OPERATING INSTRUCTIONS

SIM2000

Sensor Integration Machine

SICK
Sensor Intelligence.

Described product

SIM2000

Manufacturer

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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 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 page can be accessed 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

1.4 SICK service

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

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

2 Safety information

2.1 General safety notes

The following safety notes must always be observed regardless of specific application conditions:

- The device must only be mounted, commissioned, operated, and maintained by professionally qualified safety personnel.
- Electrical connections with peripheral devices must only be made when the voltage supply is disconnected.
- The device is only to be operated when mounted in a fixed position.
- The device voltage supply must be protected in accordance with the specifications.
- The specified ambient conditions must be observed at all times.
- The electrical connections to peripheral devices must be screwed on correctly.
- The cooling fins or fan - if present - must not be covered or restricted in their functionality.
- The pin assignment of pre-assembled cables must be checked and adjusted if necessary.
- These operating instructions must be made available to the operating personnel and kept ready to hand.

2.2 Intended use

The device is a programmable control and evaluation unit for sensors, 2D and 3D cameras, and image processing devices. The device also acts as a link between system and plant controls, and the connected terminal devices. The device is mainly used in an industrial environment in production, testing, and control. Other applications are possible depending on the device-specific properties.

The device is programmed on a PC by using the development environment software SICK AppSpace. Depending on the application, a browser-based, graphical user interface (HMI) can be created, which provides opportunities defined by the application developer to influence an application at operator level.

The device connection to the peripherals is established by means of a range of industrial fieldbuses and other interfaces.

The device offers various interfaces for controlling, programming, and operating purposes, which can be activated as necessary via development environments, control systems (programmable logic controllers), or applications.

However, configuration, programming, and control requires various technical skills, depending on how the device is connected and used.

2.3 Improper use

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

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

WARNING
Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

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

2.4 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)

An overview of cybersecurity concepts for the SICK AppSpace Eco-System is available in the SICK Support Portal: supportportal.sick.com, under the search term: **SICK AppSpace Security Concepts**

2.5 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

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

NOTE
Programmable device

The Sensor Integration Machine (SIM) is a programmable device.

Therefore, the respective programmer is responsible for his/her programming performance and the resulting operating principle of the device.

The liability and warranty of SICK AG is limited to the device specification (hardware functionality and any programming interfaces) according to the agreed conditions.

Therefore, SICK AG is not liable, among other things, for damages that are caused by programming of the customer or third parties.

2.6 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.

2.7 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.

This product documentation refers to the following qualification requirements for the various activities associated with the device:

- **Instructed personnel** have been briefed by the operator about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks delegated to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions, to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. The electrician must comply with the provisions of the locally applicable work safety regulation.

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

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 computer operating system used ▪ Basic knowledge of the design and setup of the described connections and interfaces ▪ Basic knowledge of data transmission
Operation of the device for the particular application	▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment for the particular application

2.8 Operational safety and particular hazards

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

WARNING
Electrical voltage!

Electrical voltage can cause severe injury or death.

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

WARNING
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.

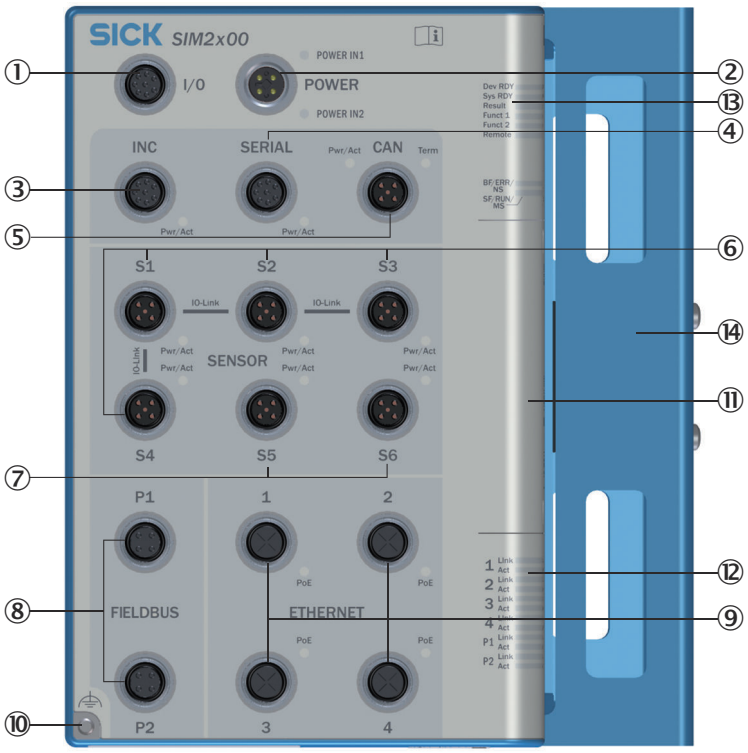
- Work on electrical systems must only be performed by qualified electricians.
- Follow the notes in the operating instructions.
- Install the grounding for the product and the system in accordance with national and regional regulations.

