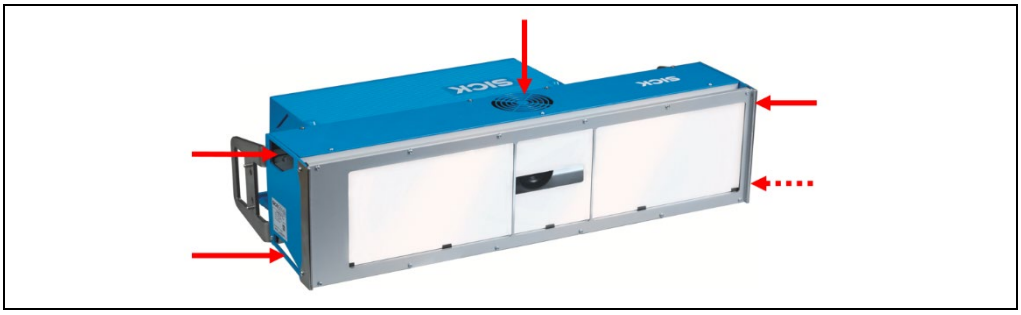


Fig. 49: Cleaning the air inlets and outlets on the illumination unit

7.1.3 Cleaning the deflector mirror

The external deflector mirror is a front surface mirror. This means that cleaning affects the optical effective area itself.

- That is why you should not clean the deflector mirror unless it is necessary.

Only touch the reflector surface when this is absolutely necessary, and only partially, if possible.

- Do not use already-used lens cloths to clean the deflector mirror.

Recommendation We recommend using the SICK lens cloth (part number 4003353) or a camel-hair brush.

NOTE

Damage to the optical effective area of the deflector mirror

Using the wrong cleaning technique or aggressive cleaning agents can damage the deflector mirror, thus impairing the reading performance of the camera system.

- That is why you should not clean the deflector mirror unless it is necessary.
- Only touch the reflector surface when this is absolutely necessary (e.g., if it is very dirty). Never touch the entire reflector surface.
- Do not use oily compressed air from a can.
- Do not wipe the mirror with a towel to prevent irreversible scratches.

Removing dust and loose dirt particles

- Carefully blow away dust and loose dirt particles with clean, oil-free air. Do not use compressed air from a can since it may contain alkaline-like additives which attack the mirror surface.

Removing solid particles

- Remove solid parties carefully with a camel-hair brush previously degreased with acetone. Do not apply any acetone directly to the mirror surface.

The camel-hair brush must have the following properties:

- Camel-hair brush for photographic purposes
- Natural hair to prevent static charge
- Suitability for cleaning optical surfaces, lenses, negatives

Intensively cleaning deflector mirror

1. Fill a clean plastic spray bottle with distilled water.
2. Spray the mirror surface uniformly with distilled water. Hold the mirror at an angle so the distilled water can drip off.
3. Let the mirror dry. **Do not wipe the mirror dry!**

Removing grease deposits

1. Spray the affected areas with conventional glass cleaner.
2. Carefully wipe paper tissue (recommendation: “Kleenex”) over the affected area. Only apply light pressure to the mirror. Do not scour!
3. Let the mirror dry. **Do not wipe the mirror dry**!

NOTE

Cleaning the deflector mirror mounted underneath the conveyor

The deflector mirror mounted underneath the conveyor features a chrome coating.

Due to its high abrasion and scratch resistance, this coating can be cleaned more frequently.

7.1.4 Maintaining the cleaning unit fan

► Clean the surface of the fan housing on a regular basis.

Changing the air filter mat

Change the air filter mat in accordance with the respective maintenance interval.

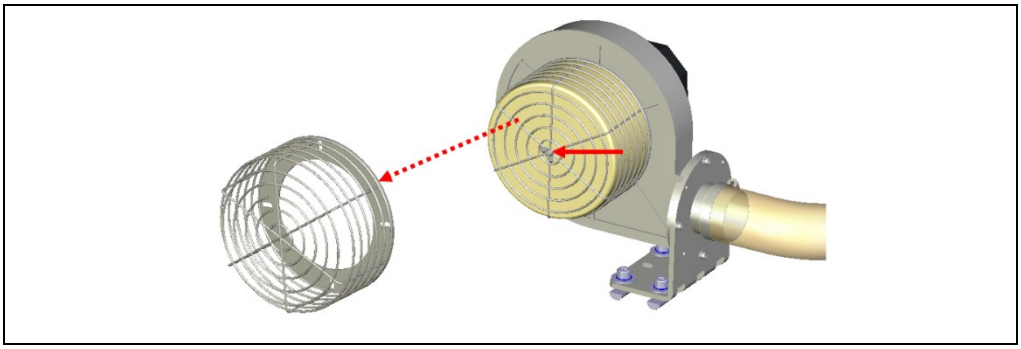


Fig. 50: Changing the air filter mat in the cleaning unit

1. Loosen the wing nut.
2. Remove the air filter mesh.
3. Remove the air filter mat and replace it.
4. Mount the air mesh and tighten the wing bolt.

7.2 Replacing a camera system or component

Faulty or damaged components must be dismantled and replaced with new or repaired components.

NOTE

Risk of damage

Repair work on the camera system may only be performed by qualified and authorized service personnel.

⚠ WARNING

Risk of injury due to falling components

A unit consisting of the illumination unit and camera weighs up to approximately 37 kg depending on the variant.

Measures

- ▶ Do not perform any mounting work alone.
- ▶ Ask a second person to hold the camera system during the mounting process.
- ▶ When replacing the illumination unit or the camera, individually remove the camera first and then the illumination unit.
- ▶ The components must be lifted from the bracket in accordance with ergonomic principles.
- ▶ Wear safety shoes.

NOTE

Claims under the warranty rendered void

Do not open the device housing. The devices are sealed.

If the device is opened, any warranty claims against SICK AG will be void.

7.2.1.1 Replacing camera system components

Faulty or damaged components of the camera system must be dismantled and replaced with new components or components repaired by SICK.

The camera features a microSD card on which all parameters of the device are permanently stored. This makes replacing the component very easy.

Removing connecting cables

1. Switch off the supply voltage for the camera system.
2. Undo all cables with an external source in the terminal compartment of the camera and disconnect them.

3. Also remove the cables between the camera and the illumination.

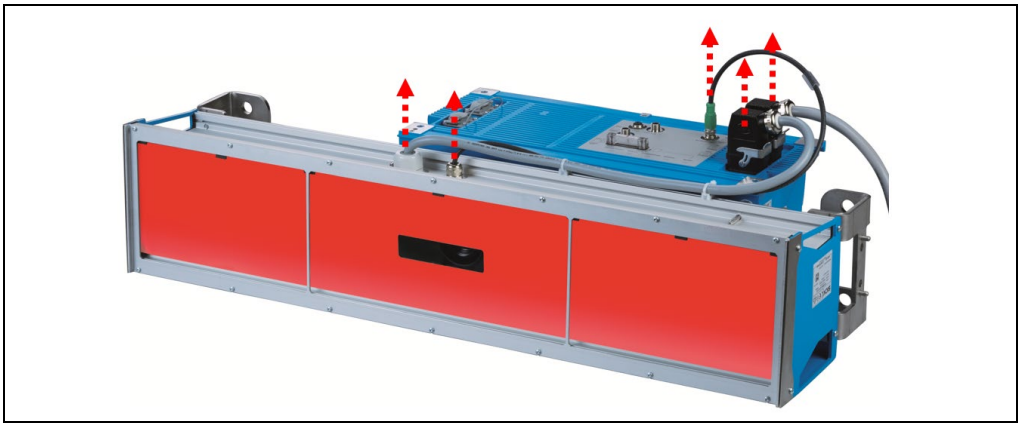


Fig. 51: Camera system replacement – removing connecting cables on the camera system

Disconnecting system components

1. Loosen the two clamping screws in the bow-shaped slots in the two 180° mounting brackets.

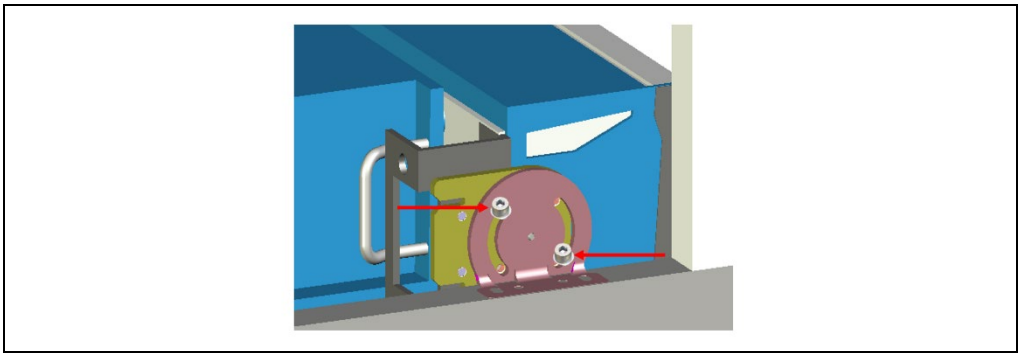


Fig. 52: Camera system replacement – loosening the clamping screws in the 180° mounting brackets

Note Do **not** completely remove the clamping screws!

