

GLS621

Grid localization

SICK
Sensor Intelligence.



Described product

GLS621

Manufacturer

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Original document

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1 About this document

1.1 Information on the operating instructions

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

Prerequisites for safe work are:

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

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



NOTE

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

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

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

1.2 Explanation of symbols

Warnings and important information in this document are labeled with symbols. Signal words introduce the instructions and indicate the extent of the hazard. To avoid accidents, damage, and personal injury, always comply with the instructions and act carefully.



DANGER

... indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.



WARNING

... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.



CAUTION

... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.



NOTICE

... indicates a potentially harmful situation, which may lead to material damage if not prevented.



NOTE

... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

1.3 Further information

More information can be found on the product page.

The call is made via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

The following information is available depending on the product:

- Data sheets
- This document in all available language versions
- CAD files and dimensional drawings
- Certificates (e.g., declaration of conformity)
- Other publications
- Software
- Accessories

2 Safety information

2.1 Intended use

The GLS621 is used for automatic localization of automatic guided vehicles (AGVs) in warehouses, logistics and distribution. The device detects and decodes 2D codes which are attached in the form of a grid on the floor. Using the data provided by the device, the AGV is localized and repositioned by a higher-level controller (e.g. PLC). The device supports 4Dpro connectivity.

The device is primarily designed for use in industrial and logistics areas. The device meets the applicable requirements for industrial robustness, interfaces and data processing.

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

2.2 Improper use

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

- The device does not constitute a safety component in accordance with the respective applicable safety standards for machines.
- The device must not be used in explosion-hazardous areas, in corrosive environments or under extreme environmental conditions.
- The device must not be operated in the temperature range below 0 °C.
- Any use of accessories not specifically approved by SICK AG is at your own risk.



WARNING

Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- Product should be used only in accordance with its intended use.
 - All information in the documentation must be strictly observed.
 - Shut down the product immediately in case of damage.
-

2.3 Cybersecurity

Overview

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive cybersecurity concept. A suitable concept consists of organizational, technical, procedural, electronic, and physical levels of defense and considers suitable measures for different types of risks. The measures implemented in this product can only support protection against cybersecurity threats if the product is used as part of such a concept.

You will find further information at www.sick.com/psirt, e.g.:

- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

2.4 Limitation of liability

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

- Non-adherence to the product documentation (e.g., operating instructions)
- Incorrect use
- Use of untrained staff
- Unauthorized conversions or repair
- Technical modifications
- Use of unauthorized spare parts, consumables, and accessories

2.5 Modifications and conversions



NOTICE

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

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

2.6 Requirements for skilled persons and operating personnel



WARNING

Risk of injury due to insufficient training.

Improper handling of the device may result in considerable personal injury and material damage.

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

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"> ■ Basic practical technical training ■ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	<ul style="list-style-type: none"> ■ Practical electrical training ■ Knowledge of current electrical safety regulations ■ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	<ul style="list-style-type: none"> ■ Basic knowledge of the computer operating system used ■ Basic knowledge of the design and setup of the described connections and interfaces ■ Basic knowledge of data transmission ■ Basic knowledge of the 2D technology (Data Matrix code, QR code)
Operation of the device for the particular application	<ul style="list-style-type: none"> ■ Knowledge of the operation and control of the devices in their particular application ■ Knowledge of the software and hardware environment for the particular application

2.7 Operational safety and specific hazards

Please observe the safety notes and the warnings listed here and in other sections of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.

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

The product is fitted with LEDs in risk group 0. The accessible radiation from these LEDs does not pose a danger to the eyes or skin.



CAUTION

Optical radiation: LED risk group 1, visible radiation, 400 nm to 780 nm

The LEDs may pose a danger to the eyes in the event of incorrect use.

- Do not look into the light source intentionally.
 - Do not open the housing. Opening the housing will not switch off the light source. Opening the housing may increase the level of risk.
 - Comply with the current national regulations on photobiological security of lamps and lamp systems.
-

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



CAUTION

Optical radiation: Class 1 Laser Product

The accessible radiation does not pose a danger when viewed directly for up to 100 seconds. It may pose a danger to the eyes and skin in the event of incorrect use.

- Do not open the housing. Opening the housing may increase the level of risk.
 - Current national regulations regarding laser protection must be observed.
-

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

For both radiation types:

It is not possible to entirely rule out temporary disorienting optical effects, particularly in conditions of dim lighting. Disorienting optical effects may come in the form of dazzle, flash blindness, afterimages, photosensitive epilepsy, or impairment of color vision, for example.



CAUTION

Risk of injury due to hot device surface.

The surface of the device can become hot.

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

**WARNING****Electrical voltage!**

Electrical voltage can cause severe injury or death.

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

**WARNING****Risk of injury and damage caused by potential equalization currents!**

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

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

3 Product description

3.1 Scope of delivery

Table 2: Scope of delivery

No. of units	Component	Note
1	Product in the type ordered	M12 female connector for Ethernet sealed with tightly-fastened protective cap Without bracket and optional connecting cables
2	Sliding nut, 5.5 mm deep, with M5 threaded fixing hole	Alternative mounting option for the device instead of the threaded mounting hole Use in pairs
1	Printed safety notes, multilingual	Brief information and general safety notes

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

3.2 Type label

The type label gives information for identification of the device.



- ① Type designation according to type code
- ② Part number
- ③ serial number
- ④ Supply voltage, power consumption and maximum current consumption
- ⑤ Certificates and symbols
- ⑥ MAC address (placeholder)
- ⑦ Date of manufacture
- ⑧ Data Matrix code with product data and link to product page

3.3 Product overview

Important information

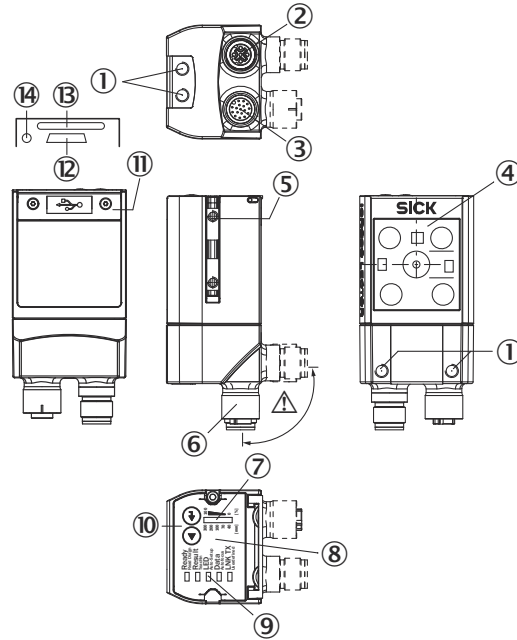


NOTICE

Damage to the swivel connector from over-rotation

- The swivel connector may be moved up to a maximum of 180° from end point to end point. Do not exceed the respective limit position.
- Carry out the rotational movement slowly.

Product overview



- ① 4 threaded mounting holes, M5: blind tapped hole; 5 mm deep; max. depth of thread 5 mm
- ② Ethernet connection (female connector, M12, 4-pin, D-coded)
- ③ Power/Serial Data/CAN connection (male connector, M12, 17-pin, A-coded)
- ④ Viewing window with four LEDs, integrated illumination unit
- ⑤ 2 sliding nuts, M5; 5.5 mm deep; as an alternative method of mounting the product
- ⑥ Swivel connector (swivel range 180°)
- ⑦ Bar graph
- ⑧ beeper (under housing cover)
- ⑨ 5 status LEDs (2 levels)
- ⑩ 2 function keys
- ⑪ Cover with 2 fixing screws (TX6 key, captive)
- ⑫ USB connection (female connector, Micro-B type, 5-pin, for temporary use as service interface)
- ⑬ Card slot for microSD memory card
- ⑭ Status LED, status indicator for the microSD memory card

Further topics

- [Dimensional drawing](#)

3.4 Integrated illumination unit

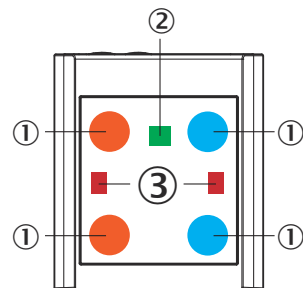
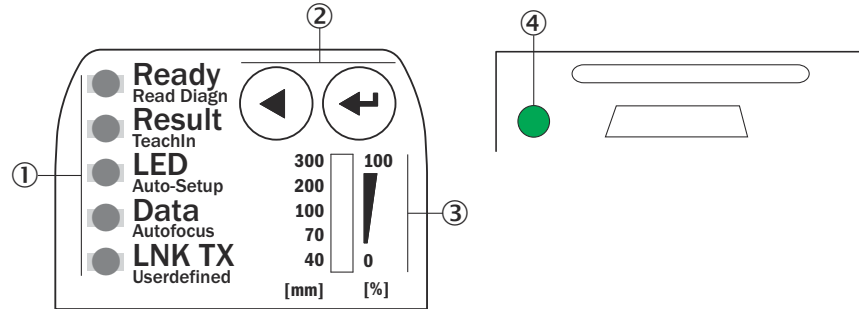


Figure 1: Integrated illumination unit

- ① 4 LEDs (color: visible red light, visible blue light; position: 2 on the left, 2 on the right)
- ② Feedback-LED (color: visible green light, e.g. for Good Read)
- ③ Laser alignment aid, can be deactivated (color: visible red light)

3.5 Display and operating elements

Overview



- ① Status LEDs and product functions
- ② Function buttons
- ③ Bar graph
- ④ Status LED of the microSD memory card

Important information



NOTE

The function keys are not available.

