OPERATING INSTRUCTIONS

GLS100

Grid localization

SICK
Sensor Intelligence.

Described product

GLS100

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use sensors 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 sensor applications.

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

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

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

These operating instructions do not provide information on operating the machine in which the sensor is integrated. For information about this, refer to the operating instructions of the particular machine.

1.2 Scope

These operating instructions explain how to incorporate a sensor into a customer system. Step-by-step instructions are given for all required actions.

These instructions apply to all available device variants of the sensor.

► www.sick.com/1114008
► www.sick.com/1116319

Commissioning is described using one particular device variant as an example.

Simplified device designation in the document

In the following, the sensor is referred to in simplified form as “GLS100”.

1.3 Explanation of symbols

Warnings and important information in this document are labeled with symbols. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.

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

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

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

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

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

1.4 Further information

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

► www.sick.com/ols20

The following information is available for download from this page:

- Type-specific online data sheets for device variants, containing technical data and dimensional drawings
- EU declaration of conformity for the product family
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- These operating instructions, available in English and German, and in other languages if necessary
- Other publications related to the sensors described here
- Interface descriptions for CANopen and RS485 (Modbus)
- Publications dealing with accessories
- EDS device description file

1.5 Customer service

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

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

2 Safety information

2.1 Intended use

The GLS100 is used for automatic localization of automatic guided vehicle system (AGV systems) 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 system is localized and repositioned by a higher-level control (e.g. PLC). The device is primarily designed for use in industrial and logistics areas. It 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

- The sensor does not constitute a safety-relevant device according to the EC Machinery Directive (2006/42 / EC).
- The sensor must not be used in explosion-hazardous areas.
- Any other use that is not described as intended use is prohibited.
- Any use of accessories not specifically approved by SICK AG is at your own risk.
- The sensor is not suitable for outdoor applications.
- The sensor must not be operated with a long cable > 30 m according to EN 61000-6-2.

! **NOTICE**
Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- ► The sensor should be used only in line with intended use specifications.
- ► All information in these operating instructions must be strictly complied with.

2.3 Notes on UL approval

The device must be supplied by a Class 2 source of supply.

UL Environmental Rating: Enclosure type 1

Maximum ambient temperature 50 °C

2.4 Limitation of liability

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

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

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

2.5 Requirements for skilled persons and operating personnel

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

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

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

- **Instructed personnel** have been briefed by the operating entity about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks assigned to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g., Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

Activities	Qualification
Mounting, maintenance	▪ Basic practical technical training ▪ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	▪ Practical electrical training ▪ Knowledge of current electrical safety regulations ▪ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	▪ Basic knowledge of the design and setup of the described connections and interfaces ▪ Basic knowledge of data transmission ▪ Knowledge of the operation and control of the devices in their particular application
Operation of the devices in their particular application	▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment in the application

2.6 Hazard warnings and operational safety

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

NOTE
The device is equipped with LEDs. The device meets the criteria of risk group 0 according to IEC 62471:2006. No special measures are required (e.g., eye protection).

2.7 Repairs

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

3 Product description

3.1 Product identification

3.1.1 Type label

Figure 1: Type label

①   Type designation
②   Part number
③   Machine-readable code
④   Serial number
⑤   Pin assignment example for CAN device

3.1.2 Structure and status indicators

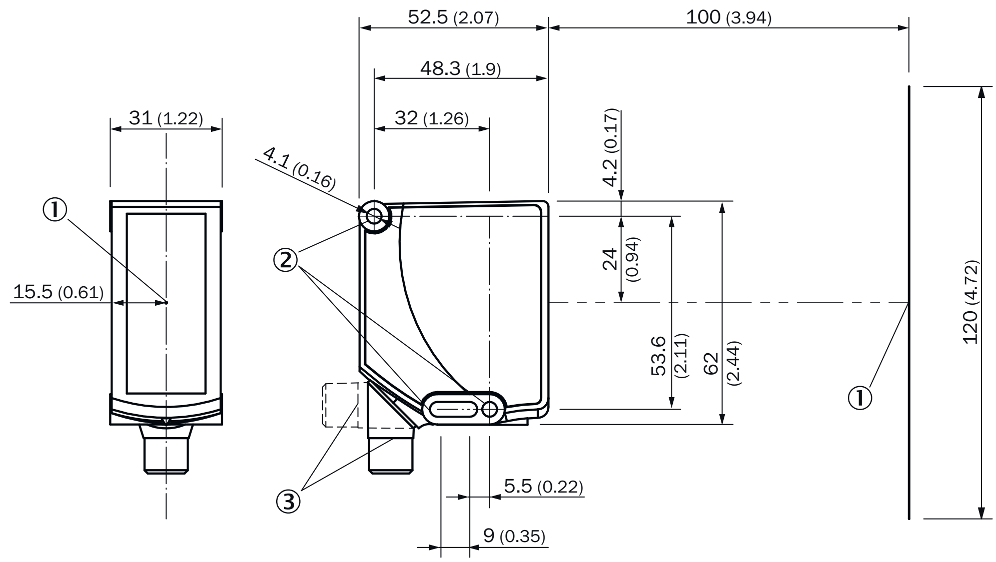


Figure 2: Device view

① Optical axis

② Fixing hole Ø4.1 mm

③ M12 male connector, rotatable by 180°

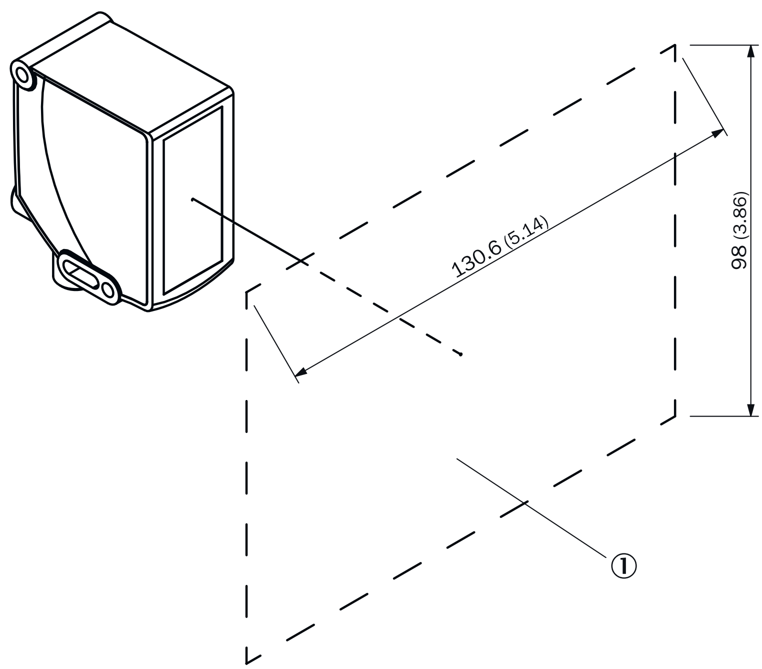


Figure 3: Field of view

① Field of view (W x H)

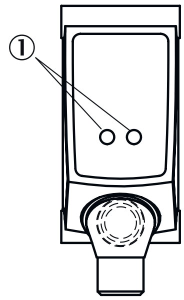


Figure 4: Status indicators

① Status indicators

Function indicators (LEDs)

Table 1: Function indicators (LEDs)

Function indicator	Description
Q	Status indicator • LED yellow: Code detected and read • LED off: No code detected
PWR	Operational status display • Green LED: Normal operation/Supply voltage on • LED off: No operation

3.2 Product features

Function and use

The GLS100 localizes automatic guided vehicle systems (AGV systems) using 2D codes. The device is mounted on the underside of the AGV system. The 2D codes are attached in the form of a raster on the floor. The individual 2D codes are numbered and contain position information.