2. Carefully tilt the camera system until the front screen of the illumination unit points upwards or downwards.
3. Remove the camera from the illumination unit. Loosen the four hexagon socket screws and carefully pull the camera out of the illumination.

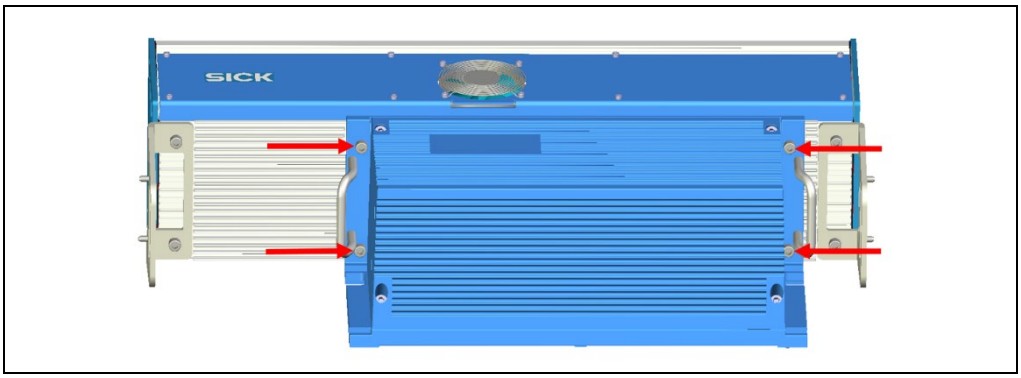


Fig. 53: Camera system replacement – removing the camera from the illumination unit

Replacing a defective illumination unit

Remember the installation length of the illumination unit in the hanging state (e.g., the position of the round air inlet in relation to the conveying direction).

1. Loosen and remove the two clamping screws for the illumination unit from the two 180° mounting brackets.
2. Pull the defective illumination unit from the guide rail out of the slots of the bracket and remove them from the frame.

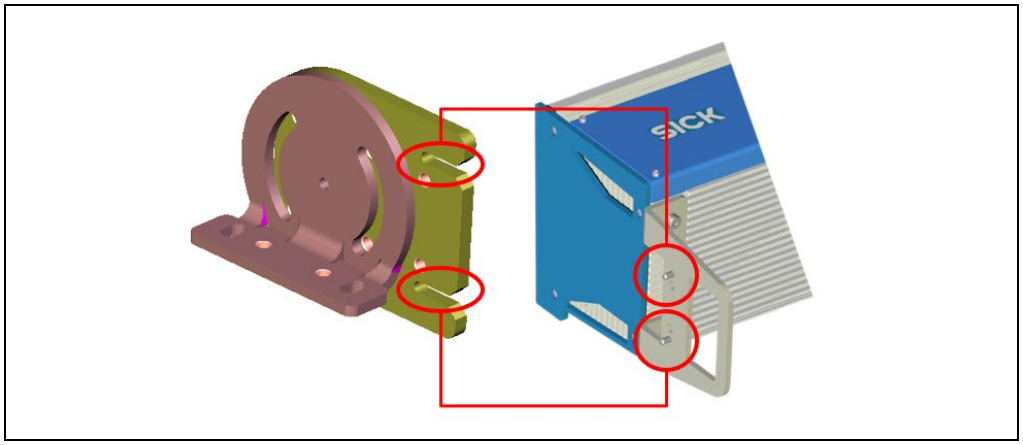


Fig. 54: Camera system replacement – pulling the illumination unit from the 180° mounting brackets

3. Place the new illumination unit in the correct sides in the two 180° mounting brackets and secure these onto the bracket with two clamping screws.
   The front screen of the illumination unit still points toward the conveyor below (see the additional procedure under *Assembling the components of the camera system*, page 87).

Replacing a defective camera

You have pulled the defective camera out of the illumination unit (as described above).

1. Remove the memory card with the secured parameters out of the defective camera. The card is accessible in the camera on the aperture with the electrical connections behind a cover.

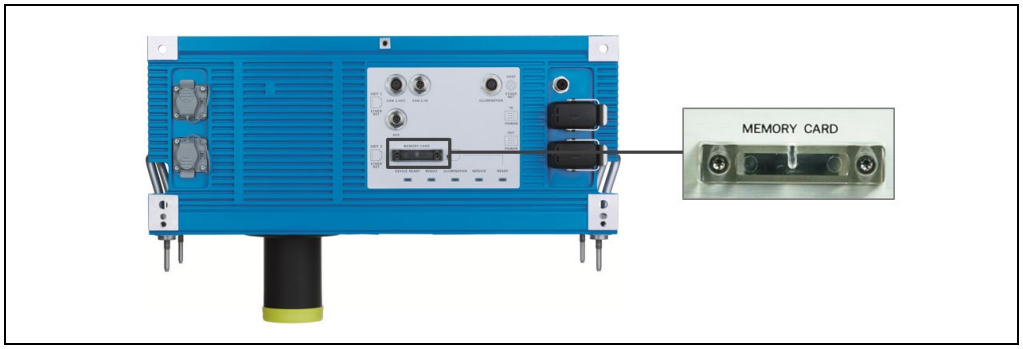


Fig. 55: Camera system replacement – replacing a faulty camera

2. Place the memory card into the empty opening of the replacement device and close the opening with the cover.

Assembling the components of the camera system

1. Remove the yellow protective cap on the new camera (1).

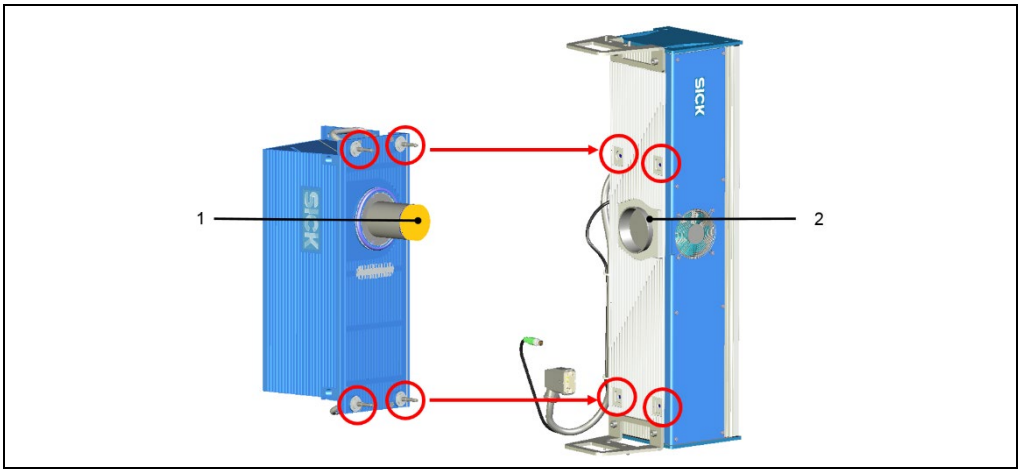


Fig. 56: Camera system replacement – assembling components following component replacement

2. Attach the camera to the illumination unit on the correct side and carefully insert the object protection tube into the opening of the illumination unit (2).
3. Fix the screw in the fitting (round hole).

Fig. 57: Camera system replacement – fastening screw in the fitting

4. Screw the camera onto the illumination unit with the four hexagon socket screws (centering pin with thread).

Aligning the camera system

1. Align the entire unit parallel to the conveying level.
2. Tighten the clamping screws.

Reconnecting the cables

1. Connect the two connection cables of the illumination unit back onto the camera.
2. Connect the two cables coming from an external source back onto the camera.
3. Reconnect the voltage supply.

   After initialization of the parameter set saved on the SD memory card, the camera system adopts this set in the permanent device memory.

7.2.1.2 Replacing the deflector mirrors

A damaged deflector mirror must be replaced immediately.

Replacement of the deflector mirror is not dependent on the position of the mirror.

NOTE

Damage to the deflector mirrors

Do not remove protective foil of the deflector mirror until mounting is complete

Disassembling damaged deflector mirrors

1. Mark the installation position of the deflector mirror in the hanging state (e.g., using the 5-piece hole pattern or the position designation of the illumination surface).
2. Loosen the clamping screws on both sides of the 180° mounting brackets.

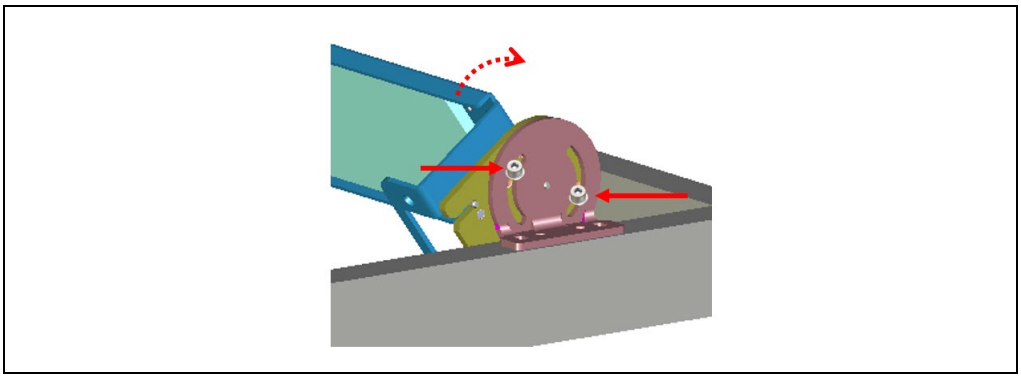


Fig. 58: Replacing the deflector mirror – loosening the clamping screws

3. Vertically position the mounting plates of the 180° mounting brackets and re-tighten the clamping screws.
4. Loosen and remove the fixing screws.