Status LEDs

Table 3: Status LEDs

Display	LED	Color	Status
Ready		Green	The product is ready for operation
		Red	Hardware or software error
Result		Green	Read operation successful
		Red	Read operation unsuccessful
LED		Green	Read mode: illumination on, internal reading interval open
Data		Yellow	Data output via host interface
LNK TX		Green	Data traffic via Ethernet
MicroSD		Green	The product does not directly signal access (read, write) to the memory card. The MicroSD status LED shows when the saving process is finished when permanently saving the parameter set. <ul style="list-style-type: none"> • When the device starts saving, the MicroSD status LED goes out. • When the product has finished saving, the MicroSD status LED lights up green again.

● = illuminated; ● (with lightning bolt) = flashing

PROFINET operation (single port)

The Ready status LED signals the product status in the PROFINET network.

Table 4: LEDs in PROFINET operation (single port)

Ready LED		Product status	Remarks
Green components	Red components		
●	○	The product is ready for operation.	
●	● Flashes every 0.5 seconds.	PROFINET is activated in the product. The product is not connected to the PROFINET IO controller (PLC) or the product is not configured.	To not use PROFINET, deactivate PROFINET. In the default configuration of the product, automatic PROFINET network detection is activated. This detects during startup whether the product is in a PROFINET environment and activates PROFINET automatically. To apply the changed settings, permanently save the changes and restart the product.
●	●	The flashing function is activated via the configuration software.	The red and green components of the LED flash alternately. Prerequisite: PROFINET is activated in the product.

● = lights up; ● = flashes; ○ = does not light up

Product functions

Table 5: Product functions

Function	Description
Read Diagn (read diagnosis)	Percentage evaluation: the product records images. The product uses the current settings of the read properties to decode them. With the 0 to 100% bar graph, the product shows the read rate of the last 10% (90% to 100%). The bar graph display is activated in standard read mode.
Autofocus	The product adjusts to the working distance. The product permanently stores this working distance.

3.6 Acoustic status indicator

The beeper (buzzer) is located under the cover on the top of the product. The beeper can be switched off.

In read mode, the beeper indicates a selectable event with a signal tone (default: event = Good Read).

3.7 Function and use

The product localizes automated guided vehicles (AGVs) using 2D codes.

The product is mounted on the underside of the AGV. The 2D codes are attached in the form of a grid on the floor. The individual 2D codes are numbered and contain position information. The product detects and decodes 2D codes. The product uses the host interface to send the read data, the additionally detected X- and Y-coordinates and the angle of shift to a higher-level controller (e.g. PLC). Using this data, the AGV is localized and repositioned by the controller.

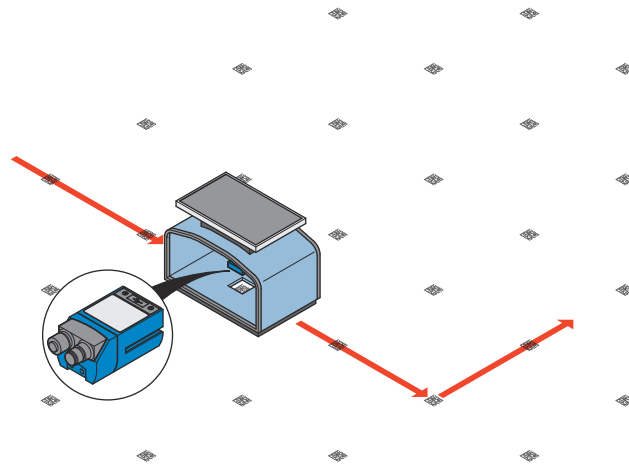
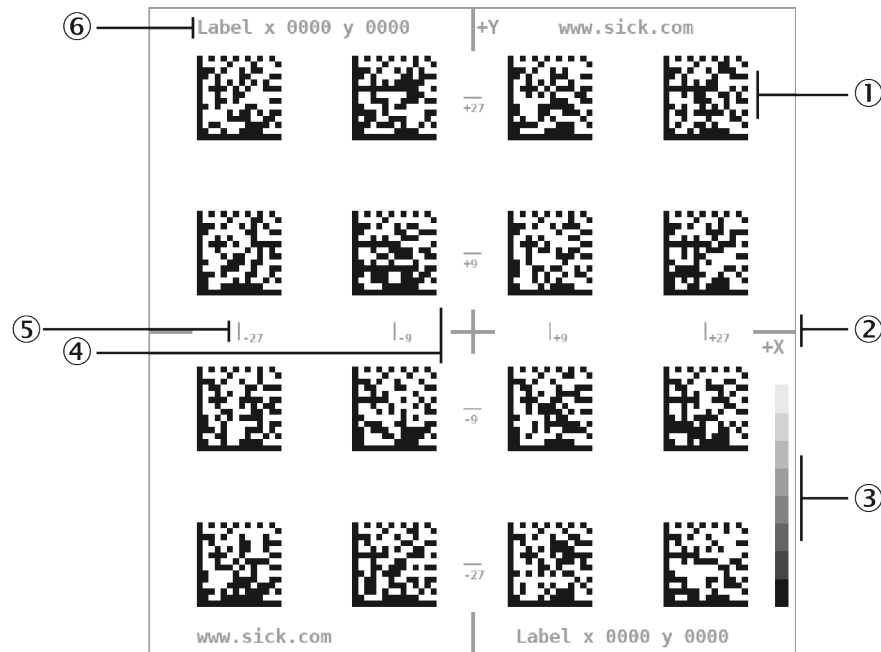


Figure 2: Application description: localization and positioning of the AGV

3.8 2D codes

Multicode label

Multicode labels can be used for localization. A multicode label consists of several Data Matrix codes. We recommend using the SICK multicode label as it is optimally tailored to the application. Using the multicode label from SICK also enables the highest travel speeds to be achieved. The multicode label is available as an accessory.



- ① Data Matrix code
- ② Helper line for alignment
- ③ Grayscale (testing of print quality of the customer print)
- ④ Center point of the multicode label
- ⑤ Distance between code and center point (testing of the dimensions of the customer print)
- ⑥ Number of the label (letters and numbers can be adjusted for the customer)

Single 2D codes

Alternatively, single 2D codes provided by the customer can be used. The 2D codes must meet specific requirements on the code resolution depending on the working distance and the mounting direction.

Further topics

- Requirements on the code resolution of single 2D codes: [Typical reference values during operation](#)

4 Transport and storage

4.1 Transport



NOTICE

Damage due to improper transport!

- The product must be packaged with protection against shock and damp.
 - Recommendation: Use the original packaging.
 - Note the symbols on the packaging.
 - Do not remove packaging until immediately before you start mounting.
-

4.2 Unpacking

- To protect the device against condensation, allow it to equilibrate with the ambient temperature before unpacking if necessary.
- Handle the device with care and protect it from mechanical damage.
- To avoid ingress of dust and water, only remove the protective elements, e.g. protective caps of the electrical connections just before attaching the connecting cable.

4.3 Transport inspection

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

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



NOTE

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

4.4 Storage

- Electrical connections are provided with a protective cap.
- Do not store outdoors.
- Store in a place protected from moisture and dust.
- Recommendation: Use the original packaging.
- To allow any residual dampness to evaporate, do not package in airtight containers.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: [see "Technical data", page 42](#).
- Relative humidity: [see "Technical data", page 42](#).
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Mounting instructions

- Observe the technical data.
- Protect the sensor from direct and indirect sunlight.
- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- The mounting site has to be designed for the weight of the device.
- Ensure a good dissipation of excess heat from the device to the surroundings, in particular at higher ambient temperatures. Good heat transfer from the device can be achieved, for example, by using a bracket on the mounting base or by ensuring that the back of the device is located at a sufficient distance from the wall of an enclosure.
- Make sure the device has a clear view of the codes.
- The substrate over which the AGV moves must be level.