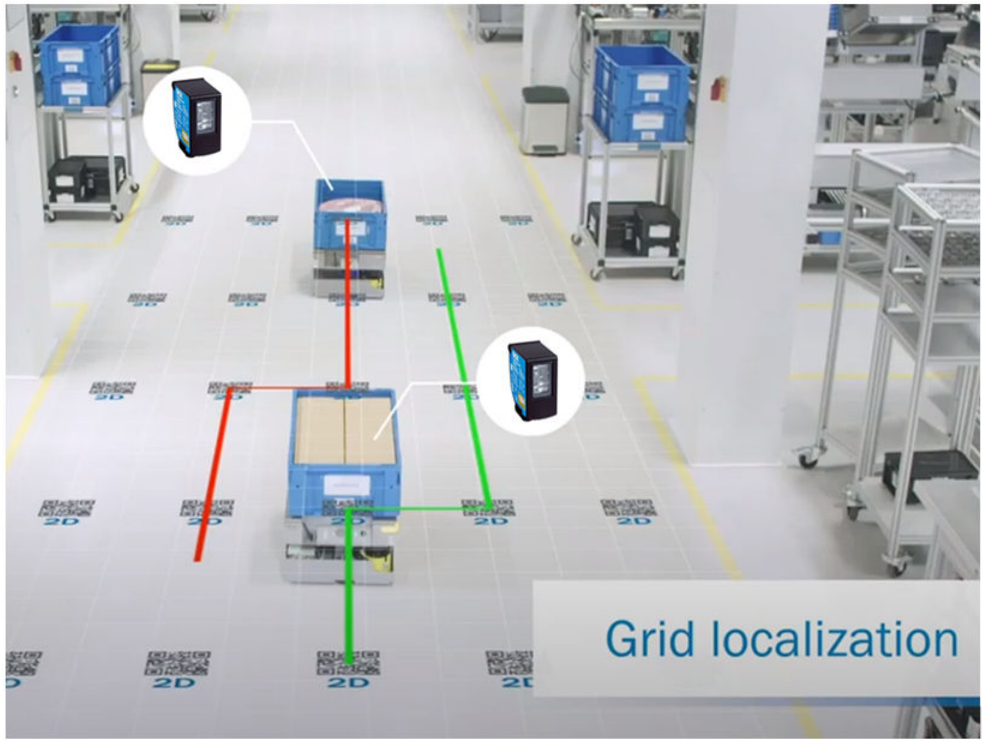


Figure 5: Grid localization with the GLS

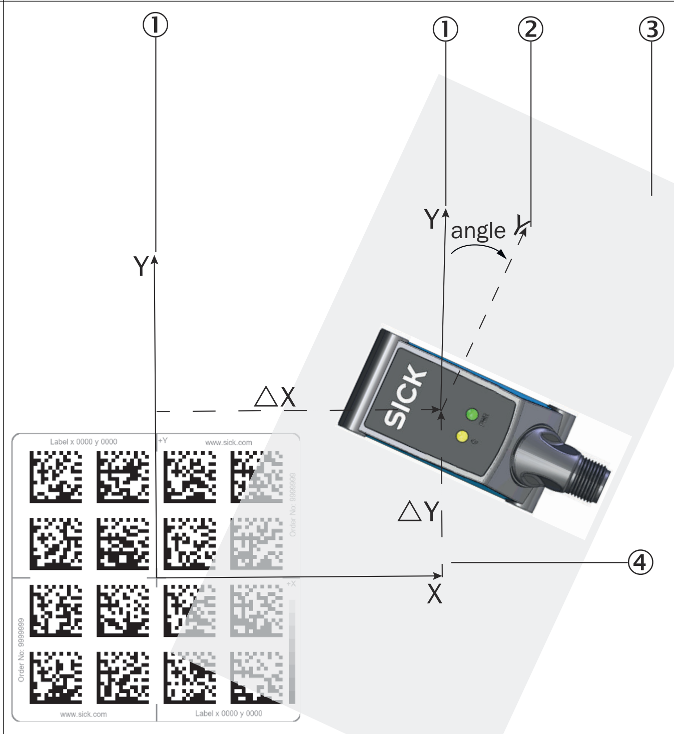
The device detects and decodes 2D codes. The device sends the following read data via the interface:

- Status
- Code label position x,y,z
- Code label orientation as angle
- Code data: Number of the MultiCode label
- Time stamp
- Overspeed in x- and y-direction

Code alignment

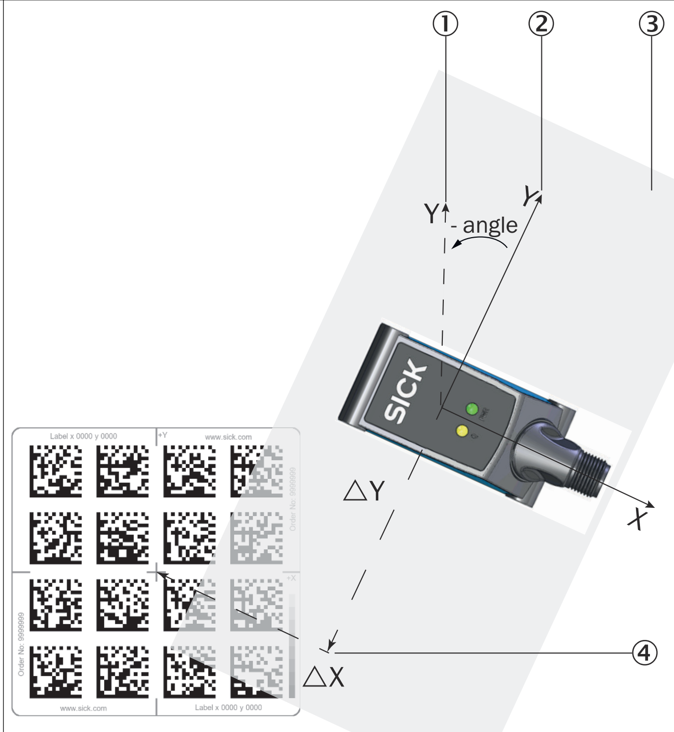
In the grid navigation application, the position of the vehicle is determined in relation to the code. This convention (code coordinate system) is preset in the factory setting for the GLS100, see table 2, page 14

Table 2: Code coordinate system

	Data Matrix MultiCode (coordinate origin is the center of the label).
Code coordinate system	 ① y-direction Code - coordinate system ② y-direction Sensor - coordinate system ③ Field of view 160 mm x 120 mm ④ Coordinates in the sensor coordination system (x/y)

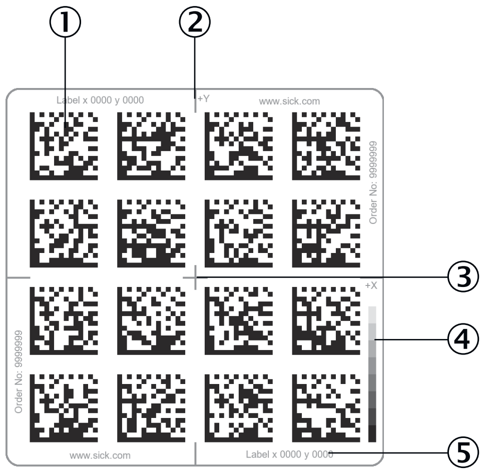
In addition, it is possible – for applications with stationary sensor mounting – to obtain the position and angular orientation of the code label in relation to the sensor center. This convention is called the sensor coordinate system in the following, see table 3, page 15

Table 3: Sensor coordinate system

	Coordinate origin is the optical center of the sensor
Sensor coordinate system	 ① y-direction Code - coordinate system ② y-direction Sensor - coordinate system ③ Field of view 160 mm x 120 mm ④ Coordinates in the sensor coordination system (x/y)

2D codes

MultiCode labels are optionally available as accessories for the device, see “Accessories”, see "", page 48. The MultiCode labels are made out of several Data Matrix codes.



① Data Matrix Code

② Auxiliary line for alignment

③ Center of the multicode label

④ Grayscale Scale (testing of print quality of the customer print)

⑤ Code data: Number of the MultiCode label

Using the SICK MultiCode label is recommended as it is optimally tailored to the application. The SICK MultiCode label also enables the highest overspeeds to be reached. Alternatively, single 2D codes or 2D MultiCodes in QR (single code only) or Data Matrix (MultiCode) formats provided by the customer can be used. QR single codes must comply with formats 25x25 px, 29x29 px, 33x33 px. The maximum edge length may not exceed 38 mm in doing so. The 2D codes must have a minimum size of 1 mm (code module size). The type of code to be read out can be selected under the “operating mode” setting. DM MultiCodes are selected in the factory setting.
When using customer codes, the module size may have to be configured (ModBus: Register 151/152. CANopen Index 0x02002 Sub 02). Factory setting for the module size is 1.0 mm. If the module size is configured incorrectly, the sensor cannot determine the z-position correctly.

SICK also provides the “LabelGenerator” software under www.sick.com/1114008and www.sick.com/1116319. This can be used to generate the SICK MultiCodes themselves as PDF or PNG files and print them. After printing by the customer, checking the dimensions of the codes is recommended, see figure 6, page 17

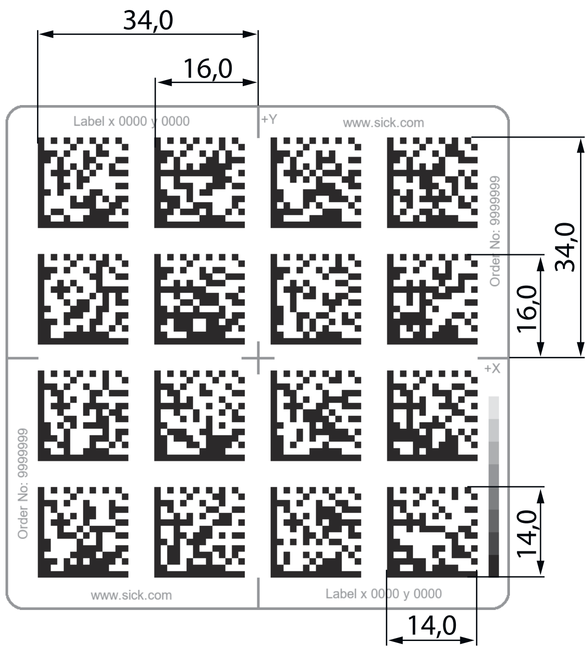


Figure 6: MultiCode dimensions

2D code tape

In addition to the 2D codes, it is also possible to read out code tapes with the GLS100. SICK also has code tapes available as accessories (see "Accessories", page 48). Reading the code tape makes linear positioning of a vehicle, shuttle, etc. along a 2D code tape possible. In this case, depending on the sensor mounting, the X or Y output value corresponds to the linear position.