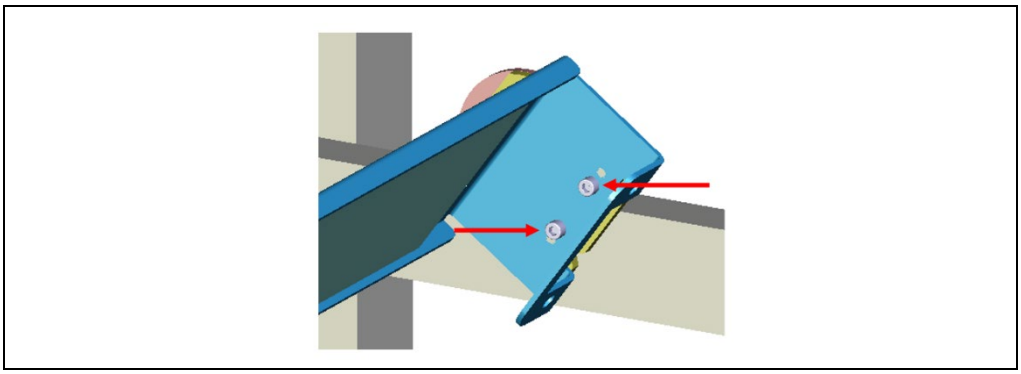


Fig. 59: Replacing the deflector mirror – removing the mirror from the bracket

5. Remove the deflector mirror from the 180° mounting brackets.

Mounting new deflector mirror

1. Insert the new deflector mirror into the 180° mounting bracket.
2. Fasten the deflector mirror onto the bracket with the two fixing screws.
3. Loosen the clamping screws and re-position the deflector mirror such that it is in its original location.
4. Firmly re-tighten the clamping screws.
5. Remove the protective foil on the new deflector mirror.

Checking alignment

1. Reconnect the voltage supply.
2. Switch on the illumination unit of the camera.
3. Check whether the deflector mirror is correctly aligned.

Recommendation

You can also remove the deflector mirror without changing the angle of the two 180° mounting brackets.

When removing the fixing screws, the deflector mirror must be held and protected against falling by a second person.

7.2.1.3 Replacing the deflector mirror underneath the conveyor

The deflector mirror mounted underneath the conveying surface can easily be replaced due to the separation of the base support and mirror holder. The deflector mirror is secured on both sides via an arm on the base support.

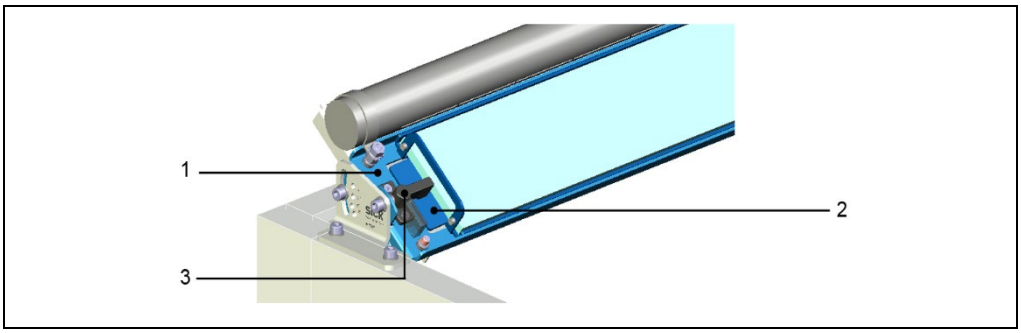


Fig. 60: Replacing the deflector mirror (underneath the conveyor) – components

No.	Meaning
1	Base support
2	Mirror holder
3	Arm

If the mirror is being replaced, the aligned base support remains in its position on the mounting frame. Only the unlocked mirror holder, upon which the deflector mirror is mounted, is removed. It is therefore not necessary to re-adjust the replacement mirror.

1. Unlock the mirror holder. To do this, move the safety arm onto the side over which you would like to remove the faulty deflector mirror.

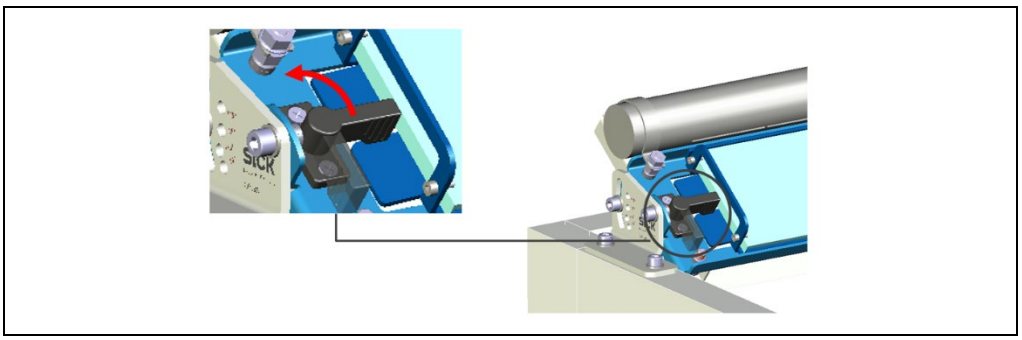


Fig. 61: Replacing the deflector mirror (underneath the conveyor) – unlocking the mirror

Note It is not necessary to unlock both safety arms.

2. Lift the deflector mirror from the base support and remove the mirror from the mounting frame sideways.

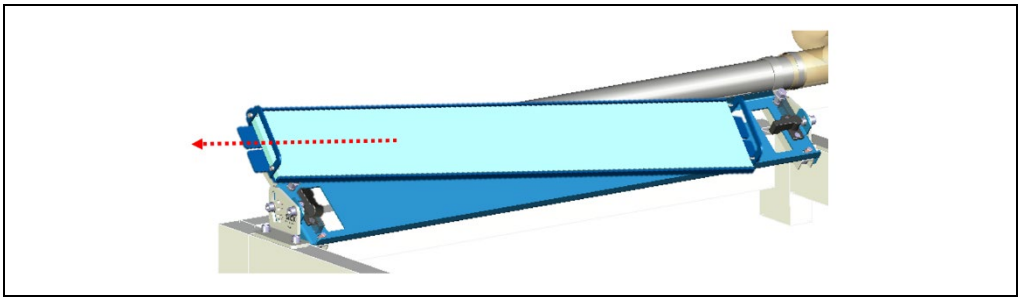


Fig. 62: Replacing the deflector mirror (underneath the conveyor) – removing the mirror

7.2.1.4 Replacing the cleaning unit fan

The replacement device is supplied with a pre-mounted bracket.

Removing the fan

1. Unscrew the connecting cable from the cable connector on the fan.
2. Loosen the bracket and remove the connecting hose from the fan couplings (1).

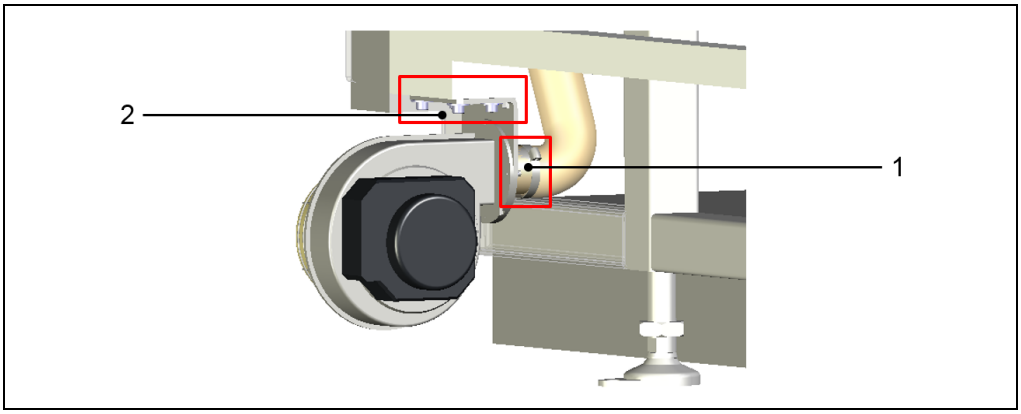


Fig. 63: Replacing the cleaning unit fan

3. Loosen the fixing screws on the bracket (2) and remove the fan from the mounting frame along with the bracket.

Mounting the replacement device

1. Mount the replacement device on the mounting frame in reverse order.
2. Tighten the fixing screws and check that the device is securely attached.
3. Place the connecting hose on the fan couplings and screw the hose connection into place.
4. Plug the connecting cable into the female connector of the cable connection and screw the M12 plug connector into place.

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.

Dismantling the camera system for decommissioning

1. Switch off the supply voltage to the camera system.
2. Detach all connecting cables on the camera system.
3. Loosen the camera system from the two brackets and remove from the frame.
4. Remove the two connection cables between the camera and illumination unit.
5. Loosen the four hexagon socket screws and carefully pull the camera out of the illumination unit.