5.2 Mounting location

5.2.1 Determining alignment

Alignment at maximum reading field width:

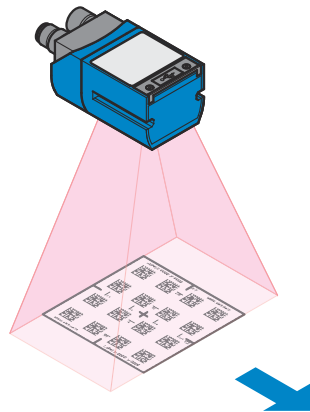


Figure 3: Mounting in the direction of movement of the AGV

Alignment at maximum transport speed of the AGV:

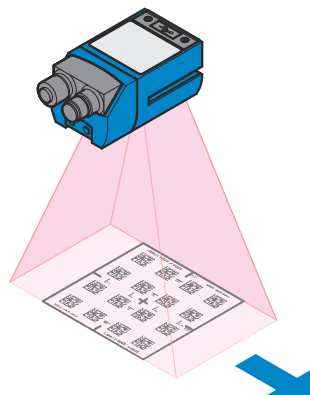


Figure 4: Mounting opposite to the direction of movement of the AGV

The selected alignment affects the speed of the AGV and the size of the field of view depending on the configured working distance and the 2D codes used, see ["Typical reference values during operation"](#), page 47.

5.2.2 Working range

The possible working range for reading is 70 mm to 500 mm. These values refer to the reading of a Data Matrix code with a resolution of 0.7 mm. The working distance is measured starting from the housing edge.

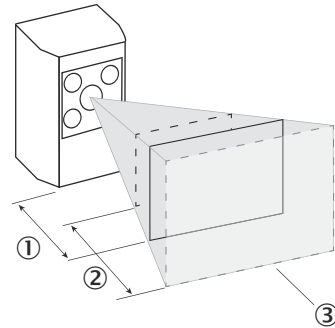


Figure 5: Field of view geometry

- ① Workspace
- ② Depth of field
- ③ Field of view

The device uses the **Auto Setup** function to automatically set the focus position to the working distance. The function can be executed in SOPAS ET.

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



NOTE

After successful calibration, do not change the working distance of the device and the reading distance set in SOPAS ET.

If these settings are changed, the device must be recalibrated.

The set working distance effects the speed of the AGV and the size of the field of view depending on the mounting alignment and the 2D codes used, [see "Typical reference values during operation", page 47](#).

5.2.3 Mounting angle

Important information



NOTE

If problems with reflections occur, use a polarizing filter (part number: 2088228), [see "Accessories", page 46](#).



NOTE

Use the latest version of the SOPAS ET configuration software.

Versions older than SOPAS ET Version 2018.04 are not compatible with the device.

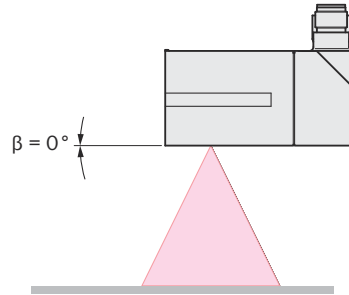
Adjusting the mounting angle

Align the device at a 90° angle to the surface so that the beta (β) and gamma (γ) angles are set to exactly 0°. Check the beta (β) and gamma (γ) angles in SOPAS ET, [see "Configuring the product manually", page 31](#).

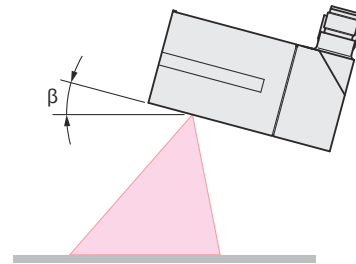
Adjustment of the alpha angle (α) is only relevant when using single 2D codes (not a multicode label). Adjust the **alpha** (α) angle to change the coordinate system of the field of view, [see "Configuring the product manually", page 31](#).

Beta mounting angle (β)

- ① Recommended:
 $\beta = 0^\circ$



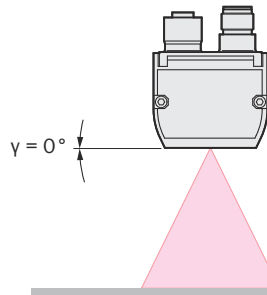
- ② Not recommended:
 $\beta < 0^\circ$ or $\beta > 0^\circ$



- ① Recommended: $\beta = 0^\circ$
② Not recommended: $\beta < 0^\circ$ or $\beta > 0^\circ$

Gamma mounting angle (γ)

- ① Recommended:
 $\gamma = 0^\circ$



- ② Not recommended:
 $\gamma < 0^\circ$ or $\gamma > 0^\circ$

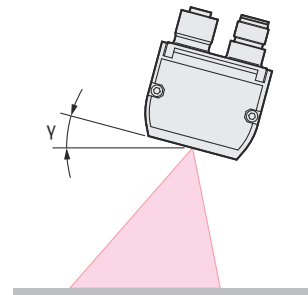


Figure 6: Gamma mounting angle (γ)

- ① Recommended: $\gamma = 0^\circ$
② Not recommended: $\gamma < 0^\circ$ or $\gamma > 0^\circ$

Alpha mounting angle (α)

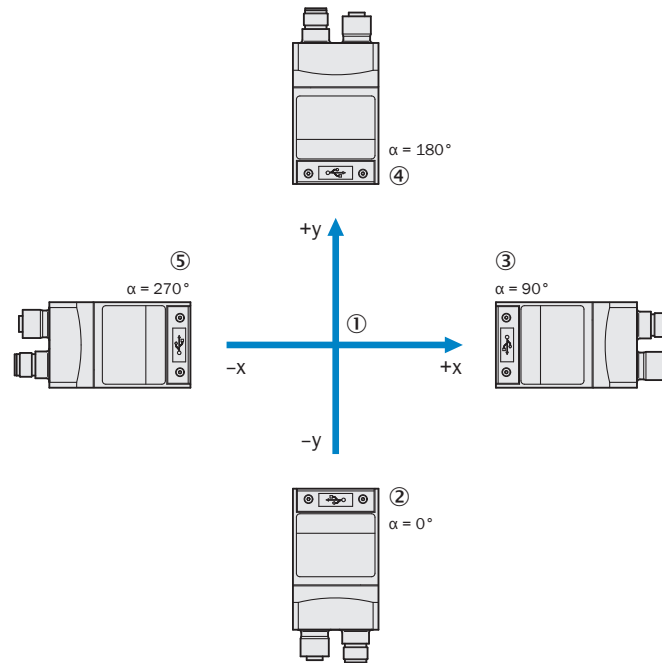


Figure 7: Mounting bracket α

- ① Coordinate system of the field of view
- ② Angle $\alpha = 0^\circ$ (default value), direction of motion according to + y
- ③ Angle $\alpha = 90^\circ$, direction of motion according to - x
- ④ Angle $\alpha = 180^\circ$, direction of motion according to - y
- ⑤ Angle $\alpha = 270^\circ$, direction of motion according to + x

5.3 Assembling the product

Prerequisites

- 4 or 2 M5 screws for mounting the product on mounting equipment

Approach

1. Mount the product on suitably prepared mounting equipment using M5 screws and by means of the provided threaded mounting holes or sliding nuts.
 - Screw the screws no more than 5 mm into the threaded mounting holes or sliding nuts.
 - Use the threaded mounting holes in pairs on the front or bottom of the product or the two sliding nuts on the side of the product.
 - Attach the optional SICK mounting equipment ordered separately using the sliding nuts on the product.
2. Align the product taking into consideration the field of view and the application circumstances.
3. Connect the product to interfaces and supply voltage when disconnected from voltage.
4. Start the product.
- ✓ The **Ready** status LED lights up green.
5. Perform fine tuning.

Further topics

- [see "Typical reference values during operation", page 47](#)
- Mounting systems are available as accessories: [Accessories](#)
- [Connecting](#)

6 Electrical installation

6.1 Wiring instructions



NOTE

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

The call is made via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).



NOTE

Pre-assembled cables with open cable end at one end:

Information about pin, signal and wire color assignments can be found in the appendix, see "[Signal assignment of cables with open cable end at one end](#)", page 49.



NOTICE

Faults during operation and defects in the device or the system

Incorrect wiring may result in operational faults and defects.

- Follow the wiring notes precisely.
-

The enclosure rating stated in the technical data is achieved only with screwed plug connectors or protective caps.

Configure the circuits connected to the device as ES1 circuits or as SELV circuits (SELV = Safety Extra Low Voltage). The voltage source must meet the requirements of ES1 and PS2 (EN 62368-1) or SELV and LPS (EN 60950-1).