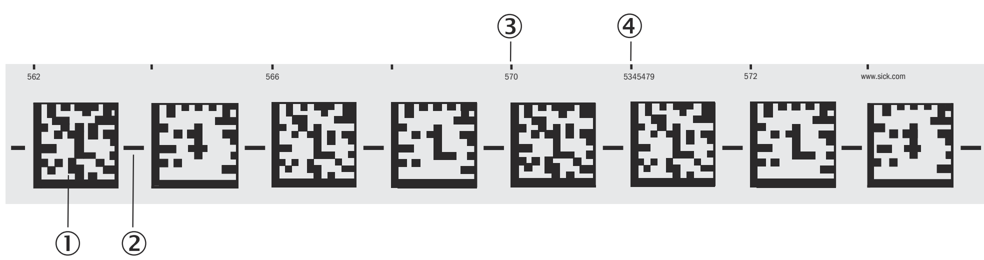


Figure 7: Structure of 2D code tape

① Data Matrix codes
② Helper line for alignment
③ Position on code tape in mm
④ Part no. of the MultiCode tape (7 digits)

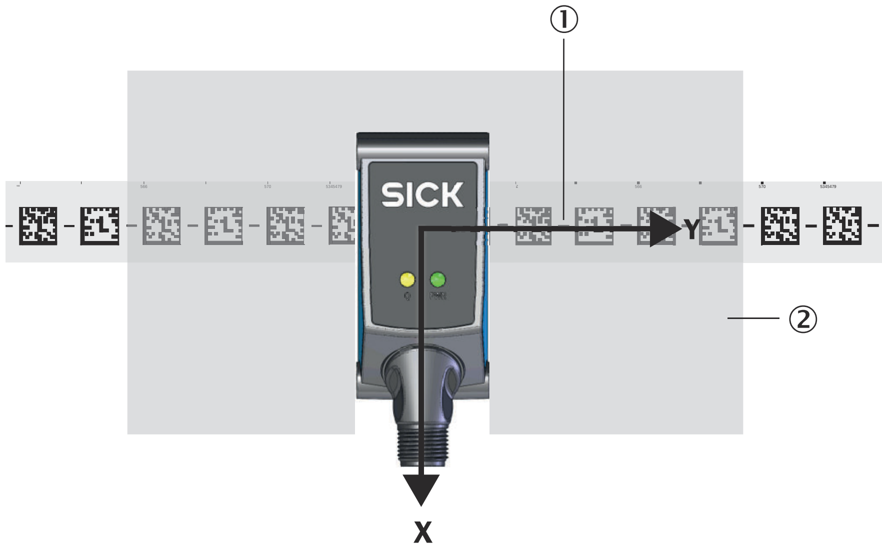


Figure 8: Sensor alignment on code tape

① Linear position here in Y direction

② Field of view 160 mm x 120 mm

Data Matrix automatic mode

If “Data Matrix automatic mode” is selected as the operating mode, the GLS100 automatically detects whether a Data Matrix code tape or 2D MultiCode is read. Manual switching is no longer necessary. The detected code is displayed in the status byte under bit 4-7 (see table 9, page 38).

4 Transport and storage

4.1 Transport

Improper transport

CAUTION DAMAGE TO THE PATTERN SENSOR DUE TO IMPROPER TRANSPORT!
Substantial material damage may result in the event of improper transport.

For this reason:

- The device should be transported only by trained specialist staff.
- The utmost care and attention is required at all times during unloading and transportation on company premises.
- Note the symbols on the packaging.
- Do not remove packaging until immediately before starting installation work.

4.2 Transport inspection

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

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

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

4.3 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- 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 "Ambient data", page 47.
- Relative humidity: see "Ambient data", page 47.
- 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 Preparation for mounting

1. Select the mounting site for the GLS100 in accordance with the following chapter "Mounting requirements", page 20.
2. Mount the GLS100 using the fixing holes.
"Structure and status indicators", page 11
"Accessories", page 48

5.1.1 Mounting requirements

- Typical space requirement for sensor, see "", page 46.
- Comply with technical parameters such as the permitted ambient conditions for the operation of the sensor (e.g., temperature range, EM interference), see "Ambient data", page 47.
- Protect the sensor from direct sunlight.
- Only affix the sensor using accessories supplied for this purpose -> there are no screw connections on the sensor.
- Sensing distance: 100 mm (±30 mm)
The sensing distance is the distance from the front sensor edge (housing edge) to the ground.

5.1.2 Scope of delivery

The following are included with delivery of the sensor:

- GLS100 grid localization sensor
- Quick-start guide

Accessories:

Accessories (e.g., cables, fastening adapters) are only included with delivery if ordered separately.

5.2 Mounting the sensor

Arrangement over guide track

The GLS100 must be positioned orthogonally to the 2D code to be detected.
To achieve the maximum overspeed, the sensor should be positioned perpendicular to the direction of travel.

Table 4: Mounting

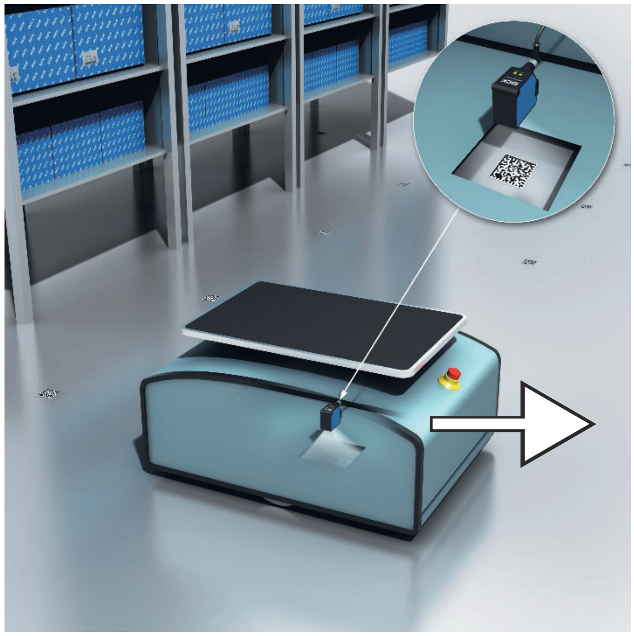


Figure 9: Arrangement via code grid and traverse direction

6 Electrical installation

6.1 Safety

6.1.1 Notes on electrical installation

CAUTION
Danger due to incorrect supply voltage!
An incorrect supply voltage may result in injuries from electric shocks and/or damage to the device.

- Only operate the sensor with safety/protective extra-low voltage (SELV/PELV).

NOTICE
Sensor damage or unpredictable operation due to working with live parts!
Working with live parts may result in unpredictable operation.

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

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

The IP enclosure rating for the sensor is only achieved if the connected cable is completely screwed in.

6.1.2 Wiring instructions

NOTE
Pre-assembled cables can be found online at:

- ► www.sick.com/1114008
- ► www.sick.com/1116319

Please observe the following wiring instructions:

- During installation, pay attention to the different cable groups. The cables are grouped into the following four groups according to their sensitivity to interference or radiated emissions:

- Group 1: Cables very sensitive to interference, such as analog measuring cables
- Group 2: Cables sensitive to interference, such as sensor cables, communication signals, bus signals
- Group 3: Cables which are a source of interference, such as control cables for inductive loads, motor brakes
- Group 4: Cables which are powerful sources of interference, such as output cables from frequency inverters, welding system power supplies, power cables

► Cables in groups 1, 2 and 3, 4 must be crossed at right angles, see figure 10.

► Cables in groups 1, 2 and 3, 4 must be routed in different cable channels or metallic separators must be used, see figure 11 and see figure 12. This applies particularly where cables of devices with a high level of radiated emission, such as frequency converters, are laid parallel to sensor cables.