Disposing of the ICI890 illumination unit

1. Remove the housing of the illumination unit.
2. Remove the electronic assemblies of the illumination unit and dispose of these as hazardous waste.
3. Remove the front screen of the illumination unit.
4. Take the Fresnel lens to a site for recycling plastics.
5. Take the housing of the illumination unit to a site for recycling aluminum die cast.

Disposing of the camera

1. Remove the camera housing.
2. Remove the electronic assemblies of the camera.
3. Remove the battery in the PC card of the camera (see circle) from the bracket and dispose of it as hazardous waste in compliance with the RoHS directives (Europe).
4. Take the camera lens to a site for glass recycling.
5. Dispose of electronic components as hazardous waste.
6. Take the camera housing and cover as well as the optical assembly to a site for recycling aluminum die cast.
7. Take connecting cables to a site for recycling metal.

8 Troubleshooting

This chapter describes how to identify and rectify faults on the camera system.

8.1 Overview of potential errors and faults

8.1.1 Errors during mounting

1. Camera system poorly aligned to objects with 1D/2D codes (e.g., dazzle)
2. Read-cycle sensor incorrectly positioned (e.g., internal reading gate is opened too late or closed too early)
3. Focus position switching: sensors for detecting the respective object height incorrectly positioned
4. Incremental encoder (optional) incorrectly positioned

8.1.2 Error during electrical installation

- Interfaces of the camera system incorrectly wired

8.1.3 Errors during configuration

- Functions not adapted to local conditions, e.g., parameters for the data interface not set correctly
- Device limits not observed, e.g., reading distance, aperture angle
- Trigger source for read-cycle not selected correctly

8.1.4 Faults during operation

- Tracking operation: minimum distance of the objects in the conveying direction not met
- Time-out period of the illumination unit exceeded
- Device faults (hardware/software)

8.2 Detailed fault analysis

8.2.1 LEDs on the camera

A number of statuses can be read from the LEDs by the electrical connections of the camera (see chapter *3.6.2 Camera LEDs*), including the following:

- Result of the self-test
- Operational status
- Fulfillment of a configured condition (e.g., display of Good Read)
- Maintenance or service activity required

The LED display can indicate possible errors or faults.

Further information on this can be found in the “System information” section.

8.2.2 System information

The camera system outputs any occurring faults in different ways. Fault output is staggered, allowing for an increasingly detailed level of analysis:

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

8.2.3 Status log

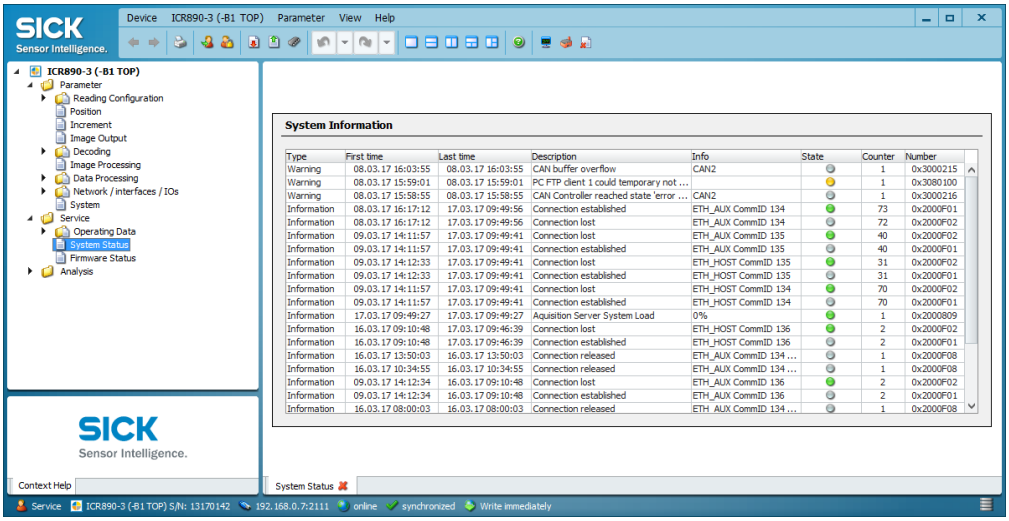
Note

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

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

Displaying the status log using the SOPAS-ET configuration software

▶ Go to the SOPAS project tree and select the following entry:
ICR8xx → Service → System Status.



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

8.3 SICK Support

If the fault cannot be rectified using the measures described above, the camera system may be defective. The system components cannot be repaired by the user in order to restore functionality after a fault. However, the user is able to quickly replace the camera or illumination unit. See chapter *7.2 Replacing a camera system or component*.

▶ Where a fault cannot be rectified, please contact the SICK Service department:

- In Germany: technical hotline for SICK Vertriebs-GmbH

  Tel. +49 211 5301 301, fax. + 49 211 5301 302, e-mail: kundenservice@sick.de.
- Abroad: responsible SICK branch or SICK subsidiary.

  For telephone numbers and e-mail addresses, please see the back page of these operating instructions. See www.sick.com for postal addresses.

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

9 Technical data

9.1 Data sheet for ICD880/ICD890 camera

Type	ICD880-32121xx	ICD890-32001xx ICD890-32011xx	ICD890-33001xx ICD890-33011xx
Function	Camera		
MTBF of the device	> 80,000 h		
MTTR of the device[1)]	< 10 min		
CMOS sensor (scan)	Line camera with 8,192 pixels		
Line frequency (scanning rate)	Max. 19 kHz		Max. 30 kHz
Image resolution	330 dpi with a reading distance of 0.8 m 190 dpi with a reading distance of 1.4 m	250 dpi with a reading distance of 2 m 170 dpi with a reading distance of 3 m	
Usable aperture angle	Max. 36° up to reading distance of 1.05 m	Max. 25° up to reading distance of 2.4 m	
Cover for width of conveyor in conveyor system	600 mm with a resolution of 250 dpi 800 mm with a resolution of 200 dpi	1,000 mm with a resolution of 170 dpi 600 mm with a resolution of 250 dpi	
Depth of field (DOF)	550 mm with a resolution of 200 dpi 250 mm with a resolution of 250 dpi	1,600 mm with a resolution of 170 dpi 600 mm with a resolution of 250 dpi	
Reading areas	0.75 m ... 1.4 m	1.4 m ... 3 m 1.6 m ... 3.3 m	
Max. conveyor speed (objects)	2.4 m/s with a resolution of 200 lpi 3.2 m/s with a resolution of 150 lpi		3.8 m/s with a resolution of 200 lpi 5.1 m/s with a resolution of 150 lpi
Supported lenses (standard)	Focal length 80 mm	Focal length 135 mm	
Focus	Dynamic		
Image data output format	JPEG, TIFF		
Ambient light immunity	2,000 lx (on 1D/2D code)		
Print contrast (PCS)	≥ 40%		
1D code types (bar codes)	2/5 interleaved, Code 39, Code 128, EAN/UPC with add-on, Codabar, EAN 128		
2D code types	Data Matrix ECC200, PDF417, MaxiCode, QR code, Aztec (optional)		
Number of objects per second	Max. 10		
Minimum object distance	50 mm		
Number of codes per object	1D: max. 50, 2D: max. 10		
Number of characters per 1D code	Max. 50 characters (max. 1,000 characters across all 1D codes per reading gate)		
Number of characters per 2D code	Max. 1,556 bytes		
Print ratio for 1D code	2:1 ... 3:1		
Number of multi-reads (1D code)	1 ... 99		
Memory card for parameters (cloning)	SD card, 2 GB		
Optical indicators	5 x LEDs (status indicators)		
Read cycle	Via MSC800		

Tab. 34: Technical specifications for the ICD880/ICD890 camera

Type	ICD880-32121xx	ICD890-32001xx ICD890-32011xx	ICD890-33001xx ICD890-33011xx
“CAN” data interface	2 x, 10 kbit/s ... 1 Mbit/s, CAN-SENSOR network		
“Host Ethernet” data interface	10/100 Mbit/s, TCP/IP, FTP port, half/full duplex, host port/AUX port		
“Gbit Ethernet” data interface	2 x, 100 Mbit/s ... 1 Gbit/s, FTP port (image output), full duplex		
Serial “AUX” data interface	RS-232, data output format can be adjusted		
Data transmission rate	57.6 kbit/s		
Electrical connections	3 x 5-pin M12 (CAN 1-IN, CAN 1-OUT, HOST ETHERNET) 2 x 8-pin M12 (AUX, ILLUMINATION) 2 x RJ-45 female connector (GBIT ETHERNET) 2 x 8-pin Harting POWER IN/POWER OUT plug connectors for special devices accompanying the camera: additional 2 x USB female connectors (type A)		
Supply voltage	DC 24 V ± 10% according to IEC 60364-4-41 (VDE 0100 Part 410: 2005)		
Power consumption	Typically 75 W		
Housing	Aluminum die cast. Outside of the housing, no materials using silicon		
Enclosure rating	IP 64 in accordance with EN 60529: 1991-10; A1: 2000, A2:2013		
Protection class	Class III in accordance with EN 61140: 2016		
EMC test	In accordance with EN 61000-6-2: 2005, EN 61000-6-4: 2007		
Vibration test	In accordance with IEC 60068-2-6: 2007		
Shock test	In accordance with IEC 68-2-27: 2008-02, equivalent to EN 60068-2-27: 2009		
Dimensions[2)]	See *9.6 Dimensional drawing of the ICR880/890 camera systems*		
Weight	Approx. 13.5 kg		
Mounting	On ICI890 illumination unit, 4 x M8 screws with centering pin		
Ambient operating temperature/ storage temperature	0 °C ... +50 °C/–20 °C ... +70 °C		
Max. rel. air humidity	≤ 95%, non-condensing		
Color	Light blue (RAL 5012)		
1) The camera and illumination unit can be replaced independently of one another. 2) Including decoder			