Protect the device with an external slow-blow fuse at the beginning of the supply cable.

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

Perform all connection work only at ambient temperatures above 0 °C.

The supply voltage must be as specified in the technical data, see "[Technical data](#)", page 42.

Wire cross-sections in the supply cable from the customer's power system must be implemented in accordance with the applicable standards.

In the case of open end cables, make sure that bare wire ends do not touch. Wires must be appropriately insulated from each other.

Wire cross-sections of the data and switching signal cables have to also be designed in accordance with the applicable national standards.

6.1.1 Data cables

Important information



NOTE

Layout of data cables

- Use screened data cables with twisted-pair wires.
 - Implement the screening design correctly and completely.
 - To avoid interference, always use EMC-compliant cables and layouts. This applies, for example, to cables for switched-mode power supplies, motors, clocked drives, and contactors.
 - Do not lay cables over long distances in parallel with power supply cables and motor cables in cable channels.
-

Length of cable and data transmission rate

The maximum length of cable between device and, for example, host computer depends on the interface type and the data transmission rate.

Further topics

- For information on data transmission rates and lengths of cable: [Wiring the data interface](#)

6.2 Prerequisites for safe operation of the device



WARNING

Risk of injury and damage caused by electrical current!

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

- Dangerous voltages are applied to the metal housings.
- Devices will behave incorrectly or be destroyed.
- Cable shielding will be damaged by overheating and cause cable fires.

Remedial measures

- Only skilled electricians should be permitted to carry out work on the electrical system.
 - If the cable insulation is damaged, disconnect the voltage supply immediately and have the damage repaired.
 - Ensure that the ground potential is the same at all grounding points.
 - Where local conditions do not meet the requirements for a safe earthing method, take appropriate measures. For example, ensure low-impedance and current-carrying equipotential bonding.
-

The device is connected to the peripheral devices (any local trigger sensor(s), system controller) via shielded cables. The cable shield – for the data cable, for example – rests against the metal housing of the device.

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

This is achieved by complying with the following conditions:

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

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

Remedial measures

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



NOTICE

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

Measures for widely distributed system installations

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

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

Measures for small system installations

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

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



NOTICE

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

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

6.3 Connection diagrams

6.3.1 Service mode connection schematic

This operating mode is recommended for initial commissioning of the product.



NOTE

The USB interface is used in industrial environments only as a service interface for temporary use (e.g. for configuration, troubleshooting). Use as a host interface while the system is in operation is not supported.

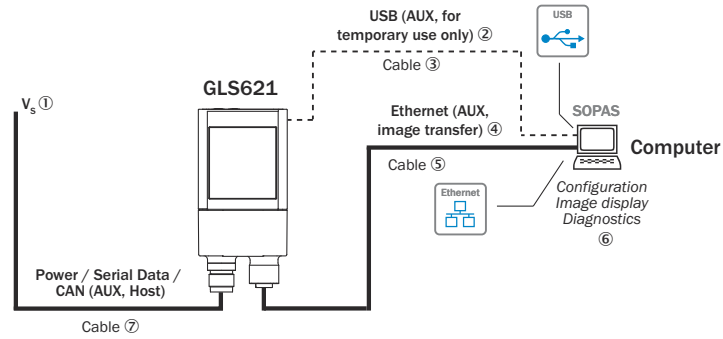


Figure 8: Connection block diagram for commissioning

- ① Supply voltage V_s , ($V_s = U_V$)
- ② USB, alternative to Ethernet AUX port, USB for temporary use only as a servicing interface
- ③ Adapter cable (male connector, USB, Micro-B type/male connector, USB, type A)
- ④ Ethernet, AUX interface (alternative to USB)
- ⑤ Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)
- ⑥ Configuration with SOPAS ET, image display or reading diagnostics
- ⑦ Cable with open end

6.3.2 Connection principle for read mode

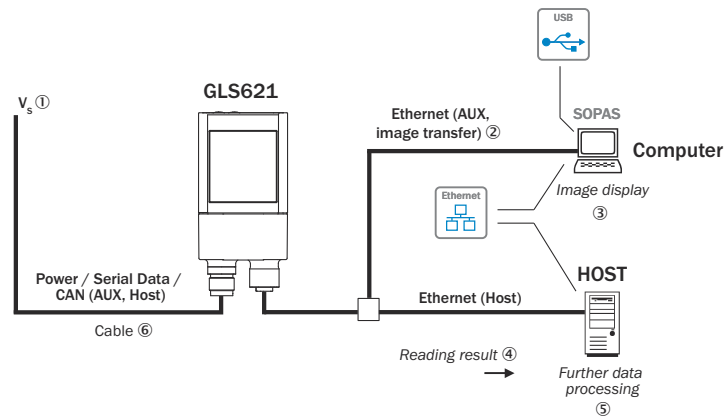


Figure 9: Connection block diagram for read mode

- ① Supply voltage V_s , ($V_s = U_V$)
- ② Ethernet, AUX interface (image transmission)
- ③ Image display
- ④ Read result
- ⑤ Data further processing
- ⑥ Cable with open end

6.4 Pin assignments of electrical connections

6.4.1 Power/Serial Data/CAN

Pin assignment

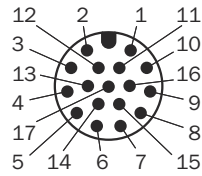


Figure 10: Male connector, M12, 17-pin, A-coded

Pin	Signal	Function
1	GND	Ground
2	V _s	Supply voltage
3	CAN L	CAN bus (IN/OUT)
4	CAN H	CAN bus (IN/OUT)
5	TD+ (RS-422/485), host	Host interface (sender+)
6	TD- (RS-422/485), host TxD (RS-232), host	Host interface (sender-)
7	TxD (RS-232), Aux	AUX interface (sender)
8	RxD (RS-232), Aux	AUX interface (receiver)
9	N.c.	Not connected
10	N.c.	Not connected
11	RD+ (RS-422/485), host	Host interface (receiver+)
12	RD- (RS-422/485), host RxD (RS-232), host	Host interface (receiver-)
13	N.c.	Not connected
14	N.c.	Not connected
15	N.c.	Not connected
16	N.c.	Not connected
17	N.c.	Not connected
-	-	Shield

6.4.2 Ethernet

Pin assignment

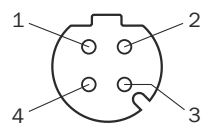


Figure 11: M12 female connector, 4-pin, D-coded

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

6.5 Connecting

6.5.1 Connecting the supply voltage

The voltage source meets the requirements of ES1 and PS2 (EN 62368-1) or SELV and LPS (EN 60950-1).

Table 6: Required supply voltage V_S and power output

Supply voltage V_S	Power source: required power output
DC 12 V ... 24 V \pm 20%	Maximum 25 W

Protecting the supply cables

To ensure protection against short-circuits/overload in the customer's supply cables, appropriately choose and protect the wire cross-sections used.

The following standards must be observed in Germany:

Observe applicable standards (Germany):

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

Connecting device without connection module

For a supply voltage of DC 12 V to 24 V \pm 20%, protect the device with a separate 2 A fuse.

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

6.5.2 Wiring the data interface

Wiring the Internet interface

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



NOTE

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

Wiring the serial data interface

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

Table 7: Data transmission rates and recommended maximum lengths of cable

Interface	Data transmission rate	Distance to the target computer (host)
RS-232	Up to 19.2 kBd	Max. 15 m
	38.4 kBd ... 57.6 kBd	Max. 5 m
	115.2 kBd ... 500 kBd	< 2 m
RS-422 ¹⁾	Up to 38.4 kBd	Max. 1,200 m
	38.4 kBd ... 57.6 kBd	Max. 500 m
	57.6 kBd ... 500 kBd	Max. 10 m

¹⁾ For RS-422-compatible cable and corresponding cable termination as per specification



NOTICE

Risk of damage to the internal interface modules!