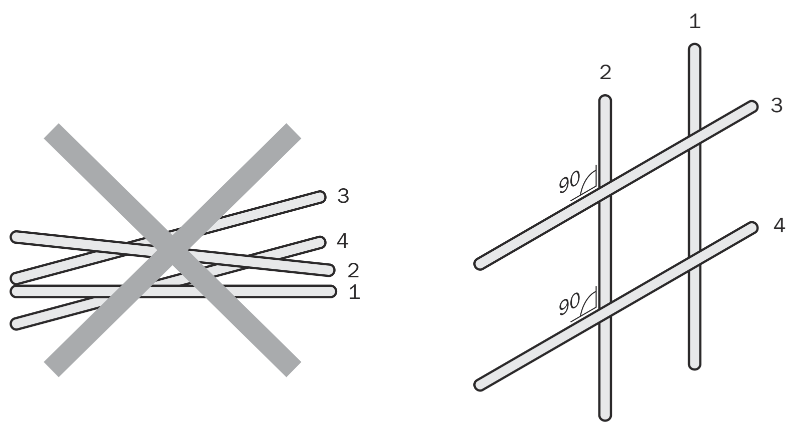


Figure 10: Cross cables at right angles

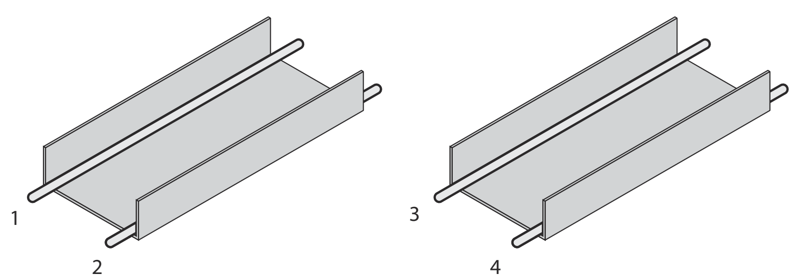


Figure 11: Ideal laying – Place cables in different cable channels

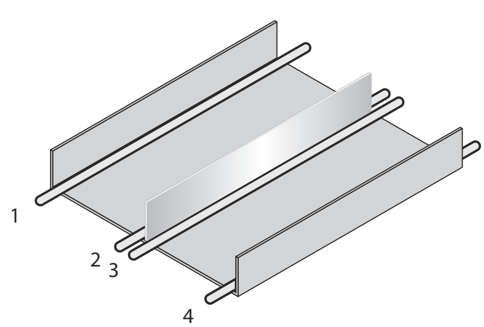
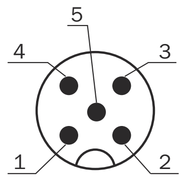


Figure 12: Alternative laying – Separate cables with metallic separators

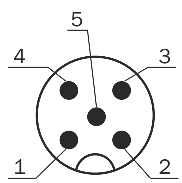
6.2 Pin assignment of the connections

M12 connection, CANopen: 1116319



PIN	Pin assignment
1 - BN	VIN
2 - WH	CAN HIGH
3 - BU	GND
4 - BK	reserved - do not connect
5 - GY	CAN LOW

M12 connection, RS485: 1114008



PIN	Pin assignment
1 - BN	VIN
2 - WH	RS485 A
3 - BU	GND
4 - BK	reserved - do not connect
5 - GY	RS485 B

6.3 Connecting the supply voltage

The sensor must be connected to a voltage supply with the following properties:

- Supply voltage DC 10.8 V ... 30 V (stabilized safety extra-low voltage (SELV/PELV) as per current standard EN 60950-1)
- Power source with at least 3 W power

Protecting the supply cables

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

The following standards must be observed in Germany:

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

Electrical connection of GLS100

- Ensure the voltage supply is not connected.
- Turn the swivel connector into the desired position.
- Connect the sensor according to the connection diagram.

6.4 CAN connection

We recommend connecting the ground cable to the CANopen communication interface as a reference.

If there is no separate CAN GND in the system, this pin is to be connected to the FE.

7 Commissioning

7.1 Overview of commissioning steps

- Connect the voltage supply.
- Commission the sensor using the factory settings.
- Configure the sensor.

7.2 Commissioning the sensor for the first time

Establish voltage supply: When the sensor voltage supply is correct, the green “PWR” LED lights up.

7.3 First step to commissioning with CANopen

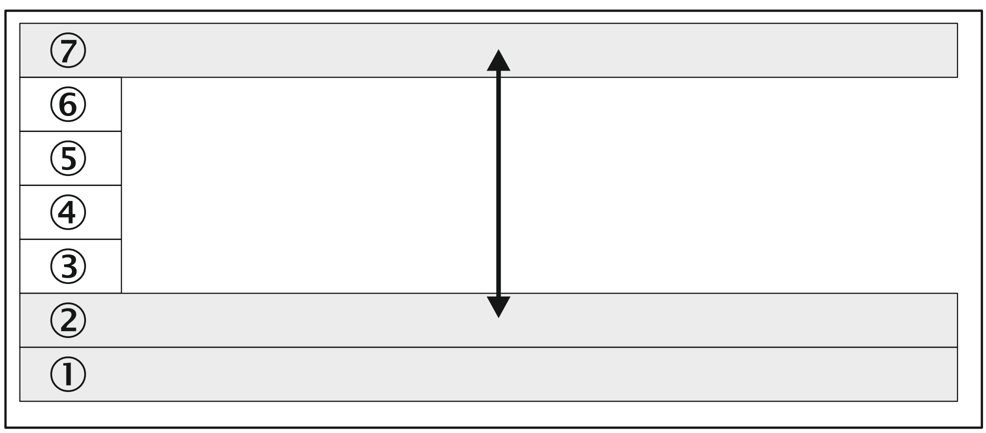
7.3.1 CANopen overview

Communication profile

The CANopen communication profile (documented in CiA DS-301) regulates how the devices in a CANopen network exchange data.

CANopen in the OSI model

The CANopen protocol is a standardized Layer 7 protocol for the CAN bus. This layer is based on the CAN Application Layer (CAL).



⑦ CAN application layer

② Data link layer

① Physical layer

NOTE

Layers 3 to 6 are not used in CANopen.

Architecture

CANopen is an asynchronous, serial fieldbus. The GLS100 is inserted into the bus via a stub cable in a star configuration. It needs to be terminated at the beginning and at the end of the fieldbus. A passive 120 Ω bus terminating resistor is sufficient for this purpose.

Communication channels and status

CANopen features various communication channels (SDO, PDO, Emergency Messages). These channels are formed with the help of the communication object identifier (COB ID). The COB IDs are based on the node IDs of the individual devices on the CANopen bus. The GLS100 has node ID 10 by in the factory setting. It can be addressed via the network management services (NMT) and its CANopen state machine can be switched to the necessary status (Pre-Operational, Operational, or Stopped) by the master.

Network management

Network management (NMT) initializes the nodes in a CANopen network. It also adds the nodes to the network, and stops and monitors them. The following statuses can be identified:

Table 5: Status of the CANopen state machine

Status	Description
Initializing	Initialization commences. Both the device application and device communication are initialized. After this, the node automatically switches to Pre-Operational status.
Pre-Operational	The GLS100 is ready for parameterization; acyclic communication can take place via SDO. However, the GLS100 is not yet able to commence PDO communication and is not sending out any emergency messages.
Operational	In this state, the GLS100 is fully ready for operation and can transmit messages autonomously (PDOs, emergency messages).
Stopped	In this state, the GLS100 is not actively communicating (although communication is still being actively monitored via node guarding).

The GLS100 automatically enters the operational state at startup in the factory setting.

7.3.2 Note ID and baud rate

There can be a maximum of 128 devices on a CANopen network: One master and up to 127 slaves. Every device has a unique node ID (node address). The COB IDs (communication object identifiers) of the communication channels are derived from this ID.
The following conditions must be met for communication with the CAN master:

- A correct node ID must be set on the GLS100.
  Correct is:
  - A node ID which is free in the CANopen network
  - A node ID which the master expects
- The same baud rate must be set in the GLS100 as in the master.

The following parameters are factory set on the GLS100:

- Node ID: 10
- Baud rate: 125 kbit/s

The following communication parameters can be allocated to the GLS100:

- Node ID: 1 to 127 (0 is generally assigned to the master)
- Baud rate: 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 1,000 kbit/s

7.3.3 General information about CAN communication

Layer setting services (LSS) are supported in order to set the node ID and the baud rate of the GLS100.

The LSS slave is accessed via its LSS address (identity object), which is stored in object 1018h.

The LSS address comprises:

- Manufacturer ID
- Product code
- Revision number
- Serial number

The master uses the LSS services to request the individual services which are then executed by the GLS100. The LSS telegrams facilitate communication between LSS master and LSS slave. An LSS telegram is always 8 bytes long. Byte 0 contains the command specifier (CS), followed by 7 bytes for the data. All bytes that are not in use must be set to zero.

The following COB IDs are used:

- 07E4h = LSS slave to LSS master
- 07E5h = LSS master to LSS slave

NOTE
During LSS configuration, only one CANopen slave device may be connected to the CAN bus, i.e. only the GLS100 to be configured.

Below are 2 examples of setting the node ID and baud rate.
In the examples, a GLS100 is configured to node ID 19 and a bit rate of 500 kbit.
The transmission direction refers to the CAN device that performs the configuration (master).