Tab. 35: Technical specifications for the ICD880/ICD890 camera (continued)

9.2 Data sheet for the ICl890-0x / ICl890-1x illumination unit

Type	**ICl890-00xxx** **ICl890-10xxx**	**ICl890-01xxx** **ICl890-11xxx**	**ICl890-02xxx** **ICl890-12xxx**
Function	LED illumination		
Light color/wavelength	ICl890-0x: red, λ = 630 nm ICl890-1x: blue-white, λ = 470 nm		
LED risk group	**Variants with red LEDs** Risk group RG 1 (low risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09. Irradiance: $L_B < 10 \times 10^3$ W/(m²sr) within 100 s (RG 1), at distances ≥ 200 mm. $L_R < 2.8 \times 10^5$ W/(m²) within 10 s (RG 0), at distances ≥ 200 mm. **Variants with blue-white LEDs** Risk group RG 2 (moderate risk) acc. to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09 due to blue light hazard. Irradiance: $L_B < 4 \times 10^6$ W/(m²sr) within 0.25 s (RG 2), at distances ≥ 200 mm. $L_R <$ 2.3 E6 W/(m²sr) within 0.25 s (RG 2), at distances ≥ 200 mm. Risk RG 1 (low risk) corresponding to $L_B < 10 \times 10^3$ W/(m²sr) within 100 s at distances > 10 m. This distance is only necessary in the range of maximum brightness in the direct illumination field.		
Switch-on time	Depending on reading pulse, minimum switch-off time 3 s		
MTBF of the device	> 80,000 h		
MTTR of the device[2)]	< 10 min		
Profile length	1,100 mm	900 mm	750 mm
Number of LED modules	10	8	4
Electrical connections	1 x male connector, M12, 8-pin (control data interface for the camera) 1 x Harting HanQ8 plug connector, 8-pin (input for DC 24 V voltage supply)		
Supply voltage	DC 24 V ± 20%		
Power consumption	ICl890-00000, -01000, -01100, 02100:		
	Typ. 160 W[3)], max. 400 W	Typ. 130 W[3)], max. 320 W	Typ. 80 W[3)], max. 170 W
	ICl890-10000, -11000, -11100, 12100:		
	Typ. 260 W[3)], max. 400 W	Typ. 210 W[3)], max. 320 W	Typ. 130 W[3)], max. 170 W
Housing/front screen	Aluminum die cast/plastic (glass for camera view) Outside of the housing, no materials using silicon		
Enclosure rating	IP 64 according to EN 60529: 1991-10; A1: 2000, A2:2013, fan IP 54		
Protection class	Class III in accordance with EN 61140: 2016		
EMC test	In accordance with EN 61000-6-2: 2005, EN 61000-6-4: 2007		
Vibration test	In accordance with IEC 60068-2-6: 2007		
Shock test	In accordance with IEC 68-2-27: 2008-02, equivalent to EN 60068-2-27: 2009		
Dimensions	See *9.6 Dimensional drawing of the ICR880/890 camera systems*		
Weight	Approx. 23.5 kg	Approx. 19 kg	Approx. 15 kg

Type	ICI890-00xxx ICI890-10xxx	ICI890-01xxx ICI890-11xxx	ICI890-02xxx ICI890-12xxx
Mounting	2 x mounting brackets (U-shape), each with 2 x alignment pins Ø 6 mm and 2 x M8 threaded holes to be used in 180° mounting brackets		
Ambient operating temperature/ storage temperature	0 °C ... +50 °C/–20 °C ... +70 °C		
Max. rel. air humidity	≤ 95%, non-condensing		
Color	Light blue (RAL 5012)		
1) Default 2) The camera and illumination unit can be replaced independently of one another 3) In the case of an ambient temperature of 20 °C			

Tab. 36: Technical specifications for ICI890-0x/ICI890-1x illumination units

9.3 Data sheet for ICI890-2x / ICI890-3x / ICI890-4x illumination unit

Type	ICI890-23xxx ICI890-33xxx ICI890-43xxx	ICI890-24xxx ICI890-34xxx ICI890-44xxx	ICI890-25xxx ICI890-35xxx
Function	LED illumination		
Light color/wavelength	ICI890-2x: red, λ = 630 nm ICI890-3x: white, λ = 400 nm to 750 nm ICI890-4x: blue, λ = 449 nm		
LED risk group	**Variants with red LEDs** Risk group RG 1 (low risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09. Irradiance: L_B < 10 x 10^3 W/(m^2sr) within 100 s (RG 1), at distances ≥ 200 mm. L_R < 2.8 x 10^5 W/(m^2) within 10 s (RG 0), at distances ≥ 200 mm. **Variants with white and blue LEDs** Risk group RG 2 (moderate risk) acc. to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09 due to blue light hazard. Irradiance: L_B < 4 x 10^6 W/(m^2sr) within 0.25 s (RG 2), at distances ≥ 200 mm. L_R < 2.0 E6 W/(m^2sr) within 0.25 s (RG 2), at distances ≥ 200 mm. Risk RG 1 (low risk) corresponding to L_B < 10 x 10^3 W/(m^2sr) within 100 s at distances > 10 m. This distance is only necessary in the range of maximum brightness in the direct illumination field.		
Switch-on time	Depending on reading pulse, minimum switch-off time 3 s		
MTBF of the device	> 80,000 h		
MTTR of the device[2)]	< 10 min		
Profile length	1,100 mm	900 mm	750 mm
Number of LED modules	10	8	4
Electrical connections	**ICI890-xxx0x** 1 x male connector, M12, 8-pin (control data interface for the camera) 1 x Harting HanQ8 plug connector, 8-pin (input for DC 24 V voltage supply) **ICI890-xxx1x** 1 x male connector, M12, 8-pin (control data interface for the camera) 1 x male connector, M12, 5-pin (input for DC 24 V voltage supply)		
Supply voltage	DC 24 V ± 20%		
Power consumption	Max. 210 W[3)]	Max. 200 W[3)]	Max. 110 W[3)]
Housing/front screen	Aluminum die cast/plastic (glass for camera view) Outside of the housing, no materials using silicon		
Enclosure rating	IP 64 according to EN 60529: 1991-10; A1: 2000, A2:2013, fan IP 54		
Protection class	Class III in accordance with EN 61140: 2016		
EMC test	In accordance with EN 61000-6-2: 2005, EN 61000-6-4: 2007		
Vibration test	In accordance with IEC 60068-2-6: 2007		
Shock test	In accordance with IEC 68-2-27: 2008-02, equivalent to EN 60068-2-27: 2009		

Type	ICI890-23xxx ICI890-33xxx ICI890-43xxx	ICI890-24xxx ICI890-34xxx ICI890-44xxx	ICI890-25xxx ICI890-35xxx
Dimensions	See *9.6 Dimensional drawing of the ICR880/890 camera systems*		
Weight	Approx. 17.4 kg	Approx. 14.1 kg	Approx. 11 kg
Mounting	2 x mounting brackets (U-shape), each with 2 x alignment pins Ø 6 mm and 2 x M8 threaded holes to be used in 180° mounting brackets		
Ambient operating temperature/ storage temperature	0 °C ... +50 °C/–20 °C ... +70 °C		
Max. rel. air humidity	≤ 95%, non-condensing		
Color	Light blue (RAL 5012)		
1) Default 2) The camera and illumination unit can be replaced independently of one another 3) In the case of an ambient temperature of 20 °C			

Tab. 37: Technical specifications for ICI890-2x, ICI890-3x, ICI890-4x illumination units

9.4 Deflector mirror data sheet

Part no.	2060018	2060132	2060175
Function	Deflector mirror		
Mirror material	Glass		
MTTR of the device	< 10 min		
Housing	Aluminum		
Reflector surface	1,000 mm x 160 mm	800 mm x 160 mm	650 mm x 160 mm
Dimensions	See *9.4 Deflector mirror data sheet*		
Weight	7 kg	6 kg	5 kg
Mounting	Both sides, each with 2 x alignment pins Ø 6 mm and 2 x M8 threaded holes to be used in 180° mounting brackets		
Ambient operating temperature/ storage temperature	0 °C ... +50 °C/–20 °C ... +70 °C		
Max. rel. air humidity	≤ 95%, non-condensing		
Color	Light blue (RAL 5012)		