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

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

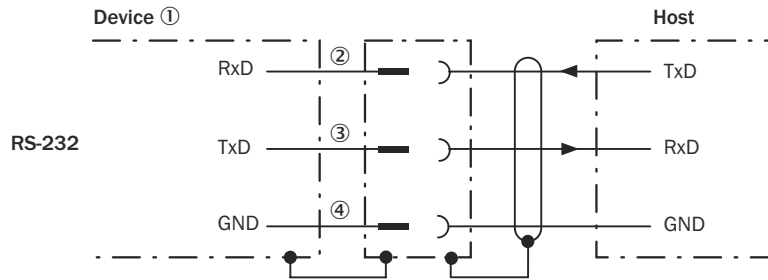


Figure 12: Wiring of the RS-232 serial data interface

- ① Device
- ②...④ Pin assignment: see RS-232 pin assignment for the respective device

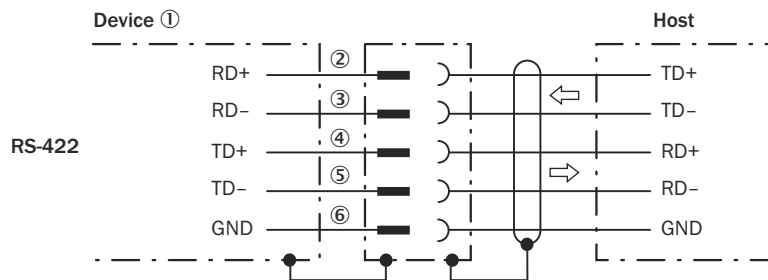


Figure 13: Wiring of the RS-422 serial data interface

- ① Device
- ②...⑥ Pin assignment: see RS-422 pin assignment for the respective device



NOTE

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

6.5.3 CAN interface

Activate the CAN data interface in the device using the SOPAS ET configuration software. Make further settings in the device corresponding to the function of the device in the system configuration.

7 Commissioning

7.1 SOPAS ET configuration software

Parameterization of the device, diagnostics in the event of an error is performed using the SOPAS Engineering Tool (SOPAS ET) software.



NOTE

Use the latest version of the SOPAS ET configuration software. Versions older than SOPAS ET Version 2018.04 are not compatible with the device.

To parameterize the device, you will require a computer with SOPAS ET installed and a free Ethernet connection (recommended) or, alternatively, a free USB interface.



NOTE

The most up-to-date version of the SOPAS ET software can be downloaded from www.sick.com/SOPAS_ET. The respective system requirements for installing SOPAS ET are also specified there.

Installing and launching SOPAS ET

1. Start computer.
2. Download and install the latest version of the SOPAS ET configuration software, as well as current device description files (*.sdd) for the device variant from the online product page for the software by following the instructions provided there. In this case, select the "Complete" option as suggested by the installation wizard. Administrator rights may be required on the computer to install the software.
3. Start "SOPAS ET" after completing the installation.
4. Establish a connection between SOPAS ET and the device.
- ✓ The connection wizard starts automatically.
The following IP addresses are configured by default on the device:
 - IP address P1: 192.168.0.1
 - Subnet mask: 255.255.255.0
5. Double-click on the desired device to add it to the project.
6. To open the device window, double-click the device in the **New Project** window.
- ✓ SOPAS ET establishes communication with the device and loads the associated device description file for the device.

7.2 Configuration with SOPAS ET

7.2.1 Configuring the product manually

1. In the **Online Image** window, click the **Live** button.
- ✓ In **Live** mode, the product starts recording images consecutively. The product uses the current settings to decode them. The effects of any parameter changes are thus directly visible.



NOTE

In **Setup** mode, data output via the host interface is deactivated.

2. Open the **Position** window.
3. Align the product at a 90° angle to the surface so that the **beta** (β) and **gamma** (γ) angles of the position sensor display exactly 0° in SOPAS ET, [see "Mounting angle", page 20](#).
4. Only relevant when using single 2D codes (not a multicode label): Adjust the **Alpha** (α) parameter to change the coordinate system of the field of view. The **Alpha** (α) parameter is set to 0° by default, [see "Mounting angle", page 20](#).

5. Lay the following calibration code in the field of view of the product:



NOTE

The calibration code must correspond exactly to the 10 mm x 10 mm dimensions. Remeasure the calibration code after printing. If the dimensions deviate, contact SICK service and request a new calibration code.



6. Open the **Camera and illumination** window.
7. Adjust the **Exposure time** and **Brightness** parameters to the working distance of the product, see "[Typical reference values during operation](#)", page 47.
8. Only relevant if QR codes are being used: Set image frequency to 33 Hz.
9. To set the **Reading distance** parameter, click on the **Auto** button.
- ✓ The **Auto-Setup** window appears.
10. Follow the instructions in SOPAS ET.
11. Ensure that the calibration code is in the field of view of the product and click the **Calibration** button.
- ✓ If calibration was successful, the indicator light lights up green.





NOTE

After successful calibration, do not change the working distance of the product and the reading distance set in SOPAS ET.

If these settings are changed, the product must be recalibrated.

12. Only relevant if not using the multicode label: Open the **Code Configuration** window. Deactivate the **Multicode Label** parameter.
13. Relevant if individual Data Matrix codes are being used:
 - Set **Minimum module size** to "Code resolution - 0.2 mm".
 - Set **Maximum module size** to "Code resolution + 0.2 mm".
 - For example: With a code resolution of 0.5 mm, the **Minimum module size** must be set to 0.3 mm and the **Maximum module size** to 0.7 mm.
14. Relevant if individual QR codes are being used:
 - Set **Code size** to **medium (> 48/48.px)**.
15. Make settings for additional functions during planned operation such as trigger, data processing, data interface, etc.
16. Open the **Online image** window.
17. Click on the **Operation** button to change back to operation.

7.2.2 Complete the configuration

1. To permanently save the parameter set in the product: Click the  button.
2. To permanently save the parameter set on the PC: Click the  button.

7.3 Saving the parameter set

The product is configured for the application using SOPAS ET. The parameter set is initially adjusted in the working memory of the product. You can permanently save the parameter set in SOPAS ET and then load it into the permanent parameter memory of the product. To be able to restore the setting to a replacement product, for example in the event of a product failure, you should also save the parameter set externally.

Approach

1. Permanently saving the parameter set of the product in SOPAS ET: **Parameters > Save permanently.**
- ✓ The product stores the parameter set internally in the permanent parameter memory.
- ✓ The product additionally saves the parameter set in the external storage medium.
2. Also save the parameter set manually as a project file (*.sopas) on the computer.

7.4 External data back-up

Manual data backup using project file

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

Automatic data backup

An additional storage medium is required to automatically save the parameter set to an external location. The product is permanently connected to the external storage medium.

External storage medium

- MicroSD memory card

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

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

Use in PROFINET

- 1 After starting, the product loads the last permanently stored internal parameter set to its working memory.
- 2 The product then searches for a valid parameter set in the optional external memory card slot. If there is a positive search result, the product overwrites the existing parameter set in its working memory with this external parameter set.
- 3 If the PROFINET controller sends a parameter set, the product again overwrites the parameter set in its working memory. These changes are lost when the product is switched off. The PROFINET controller must then again send the most recently valid parameter values each time the product is restarted (supply voltage is switched on).

7.5 MicroSD memory card

MicroSD memory card

The product has a card slot for a microSD memory card integrated in the housing. The memory card is used as an external storage medium. The microSD memory card can also be ordered as an optional accessory. To ensure that the memory card functions reliably, only use card types (industrial standard) approved by SICK.

Functions

Function	Description
Cloning	Save currently valid save parameter set on an external storage medium. The externally stored parameter set is also updated automatically each time the parameterization is permanently saved. The cloning function provides the means, for example in the event of a product fault, for manual transmission of the parameter set to an replacement product of the same type.

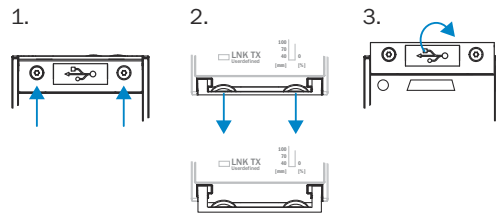
Other functions are available upon request.

Further topics

- [Inserting and removing memory card](#)
- [External data back-up](#)

7.6 Inserting and removing memory card

Overview



Important information



NOTICE

Loss of configuration data

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

Prerequisites

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

Approach

Inserting the memory card

1. Undo the screws on the hinged cover.
2. Opening cover:

- Carefully pull the upper edge of the cover away from the housing a little at the level of the hinges on the side. Use both of the recesses on the inside of the cover to do this.
 - Fold the cover upwards starting from the bottom edge.
3. Making sure it is in the correct position, insert the memory card into the slot until it locks into place. When doing this, position the contacts so that they are facing to the rear and upwards, see the card symbol on the product.
 4. Close the cover again. Make sure that the cover is completely flush with the housing.
 5. Re-tighten the screws on the cover.
 6. Switch on the supply voltage for the product.

Remove memory card

1. Undo the screws on the cover.
2. Making sure it is in the correct position, push the memory card into the slot until it is released. When doing this, position the contacts so that they are facing to the rear and upwards, see the card symbol on the product.
3. Remove the memory card.
4. Close the cover again. Make sure that the cover is completely flush with the housing.
5. Tighten the screws on the cover.
6. Switch on the supply voltage for the product.