Setting the node ID

Step	Description	Direction	CAN-ID	Length	Data (hexadecimal)
1	Send "go to pre-operational" NMT command to all slaves, result: Slaves stop sending PDOs.	transmit	000h	2	80 00
2	Send “switch all slaves to LSS configuration state” LSS command, result: Slave is in “configuration” state	transmit	7E5h	8	04 01 00 00 00 00 00 00
3	Send LSS command: “Configure Node ID” to set the node ID to 19.	transmit	7E5h	8	11 **13** 00 00 00 00 00 00 (13h is the new node ID, i.e. node ID 19 (decimal))
4	LSS slave confirms setting of the new node ID.	receive	7E4h	8	11 00 00 00 00 00 00 00
5	Send “store configuration” LSS command	transmit	7E5h	8	17 00 00 00 00 00 00 00
6	LSS slave confirms saving of configuration	receive	7E4h	8	17 00 00 00 00 00 00 00
You can now either switch the device off and on again to activate new settings, or restart communication with the following NMT commands.					
7	Send “reset communication” NMT command to all slaves.	transmit	000h	2	82 00
8	Send “go to operational” NMT command to all slaves. Result: GLS100 now communicates with new Node-ID	transmit	000h	2	01 00

Configuring baud rate

Step	Description	Direction	CAN-ID	Length	Data (hexadecimal)
1	Send "go to pre-operational" NMT command to all slaves, result: Slaves stop sending PDOs.	transmit	000h	2	80 00
2	Send “switch all slaves to LSS configuration state” LSS command, result: Slave is in “configuration” state	transmit	7E5h	8	04 01 00 00 00 00 00 00

Step	Description	Direction	CAN-ID	Len gth	Data (hexadecimal)
3	Send “Configure bit timing” LSS command to set the baud rate to 500 kBit.	transmit	7E5h	8	13 00 02 00 00 00 00 00 0 = 1,000 kBit/s 1 = not supported 2 = 500 kBit/s 3 = 250 kBit/s 4 = 125 kBit/s 5 = not supported 6 = 50 kBit/s 7 = not supported 8 = not supported 9 = not supported
4	LSS slave confirms the new baud rate.	receive	7E4h	8	13 00 00 00 00 00 00 00
5	Send “store configuration” LSS command	transmit	7E5h	8	17 00 00 00 00 00 00 00
6	LSS slave confirms saving of configuration	receive	7E4h	8	17 00 00 00 00 00 00 00
You can now either turn the device off and on again to activate new settings, or restart communication using the NMT commands in steps 7 to 8 of the previous example node ID configuration.					

The node ID and baud rate can also be set using the SOPAS ET configuration software. This is available for download here: www.sick.com/SOPAS

7.3.4 Process data objects (PDOs)

Up to four different Transmit PDOs (TPDOs) can be subscribed on the CAN interface. The contents of the TPDOs can be freely assigned via dynamic mapping under the 0x1A00 to 0x1A03 indexes.
The communication parameters can be set under 0x1800 to 0x1803.
In the default mapping, TPDOs 1 to 3 are mapped as described under 8.1.2.

7.3.5 PDO communication

In the factory setting, the transmission type for TPDO 01, TPDO02 and TPDO03 is set to asynchronous communication. A transmission period of 50 ms is set in the factory for TPDO 01, TPDO02 and TPDO03, with which TPDO 01, TPDO02 and TPDO03 are transmitted cyclically.

Changing the transmission type factory setting

The transmission type of the Transmit PDOs can be set according to CANopen standard DS-301 in configuration registers 0x1800, 0x1801, 0x1802 of TPDOs 1 to 3.
With asynchronous transmission types 254 and 255, transmission takes place at the internal sensor update rate, i.e. 33 ms (for Data Matrix MultiCode) or 40 ms (for QR code). The factory configuration setting of the transmission type is 255.

7.4 First step to commissioning with Modbus RTU

The following describes the first steps for commissioning with Modbus RTU. In the description, we refer to the "Modbus application protocol specification V1.1" Modbus standard as well as "Modbus over serial line specification and implementation guide V1.02" available at www.modbus.org.

7.4.1 Setting the ID and baud rate

The following conditions must be met for communication with the Modbus master:

- A correct slave address must be set on the GLS100.
  Correct is:

    - A slave address that is free in the Modbus network
    - A slave address that the master expects
- The same baud rate must be set in the GLS100 as in the master.

The following parameters are factory set on the GLS100:

- Slave address: 10
- Baud rate: 19,200 bps
- Parity: Even

The following communication parameters can be allocated to the GLS100:

- Slave address: 1 to 247 (0 is generally assigned to the master)
- Baud rate:
  0: 1,200 bps
  1: 2,400 bps
  2: 4800 bps
  3: 19,200 bps
  4: 19,200 bps
  5: 38,400 bps
  6: 57,600 bps
  7: 115,200 bps

7.4.2 Basic information about Modbus and reading out code information

Modbus is based on RS-485 with a Modbus RTU protocol structure. Data exchange is always based on requests from the master and responses from the slave devices. The respective request/response string looks like this:

Request

Byte	0	1	2	3	4	5	6	7
ModBus contents	Slave Address	“Function code” e.g. 0x04 Read “Input registers”	Readout: Start address (16 bit unsigned)		Readout: Number register N (16 bit unsigned)		Checksum (16 bit unsigned)	

Response

Byte	0	1	2	3	4	2xN+5	2xN+6	2xN+7
ModBus contents	Slave Address	Response: “Function code” 0x04	Number of bytes, 2xN	Start register		Register contents	Checksum (16 bit unsigned)	

The relevant code information is provided in “Section result data”. Read it out periodically (not more often than every 50 ms) (addresses 320 to 331) using "Modbus function code #4":

Example

Byte	0	1	2	3	4	5	6	7
ModBus contents	Slave Address	“Function code” e.g. 0x04 Read “Input registers”	Readout: Start address (16 bit unsigned)		Readout: Number of registers (16 bit unsigned)		Checksum (16 bit unsigned)	
Value (hex)	0x0A	0x04	0x0140		0x000C		0xF15C	

Byte	0	1	2	3	4	5	6	7
Description	The address of Modbus slave GLS (factory setting) is 0x0A.	The Modbus “function code” for reading out the “input register” is 0x04.	Start at register 320.		Read out 12 subsequent registers. Here 320 to 331.		Checksum (16 bit unsigned)	
Data type	unsigned 8-bit	unsigned 8-bit	unsigned 16-bit		unsigned 16-bit		unsigned 16-bit	

After the sensor response, interpret the status in register 320.
If bits 0, 1, 2 are set in the status, all registers have been received and are valid. Address 329 “Time offset” can be used to determine the position of the vehicle more precisely. The value indicates the time duration since the code was recorded in ms.

8 Operation

8.1 Operation via SOPAS

The SDD drivers for the SOPAS ET configuration software can be found at www.sick.com/1114008 and www.sick.com/1116319 (as well as at www.sick.com). SOPAS ET can be used to configure and analyze the sensor.

8.1.1 Overview

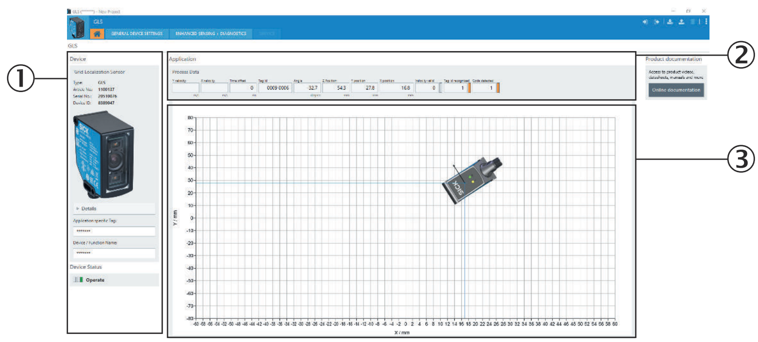


Figure 13: SOPAS overview

1 This is where you will find information about the device, for example the type or part number, and device details such as the firmware version.
2 The most important result data are displayed here, just as they are transferred in the CAN PDOs or the Modbus “result” data.
These are:
- Speed in the x and y direction
- Time offset since code reading
- TagID: numerical 2 byte value that uniquely identifies the label. For a SICK MultiCode X/Y value of the label
- Angle: orientation of the sensor relative to the code or vice-versa
- X, Y and Z position
- Status indicators for:
“velocity valid”: the GLS has output valid speed information.
TagID recognized: a code was detected and read in the field of view.
Code detected: a code was detected in the field of view.
3 The position of the code relative to the sensor (sensor coordinate system) or the sensor relative to the code (code coordinate system) is visualized.