Tab. 38: Technical specifications for deflector mirror

9.5 Specifications diagrams

9.5.1 Reading conditions for diagrams

Test code	Code 128
Code quality	A or B, in accordance with ANSI
Print contrast	> 90%
Ambient light	< 2,000 lx
Tilt/pitch/skew	360° / –15° ... +15° / –15° ... +15°

Tab. 39: Reading conditions for specifications programs

9.5.2 Read ranges of the camera systems

Camera system 1: ICD880 camera with ICI890-x1xxx / ICI890-x4xxx illumination unit (profile length: 900 mm)

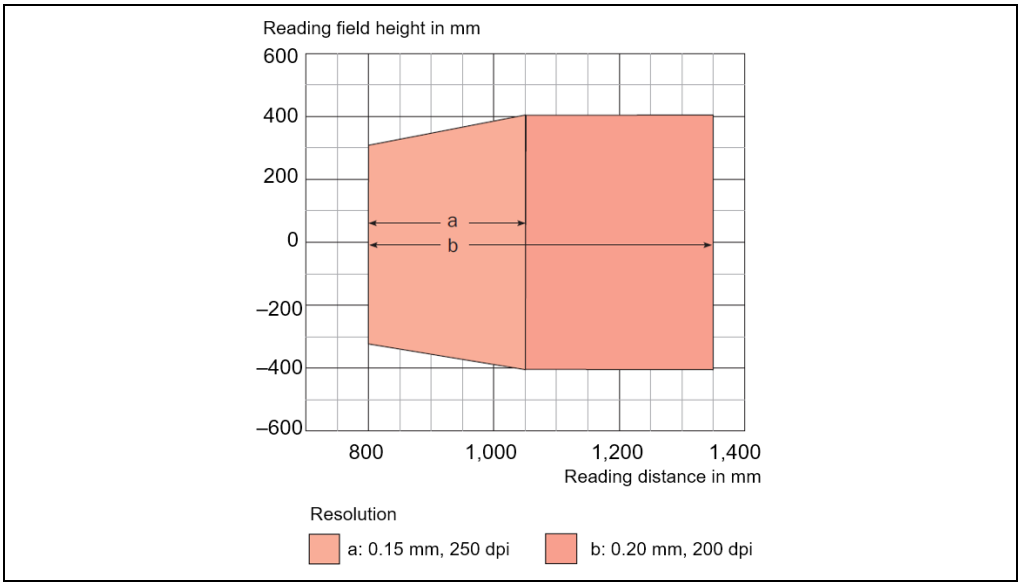


Fig. 64: Reading ranges of the camera system 1: ICD880 camera with ICI890-x1xxx / ICI890-x4xxx illumination unit

Note The ICD880 camera with ICI890-x2xxx / ICI890-x5xxx illumination unit (profile length: 750 mm) reaches a reading field height of ±300 mm and therefore covers a conveyor track width of 600 mm.

Camera system 2: ICD890 camera with ICI890-x1xxx / ICI890-x4xxx illumination unit (profile length: 900 mm)

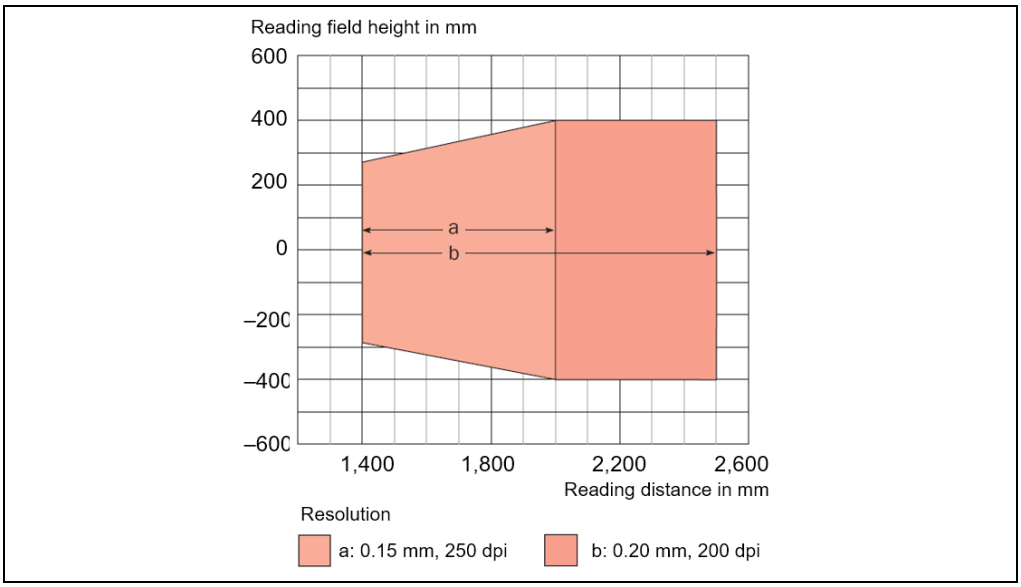


Fig. 65: Reading ranges of the camera system 2: ICD890 camera with ICI890-x1xxx / ICI890-x4xxx illumination unit

Camera system 3: ICD890 camera with ICI890-x0xxx / ICI890-x3xxx illumination unit (profile length: 1,100 mm)

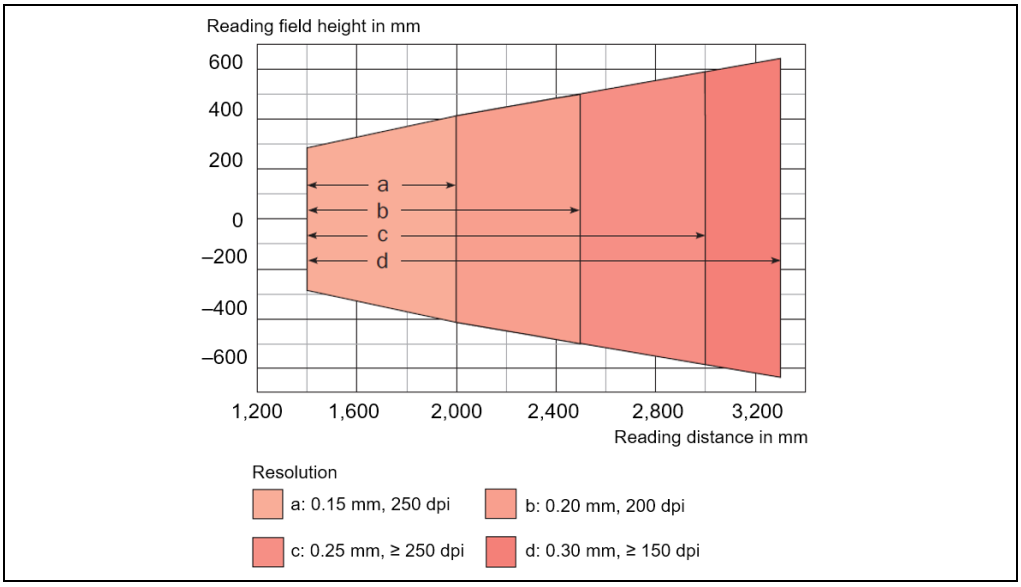
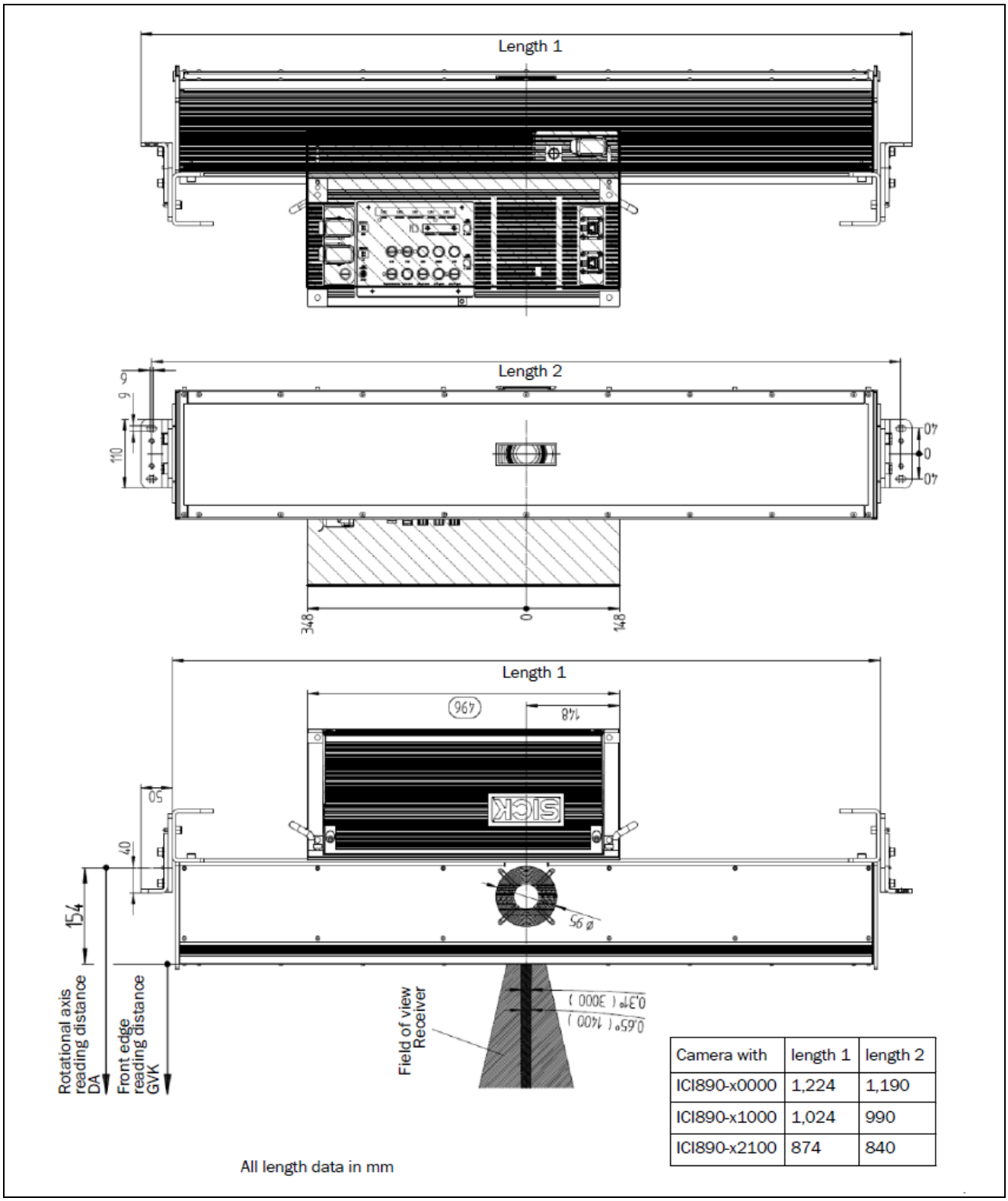