7.7 Coordinate system

The X- and Y-coordinates provided by the device refer to the zero point of a coordinate system in the field of view of the device. If the X- and Y-values are output in millimeters, the zero point of the coordinate system is located in the center of the field of view.

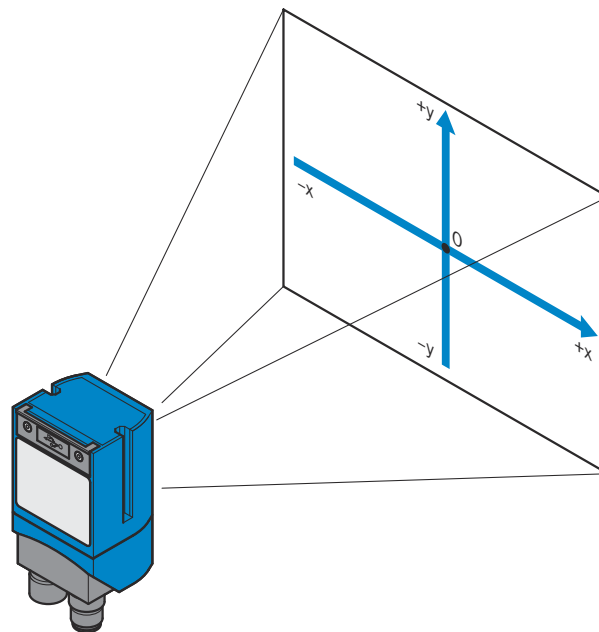


Figure 14: Coordinate system in the field of view of the device

If individual 2D codes are used, the device determines the shift of the code center point to the zero point of the coordinate system.

When using multicode labels, the device determines the shift of the center point of the multicode label relative to the zero point of the coordinate system.

8 Maintenance

8.1 Maintenance plan

During operation, the device works maintenance-free.



NOTE

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



NOTE

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

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

Table 8: Maintenance plan

Maintenance work	Interval	To be carried out by
Check device and connecting cables for damage at regular intervals.	Depends on ambient conditions and climate.	Specialist
Clean housing and viewing window.	Depends on ambient conditions and climate.	Specialist
Check the screw connections and plug connectors.	Depends on the place of use, ambient conditions or operating requirements. Recommended: At least every 6 months.	Specialist
Check that all unused connections are sealed with protective caps.	Depends on ambient conditions and climate. Recommended: At least every 6 months.	Specialist

8.2 Cleaning

Cleaning includes the viewing window and the housing of the device.



NOTICE

Damage to the inspection window.

Reduced read performance due to scratches or streaks on the window!

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



NOTICE

Equipment damage due to improper cleaning.

Improper cleaning may result in equipment damage.

- Only use recommended cleaning agents and tools.
- Never use sharp objects for cleaning.

Cleaning the viewing window

Check the viewing window of the device for accumulated dirt at regular intervals. This is especially important in harsh operating environments (dust, abrasion, damp, fingerprints, etc.).

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

**NOTE**

Static charging may cause dust particles to stick to the viewing window. This effect can be reduced by using an anti-static cleaning agent in combination with the SICK lens cloth (part number 4003353).

The viewing window is made of plastic, see "[Technical data](#)", page 42.

Cleaning procedure:

- ▶ Switch off the device for the duration of the cleaning operation. If this is not possible, use suitable laser protection goggles. These must absorb radiation of the device's wavelength effectively.
- ▶ Clean the viewing window only with a clean, damp, lint-free cloth, and a mild anti-static lens cleaning fluid.

**NOTICE**

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

- If the inspection window is cracked or broken, take the device out of operation immediately for safety reasons and have it repaired by SICK.

Cleaning the housing

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

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

9 Troubleshooting

9.1 General faults, warnings, and errors

Possible faults and corrective actions are described in the table below for troubleshooting. In the case of faults that cannot be rectified using the information below, please contact SICK Service. To find your agency, see the final page of this document.



NOTE

To help us to resolve the matter quickly, please note down the details on the type label.

Situation	Error or fault
Mounting	<ul style="list-style-type: none"> ■ Product poorly aligned to objects with codes (e.g. glare) ■ Incremental encoder (optional) incorrectly positioned
Electrical installation	<ul style="list-style-type: none"> ■ Interfaces of the product incorrectly wired
Configuration	<ul style="list-style-type: none"> ■ Functions not adapted to local conditions, e.g., parameters for the data interface not set correctly ■ Technical limits not observed, e.g., working range, aperture angle ■ Trigger source for read cycle not selected correctly
Operation	<ul style="list-style-type: none"> ■ Product faults (hardware, software)

9.2 Displaying the status log

Overview

The product saves only the last five entries for each error type. The status log is retained even after switching the product off and on again.

Error types

- Information
- Warning
- Error
- Critical fault

Approach

1. Connect the SOPAS ET configuration software to the product.
2. Opening the product in the project tree: **SERVICE > SYSTEM STATUS > SYSTEM INFORMATION** tab.

9.3 Repairs

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

9.4 Returns

- ▶ Only send in devices after consulting with SICK Service.
- ▶ The device must be sent in the original packaging or an equivalent padded packaging.

**NOTE****Optional memory card**

- Check whether there is a memory card in the card slot of the device. If yes, remove the memory card from the faulty device in **de-energized state**.
- Do not send in the memory card!

**NOTE**

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

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

9.5 Replacing the product

Transferring configuration data

The current configuration data of the product to be replaced can be transferred to a replacement product. Data transmission depends on the selected data backup concept when configuring the product to be replaced. The configuration data of the product is combined as a parameter set. The replacement product saves the parameter set to the permanent parameter memory.

Prerequisites:

- Product type identical
- External storage medium with the current configuration data

External storage medium	Prerequisite for configuration backup	Data transmission
MicroSD memory card	The configuration data is automatically saved on the memory card during the last save operation in the product with the Permanent option. The prerequisite is sufficient storage capacity on the microSD memory card.	Connecting a computer to SOPAS ET is not necessary. The product automatically transmits the data.
Project file (*.sopas)	The configuration data is saved independently as a project file (*.sopas) on the computer after configuration of the product to be replaced.	Transfer the configuration data independently via download to the replacement product and save it there permanently.

Removing the product to be replaced:

1. Switch off the supply voltage to the product that is to be replaced.
2. Mark the position and alignment of the product on the bracket or surroundings.
3. Disconnect and remove all connecting cables of the product.
4. Remove the product from the bracket.
5. Backed-up configuration data: if an optional microSD memory card is installed in the product, remove the memory card with the backed-up parameter set.

Putting the replacement product into operation:

1. Backed-up configuration data: install the optional microSD memory card from the product that is to be replaced in the replacement product of the same type.
2. Mount and align the replacement product (see "[Mounting](#)", page 19). When doing so, note the previously applied markings on the bracket or surroundings.

3. Reconnect the connecting cables of the replacement product (see ["Electrical installation", page 24](#)).
4. Switch on the supply voltage for the replacement product.
- ✓ The product starts with its last permanently saved parameter set. In the case of products that have not been used before, this corresponds to the factory default setting.
- ✓ The product searches for external storage media with a valid parameter set. Depending on the success of the search, the replacement product proceeds as follows:
 - When the replacement product detects an external storage medium, the replacement product automatically transfers the configuration data to the permanent product memory.
 - If the replacement product does not detect any external storage media, the replacement product will start with its last permanently stored parameter set. In the case of products that have not been used before, this corresponds to the factory default setting.
5. Establish a connection with the replacement product using the SOPAS ET configuration software.
6. Optional: transfer the configuration data of the product to be replaced by downloading to the replacement product and permanently store this data in the device.

10 Decommissioning

10.1 Disposal

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

The surface of the device can become hot.

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

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

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

Disposing of devices improperly may cause damage to the environment.

Therefore, observe the following information:

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

11 Technical data



NOTE

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

The call is made via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

Please note: This documentation may contain further technical data.