8.1.2 General Device Settings

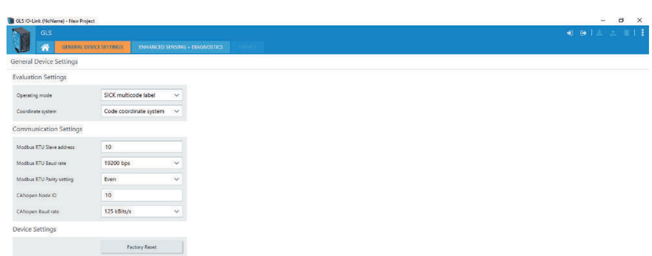


Figure 14: General Device Settings

In this menu in the **Evaluation Settings**, you can select one of available code types (Datamatrix MultiCode, QR Single Code or Code Band) as well as one of the two coordinate systems (Sensor Coordinate System and Code Coordinate System). The relevant settings for the CAN or Modbus interface can be configured in the **Communication Settings.**

8.1.3 Enhanced Sensing and Diagnostics

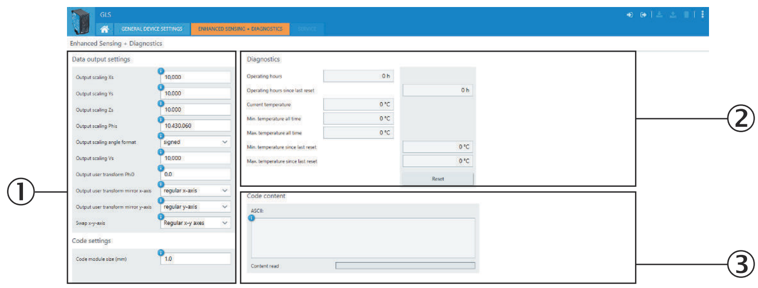


Figure 15: Enhanced Sensing and Diagnostics

1 The format and increment of the output value can be configured in this section. For a detailed explanation on the scaling of values, see "Transformation of output values", page 42. The module size of the codes used can also be configured, and are factory set to 1 mm.
This setting is correct for the SICK MultiCodes, but may need to be adjusted when using your own codes.
2 This menu can be used to read diagnostic data, for example operating hours and temperature.
3 The entire contents of the code (230 bytes) can be read in this area.

8.2 Operation via CANopen

CANopen object directory

This chapter contains information on integration of the sensor using CANopen.

All sensor functions can be accessed via the CANopen interface. All settings can be configured in this interface. The EDS file can also be found at:

- ► www.sick.com/1114008
- ► www.sick.com/1116319

8.2.1 Object directory

This section only describes the objects that do not have a fixed definition in the CANopen standard. Default values are listed only for parameters that can be modified by the user.

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
0x1000	-	RO	Device type	0x00000000	UINT32		No device profile supported
0x1001	-	RO	Error register	0x00	UINT8		
0x1005	-	R/W	COB ID SYNC	0x00000080	UINT32		
0x1008	-	RO	Manufacturer device name		STRING		GLSXXXX

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
0x1009	-	RO	Manufacturer hardware rev		STRING		Hardware version, sensor
0x100A	-	RO	Manufacturer software rev		STRING		Firmware version, sensor
0x100C	-	R/W	Guard time	0x0000	UINT16		
0x100D	-	R/W	Life time	0x00	UINT8		
0x1014	-	R/W	COB-ID EMCY	0x000000 80	UINT32		
0x1015	-	R/W	Inhibit Time Emergency	0x0000	UINT16		
0x1016			Heartbeat Con-sumer Entries				
	1	R/W	Consumer Heartbeat Time 1	0x000000 00	UINT32		
	2	R/W	Consumer Heartbeat Time 2	0x000000 00	UINT32		
0x1017	-	R/W	Heart Beat Time	0x0000	UINT16		
0x1018		RO	Identity object		UINT8		
	1	RO	Vendor Id	0x010000 56	UINT32		0x01000056 (SICK AG)
	2	RO	Product code	0x000010 06	UINT32		
	3	RO	Revision num-ber	0x000100 00	UINT32		Firmware version
	4	RO	Serial number		UINT32		Device serial number
0x1800			Transmit PDO Communication Parameter 1				
	1	R/W	COB-ID	0x000001 8A	UINT32		PDO 1 is valid
	2	R/W	Transmission type	0xFF	UINT8		Asynchronous
	3	R/W	Inhibit Time	0x0000	UINT16		
	5	R/W	Event timer	0x0032	UINT16		**50 ms (default)**
0x1801			Transmit PDO Communication Parameter 2				
	1	R/W	COB-ID	0x000002 8A	UINT32		PDO 2 ist gültig
	2	R/W	Transmission type	0xFF	UINT8		Asynchronous
	3	R/W	Inhibit Time	0x0000	UINT16		
	5	R/W	Event timer	0x0032	UINT16		**50 ms (default)**
0x1802			Transmit PDO Communication Parameter 3				

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
	1	R/W	COB-ID	0x0000038A	UINT32		PDO 3 is valid
	2	R/W	Transmission type	0xFF	UINT8		Asynchronous
	3	R/W	Inhibit Time	0x0000	UINT16		
	5	R/W	Event timer	0x0032	UINT16		**50 ms (default)**
0x1803			Transmit PDO Communication Parameter 4				
	1	R/W	COB-ID	0x8000048A	UINT32		PDO 4 is invalid, i.e. not activated at the factory.
	2	R/W	Transmission type	0xFF	UINT8		Asynchronous
	3	R/W	Inhibit Time	0x0000	UINT16		
	5	R/W	Event timer	0x0032	UINT16		**50 ms (default)**
0x1A00							
	0	R/W	Number of mapped objects	0x02	UINT8		
	1	R/W	Mapping Entry 1	0x20210220	UINT32		map 0x2021 SI 0x02 x-position
	2	R/W	Mapping Entry 2	0x20210320	UINT32		map 0x2021 SI 0x03 y-position
	3	R/W	Mapping Entry 3	0x00000000	UINT32		
	4	R/W	Mapping Entry 4	0x00000000	UINT32		
	5	R/W	Mapping Entry 5	0x00000000	UINT32		
	6	R/W	Mapping Entry 6	0x00000000	UINT32		
	7	R/W	Mapping Entry 7	0x00000000	UINT32		
	8	R/W	Mapping Entry 8	0x00000000	UINT32		
0x1A01							
	0	R/W	Number of mapped objects	0x04	UINT8		
	1	R/W	Mapping Entry 1	0x20210110	UINT32		map 0x2021 SI 0x01 Status
	2	R/W	Mapping Entry 2	0x20210410	UINT32		map 0x2021 SI 0x04 z-position
	3	R/W	Mapping Entry 3	0x20210510	UINT32		map 0x2021 SI 0x05 angle
	4	R/W	Mapping Entry 4	0x20210710	UINT32		map 0x2021 SI 0x07 time offset
	5	R/W	Mapping Entry 5	0x00000000	UINT32		
	6	R/W	Mapping Entry 6	0x00000000	UINT32		

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
	7	R/W	Mapping Entry 7	0x00000000	UINT32		
	8	R/W	Mapping Entry 8	0x00000000	UINT32		
0x1A02							
	0	R/W	Number of mapped objects	0x03	UINT8		
	1	R/W	Mapping Entry 1	0x20210620	UINT32		map 0x2021 SI 0x06 tag id
	2	R/W	Mapping Entry 2	0x20210810	UINT32		map 0x2021 SI 0x08 x-velocity
	3	R/W	Mapping Entry 3	0x20210910	UINT32		map 0x2021 SI 0x09 y-velocity
	4	R/W	Mapping Entry 4	0x00000000	UINT32		
	5	R/W	Mapping Entry 5	0x00000000	UINT32		
	6	R/W	Mapping Entry 6	0x00000000	UINT32		
	7	R/W	Mapping Entry 7	0x00000000	UINT32		
	8	R/W	Mapping Entry 8	0x00000000	UINT32		
0x1A03							
	0	R/W	Number of mapped objects	0x00	UINT8		
	1	R/W	Mapping Entry 1	0x00000000	UINT32		
	2	R/W	Mapping Entry 2	0x00000000	UINT32		
	3	R/W	Mapping Entry 3	0x00000000	UINT32		
	4	R/W	Mapping Entry 4	0x00000000	UINT32		
	5	R/W	Mapping Entry 5	0x00000000	UINT32		
	6	R/W	Mapping Entry 6	0x00000000	UINT32		
	7	R/W	Mapping Entry 7	0x00000000	UINT32		
	8	R/W	Mapping Entry 8	0x00000000	UINT32		
0x1F80	-	const	NMT Startup	0x08	UINT32		
0x2001	-	R/W	Operating mode	2	UINT8	x	0: QR single code 1: Data Matrix single code **2: Data Matrix label (default)** 3: Data Matrix code tape 4: Data Matrix auto mode