Fig. 66: Reading ranges of the camera system 3: ICD890 with ICI890-x0xxx / ICI890-x3xxx illumination unit

9.6 Dimensional drawing of the ICR880/890 camera systems



Camera with	length 1	length 2
ICI890-x0000	1,224	1,190
ICI890-x1000	1,024	990
ICI890-x2100	874	840

Fig. 67: Dimensions of the ICR880/890 camera system

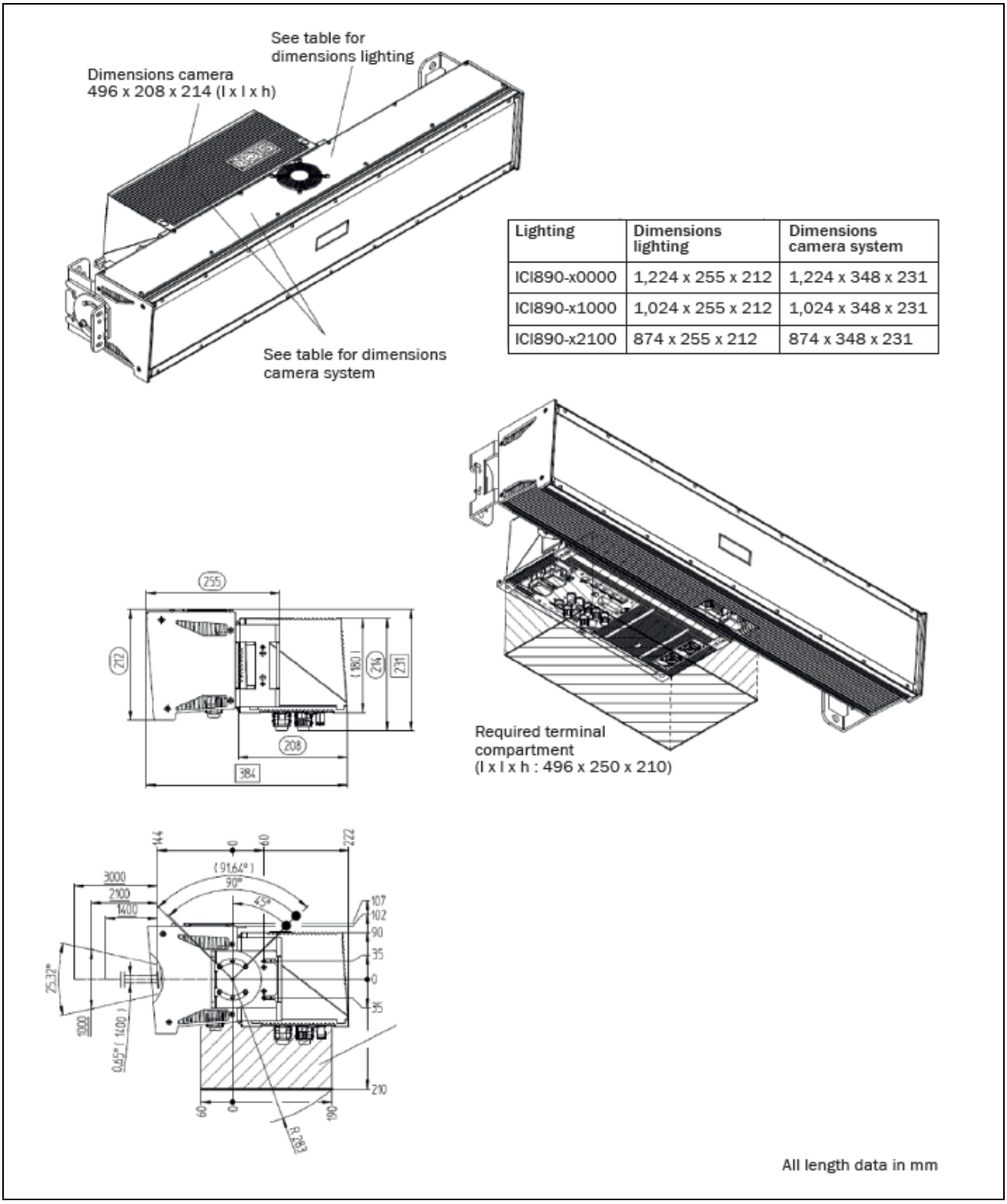
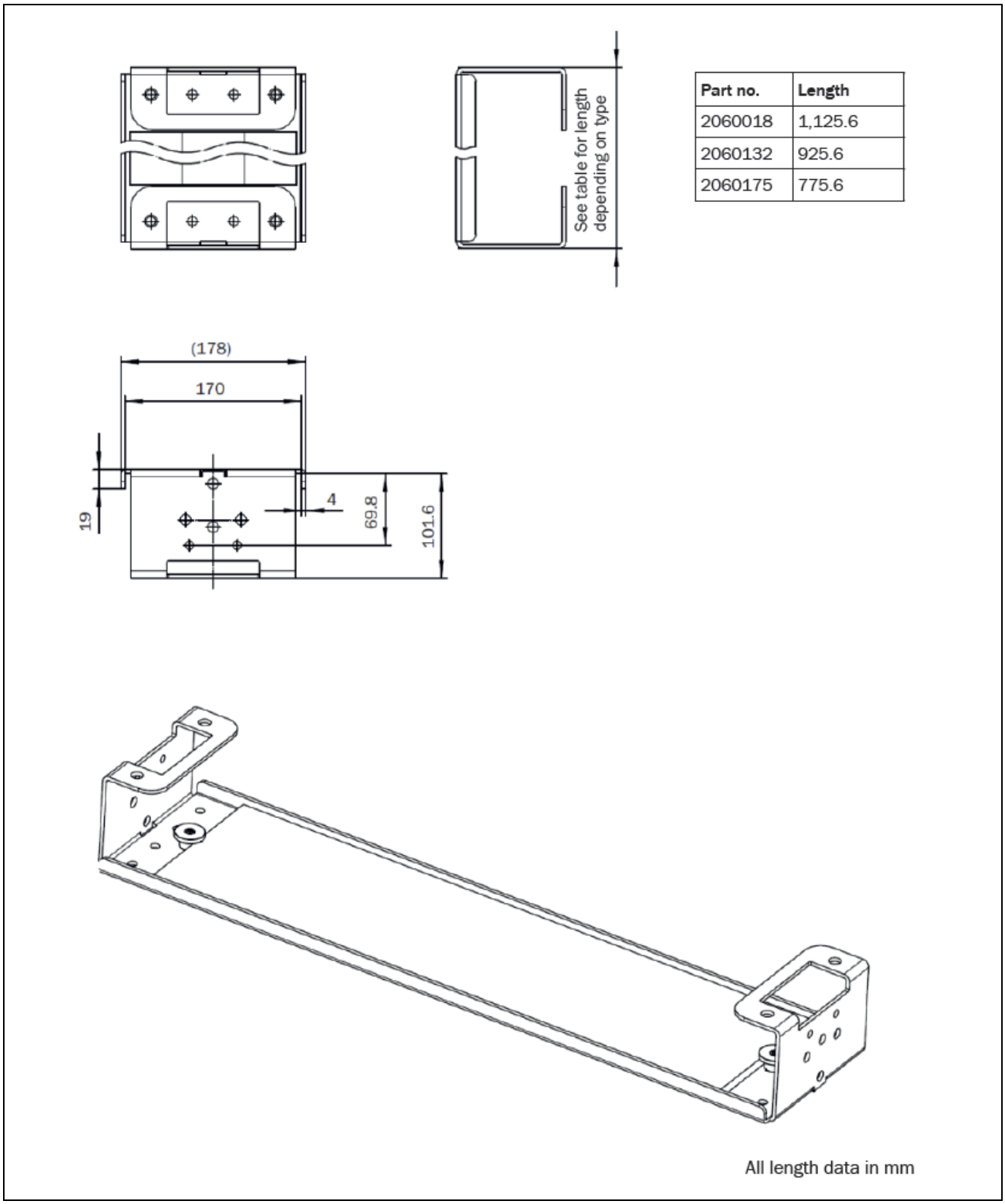