11.1 Features

Focus	Automatic adjustment of the focus position with the Auto-Setup function in SOPAS ET
Integrated illumination unit	4 LEDs (2 on the left, 2 on the right), light color combination: <ul style="list-style-type: none"> • Visible blue light ($\lambda = 470 \text{ nm} \pm 15 \text{ nm}$) • Visible red light ($\lambda = 617 \text{ nm} \pm 15 \text{ nm}$)
LED risk group of illumination unit	Integrated illumination unit (visible blue light, visible red light) Risk group 1 (low risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09. Radiance: <ul style="list-style-type: none"> • $L_B < 10 \times 10^3 \text{ W}/(\text{m}^2\text{sr})$ within 100 seconds; at a distance $\geq 200 \text{ mm}$ • $L_R < 3.7 \times 10^5 \text{ W}/(\text{m}^2\text{sr})$ within 10 seconds; at a distance $\geq 200 \text{ mm}$
Feedback LED (spot in field of view)	Feedback LED Risk group 0 (no risk) according to IEC 62471-1: 2006-07 / EN 62471-1: 2008-09
Feedback LED (spot in field of view)	1 LED: visible green light ($\lambda = 525 \text{ nm} \pm 15 \text{ nm}$)
MTBF of the LEDs (illumination unit and feedback LEDs)	75,000 h, at 25 °C ambient operating temperature
Laser alignment aid (2 points in the field of view)	2 LEDs: visible red light ($\lambda = 630 \text{ nm} \dots 680 \text{ nm}$), can be deactivated
Laser class of the laser alignment aid	Class 1 according to EN/IEC 60825-1: 2014. Complies with 21 CFR 1040.10/11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56 dated 8 May 2019. $P < 0.39 \text{ mW}$ per laser module
Working range	70 mm ... 500 mm (Data Matrix code, resolution: 0.7 mm)
Overspeed ²⁾	$\leq 5 \text{ m/s}$

¹⁾ SOPAS ET configuration software

²⁾ The overspeed is dependent on reading distance, alignment and the 2D code used, see "[Typical reference values during operation](#)", page 47.

11.2 Mechanics/electronics

Connection type	1 male connector, M12, 17-pin, A-coded ¹⁾ 1 female connector, M12, 4-pin, D-coded ¹⁾ 1 female connector, USB, 5-pin, Micro-B type 1 microSD card slot
------------------------	--

Supply voltage V_s	12 V AC ... 24 V DC, $\pm 20\%$ Voltage source in accordance with ES1 and PS2 (EN 62368-1) or SELV and LPS (EN 60950-1).
Power consumption	Operation: 4 W Max. 22 W
Current consumption	Max. 0.8 A at DC 28.8 V
Housing material	Die cast aluminum, plastic
Housing color	Light blue (RAL 5012), black
Viewing window material	Plastic (PMMA), 2 mm thick, with scratch-proof coating
Cover (rear product side)	Plastic, can be folded out ²⁾ For temporary access to USB interface and memory card slot 2 TX6 fixing screws, captive
Enclosure rating	IP65 (EN 60529, EN 60529/A2) ³⁾
Protection class	III
Electrical safety	EN 62368-1
Weight	170 g
Dimensions (L x W x H)	88.5 mm x 43 mm x 35.6 mm

- 1) On swivel connector.
- 2) When the cover is open, the product no longer complies with the specified protection class. Protect the product against moisture and dust when the cover is open temporarily.
- 3) Prerequisites:
 - The cables plugged into the electrical connections must be screwed tight. Unused electrical connections are sealed off with a protective cap.
 - The foldable cover must be flush with the product and screwed tight.
- 4) Dimensional drawing, see "Product overview", page 12. Swivel connector protrudes by 17.8 mm.

11.3 Dimensional drawing

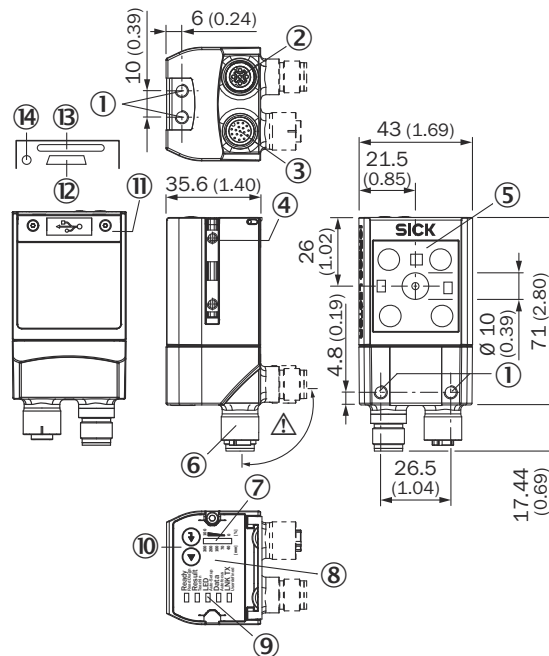


Figure 15: structure and device dimensions, unit: mm (inch), decimal separator: period

- ① 4 threaded mounting holes, M5: blind tapped hole; 5 mm deep; max. depth of thread 5 mm
- ② 2 sliding nuts, M5; 5.5 mm deep; as an alternative method of mounting the product

11.4 Performance

Image sensor resolution	1.3 Mpx (1,280 px x 1,024 px)
Image sensor type (color)	CMOS matrix sensor, monochrome (black/white)
Image recording rate	1.3 Mpx: 50 Hz
Readable code structures	2D
2D code types	Data Matrix ECC200, QR code
Code qualification	On the basis of ISO/IEC 16022, ISO/IEC 15415, ISO/IEC 15416, ISO/IEC 18004
Evaluation time	≥ 100 μs

1) The overspeed is dependent on reading distance, alignment and the 2D code used, see "Typical reference values during operation", page 47.

11.5 Interfaces

Ethernet	<p>Protocol:</p> <ul style="list-style-type: none"> • TCP/IP • EtherNet/IP <p>Function</p> <ul style="list-style-type: none"> • Host (data output of the read result) • AUX (Service) • OPC DA Server • FTP (image transfer) <p>Data transmission rate: 10/100 Mbit/s Services: DHCP, NTP, HTTP, mDNS, DNS-SD. DNS and HTTPS MAC address (device-specific), see type label</p>
PROFINET	<p>Function: PROFINET single port Data transmission rate: 10/100 Mbit/s</p>
Serial RS-232 / RS-422	<p>Function: host (data output of the read result) Data transmission rate: 0.3 kBd ... 115.2 kBd</p>
Serial RS-232	<p>Function: AUX (service) Data transmission rate: 57.6 kBd</p>
CAN	<p>Function: SICK CAN Sensor Network CSN (primary/secondary, multiplexer/server)</p> <p>Protocol:</p> <ul style="list-style-type: none"> • CSN (SICK CAN sensor network) • A connection in a CANopen-based environment is possible. For additional support, please contact SICK customer service. <p>Data transmission rate: 20 kBit/s ... 1 MBit/s Bus length: max. 30 m</p>
USB 2.0 ²⁾	<p>Function: AUX (service)</p>
Optical indicators	<p>5 status LEDs on the top of the device 10 bar graph LEDs (blue) on the top of the device 1 feedback LED (green) as light area on code</p> <p>1 status LED (status indicator for the memory card), under hinged cover</p>
Acoustic indicator	<p>Beeper, can be switched off e.g. in SOPAS ET Function for event signaling adjustable e.g. in SOPAS ET</p>
Configuration tools (parameterization)	<p>SOPAS ET configuration software, CoLa commands (telegrams), fieldbus controller (PLC) with additional support by SICK function blocks, function buttons</p>

Memory card	MicroSD memory card (flash card), optional, max. 32 GB
Data storage and retrieval	image and data storage via microSD memory card and external FTP
Maximum encoder frequency	300 Hz

- 1) For example: Configuration, diagnosis, transponder access or display of the read result.
- 2) Data interface only for temporary use (service).

11.6 Ambient data

Electromagnetic compatibility (EMC)	Radiated emission: EN 61000-6-4: 2007-01 + A1: 2011-03 Immunity: EN 61000-6-2: 2005-08
Vibration resistance	EN 60068-2-6:2008-02
Shock resistance	EN 60068-2-27:2009-05
Ambient operating temperature ¹⁾	<ul style="list-style-type: none"> • 0 °C ... +40 °C • 0 °C ... +50 °C, if the device is mounted on a mounting angle to dissipate the heat.
Storage temperature	-20 °C ... +70 °C
Permissible relative humidity	0% ... 90%, non-condensing
Ambient light immunity	2,000 lx on code

- 1) Notes regarding adequate dissipation of heat loss, see ["Mounting instructions", page 19](#).

12 Accessories

**NOTE**

On the product page you will find accessories and, if applicable, related installation information for your product.

The call is made via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

13 Annex

13.1 Declarations of conformity and certificates

You can download declarations of conformity and certificates via the product page.

The call is made via the **SICK Product ID: `pid.sick.com/{P/N}/{S/N}`**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

13.2 Typical reference values during operation

Depending on the configured working distance, the mounting alignment and the 2D codes used, a certain field of view size of the device and speed of the AGV is reached.



NOTE

The values specified in the table are calculated reference values. Even if the device setting is optimal and the code quality is good, this does not ensure that the device will achieve the specified speed and field of view. Uneven areas of the substrate and other environmental influences could lead to deviating values.