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
0x2002			Positioning set-tings		Record		Settings for the coordinate system and code used
	1	R/W	Coordinate sys-tem	1	UINT8		**1: Tag centered (default)** 2: Sensor centered
	2	R/W	Code module size	1.0	FLOAT		**1.0 mm (default)** (definition SICK MultiCode Tag)
	3	R/W	Distance to inner code	0.009	FLOAT		**0.009 m (default)** (for 1 mm pixel size in SICK Multi-Code tag)
	4	R/W	Distance to outer code	0.027	FLOAT		**0.027m (default)** (for 1 mm pixel size in SICK Multi-Code tag)
0x2003			Output scaling		Record		Scaling of output values
	1	R/W	xs	10000	FLOAT		**10,000 (default)** (result in 0.1 mm steps)
	2	R/W	ys	10000	FLOAT		**10,000 (default)** (result in 0.1 mm steps)
	3	R/W	zs	10000	FLOAT		**10,000 (default)** (result in 0.1 mm steps)
	4	R/W	phis	32,767 / p i	FLOAT		**32,767 / pi (default)**
	5	R/W	angle format	0	UINT8		**0: Signed (i.e. -pi...+pi) (default)** 1: Unsigned (i.e. 0...+2pi)
	6	R/W	vs	10000	FLOAT		**10,000 (default)** (result in 0.1 mm steps)
0x2004			Output user transform		Record		Result transformation (e.g. for non-vehicle-centered sensor mounting)
	1	R/W	phi_0	0	FLOAT		Offset value for code orientation (angle). Clockwise direction of rota-tion = positive values. **0° (default)**
	2	R/W	mirror x-axis	0	UINT8		Mirroring of x-axis **0: x-axis not mirrored (default)** 1: x-axis mirrored
	3	R/W	mirror y-axis	0	UINT8		**0: y-axis not mirrored (default)** 1: y-axis mirrored
	4	R/W	swap x-y axes	0	UINT8		Swap of x-and y-axis **0: Axes not swapped (default)** 1: Axes swapped
0x2021			**Result data**				Result data analog to PDOs 1-3
	1	RO	Status		UINT16	x	"PDOs", page 38
	2	RO	x-position		INT32	x	Output unit x-position according to scaling. Value is a multiple of 1 m/x_s
	3	RO	y-position		INT32	x	Output unit x-position according to scaling. Value is a multiple of 1 m/x_y
	4	RO	z-position		INT32	x	Output unit x-position according to scaling. Value is a multiple of 1 m/x_z
	5	RO	Angle		INT16	x	Code orientation. Positive values in clockwise direction. For output value, see scaling: Multiple of 1 / phi_s.

Index	Subindex	R/W	Object name	Default value	Type	PDO mapbar	Description
	6	RO	Tag Id		UINT32	x	Numeric read value of the code tag; for 64-bit tag IDs, these are the lower 32 bits.
	7	RO	Time offset		UINT16	x	Time since image was taken. Unit 0.1 ms
	8	RO	x-velocity		INT16	x	Overspeed in x-direction - according to scaling. Value is a multiple of 1 m/v_s
	9	RO	y-velocity		INT16	x	Overspeed in y-direction - according to scaling. Value is a multiple of 1 m/v_s
	10	RO	Tag ID (high)		UINT32	x	Only for 64-bit tag IDs: Upper 32 bits of the numeric read code tag value.
0x2022	-		Code data		DOMAIN		2 bytes: Number of valid data bytes 230 bytes: Code content For the SICK MultiCode label, e.g.: c3 x 0000 y 0005. c3 is an internal alphanumeric indication of the code content used to identify the code.

8.2.2 PDOs

The GLS100 has three TPDO with fixed mapping under 0x180x + node ID and no RPDO. In its default state (node ID 0x0A), the index for TPDO1 is 0x018A.

The TPDO1 is structured as follows:

Table 6: PDO1

Byte	7	6	5	4	3	2	1	0
Value				Y-Position				X-Position

Table 7: PDO2

Byte	7	6	5	4	3	2	1	0
Value		Time offset		Angle		Z-Position		Status

Table 8: PDO3

Byte	7	6	5	4	3	2	1	0
Value		Y-Velocity		X-Velocity				Tag-ID

Table 9: Status bits

Bit	15	14-8	7-4	3	2	1	0
Value	Device status: 0 = ok 1 = ERROR	Reserved	0: QR single 1: Data Matrix single code 2: SICK Data Matrix tag 3: SICK Data Matrix code tape 4: 3rd party Data Matrix tag 5: 3rd party Data Matrix code tape	x/y-velocity valid 1 - Velocity is valid 0 - Invalid (not computable)	Tag Id recognized 1 = Valid 0 = Invalid (unknown format)	Code read 1 = Success 0 = Error	Code detected 1 = Success 0 = Error

NOTE

Parameter changes to the PDO mapping objects are only made in Pre-operational status.

1 First, set bit 31 to 1 in corresponding object 180xh in subindex 01h.
2 Set subindex 00h to 0 in object 1A0xh.
3 Configure the objects to be mapped in subindexes 01h to n of object 1A0xh.
4 Set subindex 00h of object 1A0xh to the number of mapped objects.
5 Then set bit 31 back to 0 in corresponding object 180xh in subindex 01h.

8.2.3 Transmission types

The transmission type of the respective TPDO can be set in index 0x1800 to 0x1803. This index comprises the following subindexes:

Table 10: Subindexes

Subindex	Name	Permissible values	Description
1	COB-ID	-	The COB ID is automatically adjusted to the note ID and should not be amended by the user.
2	Transmission type	0 - 255	The transmission type is set here.
3	Inhibition Time	0 - 65535	The inhibition time (send delay time) specifies in ms the minimum waiting time between the sending of two identical Transmit PDOs. It always has higher priority than the event timer, the CoS events and triggering with SYNC messages. If, for example, the event timer is set to 100 ms and the inhibition time to 1 s, the respective PDO is only sent every second.
4	Compatibility entry	-	Not used
5	Event timer	0 ... 65535	The event timer sets the time between two transmissions from the TPDO in [ms]. The value 0 results in data being sent at the internal sensor update rate (33 ms for Data Matrix MultiCode, 40 ms for QR Code). The recommended minimum value here is 50 ms.

NOTE

Some bus module manufacturers do not support use of inhibition time. We recommend using synchronous communication if you want to control the bus load.

8.3 Operation via Modbus RTU

The following is an overview of the various “sections” and individual register addresses and their values.

Configuration data can be read and, if necessary, written in the “section configuration” and the code read results in the “section results”.

“Input registers” register group (read-only)

The “Input registers” can be read out via function code 0x04.

“Device Identification” section

The device identification details (all of data type ASCII string) can be found from 0x00 onwards in the address range of the input register.

Address	Name	#Register	Description / Value
0	Vendor name	4	SICK AG
4	Product code	4	1100137

Address	Name	#Register	Description / Value
8	Firmware version	6	
14	Vendor URL	6	www.sick.com
20	Product name	16	
36	Model name	9	
45	Serial number	4	
49	Application name	16	
65	SickModBusProfileVersion	6	

"Result" section

Version 1.1

The Section Index tabs contain the results of the read code in different data versions:

Address	Name	#Register	Description / Value
320	Status	1	See below
321	X-Position	2	In 0.1 mm steps (by default)
323	Y-Position	2	In 0.1 mm steps (by default)
325	z-position	1	In 0.1 mm steps (by default)
326	Angle	1	In pi / 32,767 rad (by default)
327	Tag ID	2	Tag identifier
329	Time Offset	1	Time since code acquisition: In 0.1 ms
330	x-velocity	1	In 0.1 mm/s (by default)
331	y-velocity	1	In 0.1 mm/s (by default)
Code contents:			
197	Code size	1	Code content size [number of bytes], 16-bit unsigned.
198	Code data	115	230 bytes of code data [UINT]. For the SICK MultiCode label, e.g.: c3 x 0000 y 0005. c3 is an internal alphanumeric indication of the code content used to identify the code.

Version V3.2

This version also supports contents of tag IDs up to 64 bits.

Address	Name	#Register	Description / Value
340	Status	1	See below
341	X-Position	2	In 0.1 mm steps (by default)
343	Y-Position	2	In 0.1 mm steps (by default)
345	z-position	1	In 0.1 mm steps (by default)
346	Angle	2	In pi / 32,767 rad (by default)
347	Tag ID	2	Numeric TagID value (lower 32 bits)
349	Tag ID (high)	2	Numeric TagID value (upper 32 bits)
351	Time offset	1	Time since code acquisition: In 0.1 ms
352	Code size	1	In 0.1 mm/s (by default)
353	Code data	1	In 0.1 mm/s (by default)

Status bits in register 320

Bit	15	14-8	7-4	3	2	1	0
Value	Device status: 0 - OK 1 - ERROR	Reserved	0: QR single 1: Data Matrix single code 2: SICK Data Matrix tag 3: SICK Data Matrix code tape 4: 3rd party Data Matrix tag 5: 3rd party Data Matrix code tape	x/y-velocity valid 1 - Velocity is valid 0 - Invalid (not computable)	Tag ID recognized 1 = Valid 0 = Invalid (Unknown)	Code read 1 = Success 0 = Error	Code detected 1 = Success 0 = Error

“Status” section

The result data starts at address 0xC0:

Address	Name	#Register	Description / Value
4096	Device Status	1	0 = Device is OK 1 = Maintenance required 3 = Functional Check 2 = Out of Specification 4 = Failure

“Holding registers” register group (read-write)

The following registers are used to configure the sensor via Modbus and can be read using function code 0x03, written to individually using function code 0x06, or written to continuously using function code 0x10.