Fig. 68: Overall dimensions of the ICR880/890 camera system and required terminal compartment

9.7 Dimensional drawing of the deflector mirror



Part no.	Length
2060018	1,125.6
2060132	925.6
2060175	775.6

Fig. 69: Dimensional drawing of the deflector mirror

Dimensional drawings of the mirror module mounted underneath the conveyor

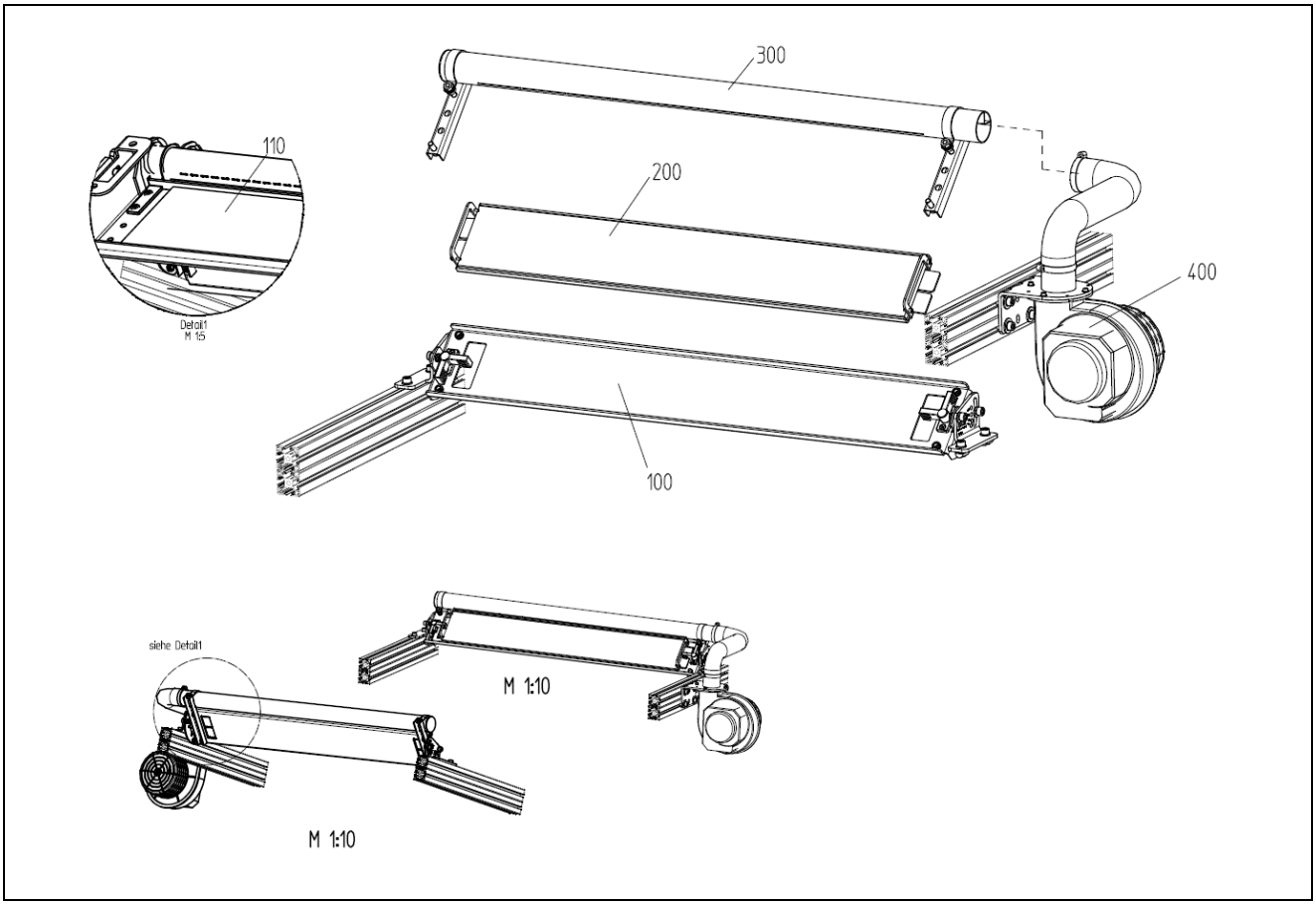


Fig. 70: Dimensional drawings of the mirror module mounted underneath the conveyor

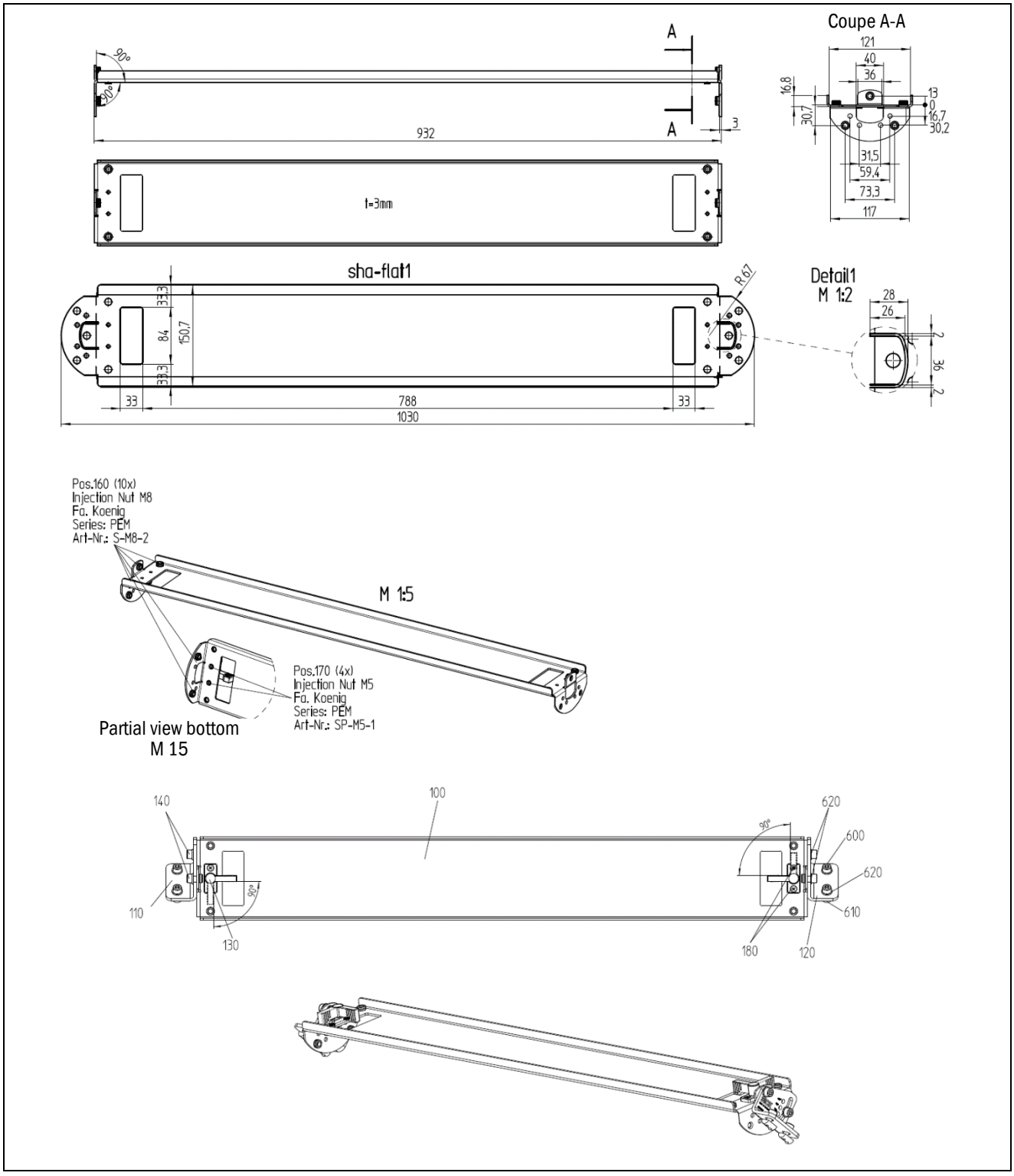


Fig. 71: Dimensional drawing of the base support (mirror module mounted underneath the conveyor)

9.8 Compliance with EU directives

EU declaration of conformity (extract)

The undersigned, who represents the manufacturer below, hereby declares that the product complies with the regulations of the EU directive(s) below (including all relevant changes), and that it is based on the relevant standards and/or technical specifications.

Complete EU declaration of conformity for download

You can call up the EU declaration of conformity and the current operating instructions for the protective device by entering the item number in the search field at www.sick.com (part number: see the type label entry in the **Ident. no.** field).

10 Figures and tables

10.1 List of tables

10.2 List of figures

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