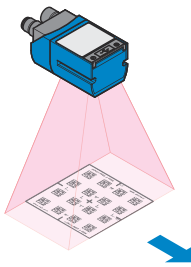


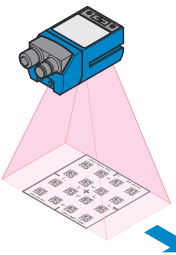
NOTE

We recommend using the SICK multicode label as it is optimally tailored to the application. Using the multicode label from SICK enables the highest travel speeds to be reached. Alternatively, individual 2D codes provided by the customer can also be used. The 2D codes must be dependent on the working distance and the mounting direction of certain requirements on code resolution; see following tables.

The smaller the code size is, the higher the risk that the code will not be read in a stable manner due to contamination or damage.

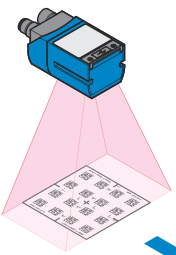
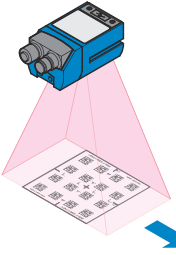
Table 9: Use of the multicode label (Data Matrix codes)

	Working distance [mm]	Horizontal field of view [mm]	Vertical field of view [mm]	Effective vertical field of view [mm]	V_{\max} [m/s] ¹⁾	Shutter time [μ s]	Brightness
Maximum reading field width 	70	42.7	34.1	76.7	3.9	160	1.4
	100	63.9	51.1	93.7	4.7	140	2.8
	120	78.0	62.4	105.0	5.0	140	3.6
	150	99.2	79.4	122.0	5.0	140	5.8
	250	169.9	135.9	178.5	2.1	335	5.8

	Working distance [mm]	Horizontal field of view [mm]	Vertical field of view [mm]	Effective vertical field of view [mm]	V_{max} [m/s] ¹⁾	Shutter time [μs]	Brightness
Maximum transport speed of the AGV 	70	34.1	42.7	85.3	4.4	160	1.4
	100	51.1	63.9	106.5	5.0	140	2.8
	120	62.4	78.0	120.6	5.0	140	3.6
	150	79.4	99.2	141.8	5.0	140	5.8
	250	135.9	169.9	212.5	2.1	335	5.8

1) V_{max} [m/s] = maximum overspeed [m/s]

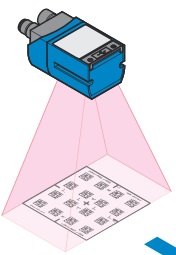
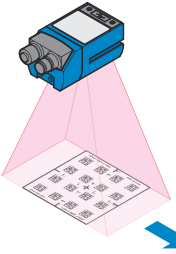
Table 10: Use of individual Data Matrix codes¹⁾

	Working distance [mm]	Horizontal field of view [mm]	Vertical field of view [mm]	Recommended code resolution [mm]	V_{max} [m/s] ²⁾	Shutter time [μs]	Brightness
Maximum reading field width 	70	42.7	34.1	0.4	1.4	110	1.4
	100	63.9	51.1	0.5	2.2	160	1.9
	120	78.0	62.4	0.6	2.6	175	2.5
	150	99.2	79.4	0.8	3.3	185	3.6
	250	169.9	135.9	1.3	3.9	335	5.8
Maximum transport speed of the AGV 	70	34.1	42.7	0.4	1.8	110	1.4
	100	51.1	63.9	0.5	2.8	160	1.9
	120	62.4	78.0	0.6	3.4	175	2.5
	150	79.4	99.2	0.8	4.3	185	3.6
	250	135.9	169.9	1.3	3.9	335	5.8

1) Valid for Data Matrix codes with icon size 14 x 14 cells.

2) V_{max} [m/s] = maximum overspeed [m/s]

Table 11: Use of individual QR codes ¹⁾

	Working distance [mm]	Horizontal field of view [mm]	Vertical field of view [mm]	Recommended code resolution [mm]	V_{\max} [m/s] ²⁾	Shutter time [μ s]	Brightness
Maximum reading field width 	70	42.7	34.1	0.4	0.8	60	1.2
	100	63.9	51.1	0.4	1.4	150	2.1
	120	78.0	62.4	0.4	1.6	200	2.8
	150	99.2	79.4	0.4	1.3	250	4.8
	250	169.9	135.9	0.7	0.7	800	4.8
Maximum transport speed of the AGV 	70	34.1	42.7	0.4	1.1	160	1.2
	100	51.1	63.9	0.4	1.8	160	2.1
	120	62.4	78.0	0.4	2.3	160	2.8
	150	79.4	99.2	0.4	2.9	140	4.8
	250	135.9	169.9	0.7	2.1	335	4.8

1) Valid for QR codes with icon size 21 x 21 cells.

2) V_{\max} [m/s] = maximum overspeed [m/s]

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

13.3.1 Power/Serial Data/CAN

Adapter cable, straight female connector, open end

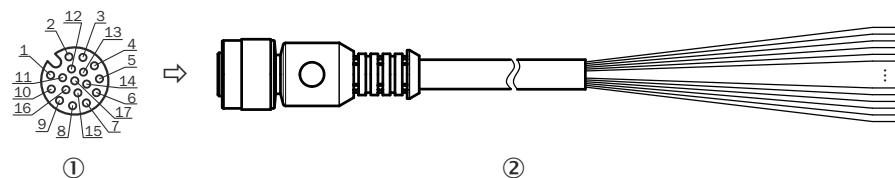


Figure 16: Adapter cable, e.g., part no. 2070425 (3 m)

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

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

Ambient temperature range:

For mobile installation: $-25\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$, for fixed installation: $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$

Pin assignment

Table 12: Signal assignment of adapter cable with open end

Pin	Signal	Function	Wire color
1	GND	Ground	Blue
2	V _s	Supply voltage	Brown
3	CAN L	CAN bus (IN/OUT)	Green
4	CAN H	CAN bus (IN/OUT)	White
5	TD+ (RS-422), Host	Host interface (sender+)	Pink
6	TD- (RS-422), Host TxD (RS-232), host	Host interface (sender-)	Yellow
7	TxD (RS-232), Aux	AUX interface (sender)	Black
8	RxD (RS-232), Aux	AUX interface (receiver)	Gray
9	N.c.	Not connected	White-black
10	N.c.	Not connected	Violet
11	RD+ (RS-422) Host	Host interface (receiver+)	Gray-pink
12	RD- (RS-422), host RxD (RS-232), host	Host interface (receiver-)	Red-blue
13	N.c.	Not connected	White-green
14	N.c.	Not connected	Brown-green
15	N.c.	Not connected	White-yellow
16	N. c.	Not connected	Yellow-brown
17	N. c.	Not connected	White-gray

13.3.2 Power/Serial Data/CAN

Adapter cable, straight female connector, open

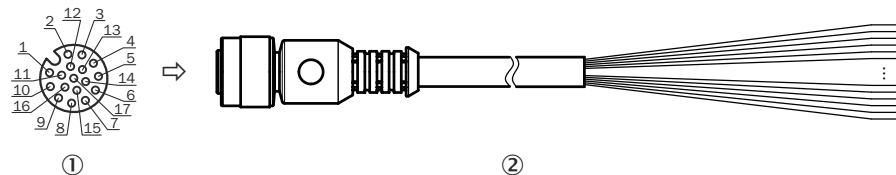


Figure 17: Adapter cable, part no. 2075220

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

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

Permitted currents for ambient temperature +40 °C:

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

Ambient temperature range:

For mobile installation: -25 °C to +40 °C, for fixed installation:: -35 °C to +40 °C

Pin assignment

Table 13: Signal assignment of adapter cable with open end

Pin	Signal	Function	Wire color
1	GND	Ground	Blue

Pin	Signal	Function	Wire color
2	V _s	Supply voltage	Brown
3	CAN L	CAN bus (IN/OUT)	Green
4	CAN H	CAN bus (IN/OUT)	White
5	TD+ (RS-422), Host	Host interface (sender+)	Pink
6	TD- (RS-422), Host TxD (RS-232), host	Host interface (sender-)	Yellow
7	TxD (RS-232), Aux	AUX interface (sender)	Black
8	RxD (RS-232), Aux	AUX interface (receiver+)	Gray
9	N.c.	Not connected	Gray-brown
10	N.c.	Not connected	Violet
11	RD+ (RS-422) Host	Host interface (receiver)	Gray-pink
12	RD- (RS-422), host RxD (RS-232), host	Host interface (receiver-)	Red-blue
13	N.c.	Not connected	White-green
14	N.c.	Not connected	Brown-green
15	N.c.	Not connected	White-yellow
16	N.c.	Not connected	Yellow-brown
17	N. c.	Not connected	White-gray

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