“Commands” section

Address	Name	#Register	Description / Value
96	Set Application name	16	To be set

“Configuration” section

NOTE
Changes become active only after a “power cycle”.

Address	Name	#Register	Description / Value
144	Modbus RTU slave address	1	1 - 247 **(default: 10)**
145	Modbus RTU baud rate	1	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps **4: 19,200 bps (default)** 5: 38400 bps 6: 57600 bps 7: 115,200 bps
146	Modbus RTU parity setting	1	0: None **1: Even (default)** 2: Odd
149	Operating mode	1	0: QR single code 1: Data Matrix single code **2: Data Matrix tag (Default)** 3: Data Matrix code tape 4: Data Matrix auto mode
150	Coordinate system of position data	1	**1: Tag centered (default)** 2: Sensor centered

Address	Name	#Register	Description / Value
151	Module size	2	**1.0 mm (default)** (definition SICK MultiCode Tag)
153	Distance inner code	2	**0.009 m (default)** (for 1 mm pixel size in SICK Multi-Code Tag)
155	Distance outer code	2	**0.027 m (default)** (for 1 mm pixel size in SICK Multi-Code Tag)
165	Scaling x_s	2	32-bit float (**default: 10,000**)
167	Scaling y_s	2	32-bit float (**default: 10,000**)
169	Scaling z_s	2	32-bit float (**default: 10,000**)
171	Scaling phi_s	2	32-bit float **(default: 32,767 / pi)**
173	Angle format	1	**0: Signed (i.e. -pi...+pi) (default)** 1: Unsigned (i.e. 0...+2pi)
175	Scaling v_s	2	32-bit float (**default: 10,000**)
180	Angle offset phi_0	2	32-bit float (**default:0**) Rotation offset in z-plane. unit: deg
182	Mirror axes	1	16-bit unsigned (default: 0) mirroring of axes Low byte (x-axis): 0: x-axis not mirrored 1: x-axis mirrored High byte (y-axis): 0: y-axis not mirrored 1: y-axis mirrored
183	Swap axes	1	16-bit unsigned swapping of axes **0: Axes not swapped (default)** 1: Axes swapped

8.3.1.1 Reading out SICK MultiCodes

Read the 12 input registers with the result data (register addresses 320 to 331) periodically (not more often than every 30 ms). Use Modbus function code 0x04.

If status bits 0, 1, 2 are set, all registers are valid.

The “time offset” value (register address 329) can be used to determine the exact relative position of the code to the vehicle. The value indicates the time from the code reading to transmission of the Modbus telegram.
If the value is 30 ms, the value was read out 30 ms ago.
In conjunction with the vehicle speed, the position of the vehicle can be precisely determined in this way.

8.4 Transformation of output values

8.4.1 Scaling of output values

The GLS100 internally calculates the position and alignment of a code with floating point accuracy. However, the result data is output as integer values.

The standard scaling of the position data (x, y, z) is 0.1 mm per increment in 32-bit two's complement. The standard scaling of the orientation angle is (pi / 32,737) per increment in 16-bit two's complement. By default, the angle is output as a signed value and therefore maps the orientation angle from -pi to + pi.

For special applications, e.g. for compatibility requirements, a scaling of the integer position and orientation data must be done. In addition, the angle output format can be adjusted by configuration.

The position scaling can be changed individually for each coordinate axis via the x_s, y_s, z_s configuration parameters.
The resulting scaling is given by x_s^{-1} m, y_s^{-1} m, z_s^{-1} m.

By default, x_s, y_s, z_s are set to 10,000 to achieve a scaling of 0.1 mm.
To achieve a scaling of 1 mm per increment, x_s, y_s, z_s must be set to the value 1,000.

Likewise, the orientation scaling can be changed via the phi_s configuration parameter. The default value (pi / 32,737) specifies the highest accuracy of the angle as a 16-bit integer value. To output the angle directly in integer degrees, set phi_s to the value 180 / pi, = 57.3.

The “angle format” configuration parameter can be used to switch between a signed (-pi... + pi, -180°... + 180°) and an unsigned (0... 2pi, 0°... 360°) angle output format.

8.4.2 Transformation of the coordinate axes

To compensate for special assembly conditions, the GLS100 can be configured to apply the following transformations to initial position and orientation data:

- mirror x-axis: Inverts the sign of the x-coordinate value
- mirror y-axis: Inverts the sign of the y-coordinate value
- swap axes: Swaps x-and y-coordinate values

The above options do not affect the value of the orientation angle. To set the angle, the configuration parameter phi_0 can be set as an offset value.

9 Maintenance

9.1 Cleaning

CAUTION DEVICE DAMAGE DUE TO IMPROPER CLEANING!
Improper cleaning may result in device damage.

For this reason:

- Never use cleaning agents containing aggressive substances.
- Never use sharp objects for cleaning.

Clean the front screen at regular intervals with a lint-free cloth and plastic cleaning agent. Cleaning agents containing solvents are not allowed.

The cleaning interval essentially depends on the ambient conditions.

9.2 Maintenance

The sensor requires the following maintenance work at regular intervals:

Table 11: Maintenance schedule

Interval	Maintenance work	To be performed by
Cleaning interval depends on ambient conditions and climate	Clean housing, particularly the front screen.	Specialist
Every 6 months	Check the screw connections and plug connectors.	Specialist

9.3 Repairs

Repairs on the sensor may only be carried out by the manufacturer. Any interruption or modification of the sensor will invalidate the manufacturer warranty.

10 Decommissioning

10.1 Decommissioning

Removing the sensor

1. Switch off the supply voltage to the sensor.
2. Detach all connecting cables from the sensor.
3. If the sensor is being replaced, mark its position and alignment on the bracket or surroundings.
4. Remove the sensor from the slot.

Disposing of the sensor

Any sensor which can no longer be used must be disposed of in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations. The sensor is electronic waste and must under no circumstances be disposed of with general waste.

11 Technical data

Features

Table 12: Features

	1116319	1114008
Optical focus	100 mm fixed focus	
Light sender[1]	2 x LED, visible, amber, 590 nm, ± 80 nm	
LED class	Free group (IEC 62471:2006-07, EN 62471:2008-09)	
Sensing distance	100 mm	
Sensing distance tolerance	+/-30 mm[2]	
Overspeed	≤ 3.5 m/s[2]	
Repeatability (position x,y)	± 0.1 mm (3 sigma)[3]	
Repeatability (angle)	± 0.1° (3 sigma)[3][4]	
Absolute accuracy across the entire field of view	2%	
Field of view	160 mm x 120 mm	

1) Average service life 100,000 h at TU = +25 °C.
2) When using the SICK MultiCode label.
3) In optical center and after sensor warm-up phase
4) In nominal sensing range 100 mm when using the SICK MultiCode label.

Mechanics/electronics

Table 13: Mechanics/electronics

	1116319	1114008
Connection type	1 x M12, 5-pin male connector[1]	
Supply voltage	10.8 V ... 30 V	
Power consumption	< 3 W	
Enclosure rating	IP65 (EN 60529, EN 60529 / A2)	
Protection class	III	

1) Use of a shielded cable is recommended for longer connecting cables.

Performance

Table 14: Performance

	1116319	1114008
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	

Interfaces

Table 15: Interfaces

	1116319	1114008
Serial		Yes , RS-485
Serial (data transmission rate)		1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbit/s
Serial (remark)		Modbus RTU
CANopen	Yes	
CANopen (data transmission rate)	50/125/250/500/1,000 kbit/s	
Optical displays	2 LEDs (1 x voltage supply, 1 x code read)	

1 Average service life 100,000 h at TU = +25 °C.

Ambient data

Table 16: Ambient data

	1116319	1114008
Electromagnetic compatibility EMC	EN 61000-6-3:2007+A1:2011 / IEC 61000-6-3:2006+AMD1:2010 EN 61000-6-2:2005-08	
Vibration resistance	EN 60068-2-6:2008-02 EN60068-2-27:2010-02	
Ambient operating temperature	0 °C ... +50 °C	
Storage temperature	-25 °C ... +75 °C	
Permissible relative humidity	90%, non-condensing	

12 Accessories

NOTE
Accessories can be found on the online product page at:
www.sick.com/1114008
www.sick.com/1116319

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14 Annex

14.1 EU declaration of conformity

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

www.sick.com/1114008

www.sick.com/1116319

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