2.8.1 LED RG0

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.

3 Product description

3.1 Device view



① Connection for digital I/Os
② Connection for power
③ Connection for incremental
④ Connection for serial
⑤ Connection for CAN
⑥ Connection for (IO-Link) sensors or fan
⑦ Connection for sensors, illumination unit or fan
⑧ Fieldbus connections
⑨ Ethernet connections
⑩ Functional ground connection
⑪ Servicing panel
⑫ Status indicators for Ethernet and fieldbus connections
⑬ Device status indicators
⑭ fan

3.2 Functionality

The SIM2000 Sensor Integration Machine – part of the SICK AppSpace ecosystem – is opening up new possibilities for application solutions.

Data from SICK sensors such as LiDAR scanners and cameras can be read, merged into a point cloud, evaluated, archived, and transmitted. Four fast Ethernet interfaces are available for 2D or 3D cameras that feature power supply over Ethernet (PoE). The SIM enables SICK picoCam and midiCam as well as any GigE Vision/GenICAM compliant cameras to be used.

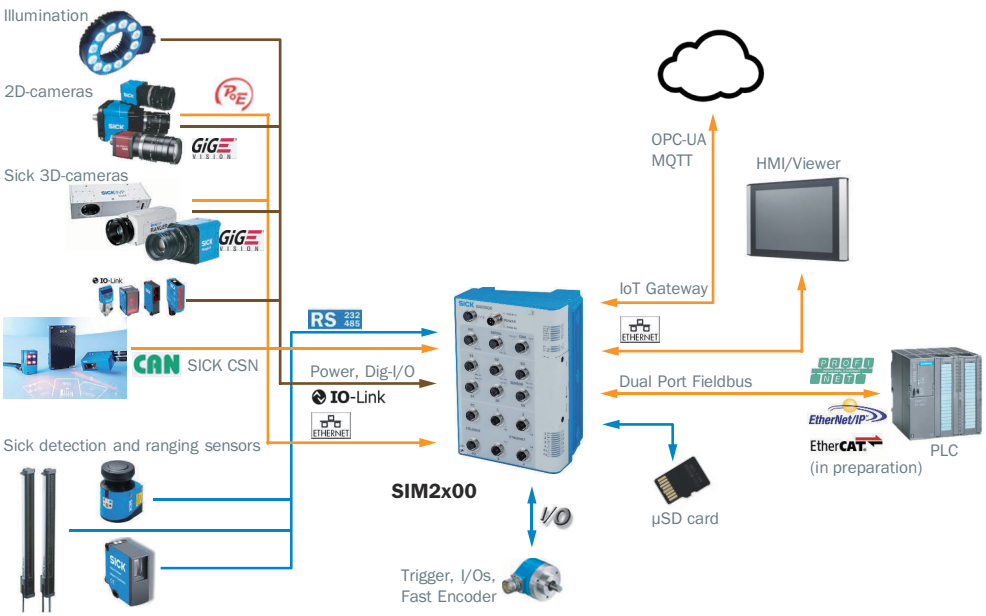
Other sensors can be integrated via IO-Link, for example for distance and height measuring purposes.

Fieldbus and Ethernet interfaces with OPC-UA and MQTT provide data preprocessed in “dual talk” (edge computing) for the controller and for cloud computing. In addition, the SIM can be integrated into a SICK CAN sensor network.

Thanks to the high-performance multi-core processor and a highly synchronous FPGA I/O module, the SIM2000 can be used for fast image/sensor data processing and handling of input and output signals in real time.

The SICK AppSpace open software platforms enable tailor-made application programs to be developed for demanding applications.

The HMI and data visualization features can be provided on any browser-enabled notebook, PC, or tablet. The app is created using the SICK AppStudio SDKs and - when using HALCON - using HDevelop from MVTec.



3.3 SICK AppSpace

Detailed instructions on the SICK AppStudio as well as programming the device can be found at supportportal.sick.com.

3.4 Preset Ethernet interfaces

NOTE

Preset IP addresses of the ETHERNET interfaces:

- ETHERNET 1: 192.168.0.1
- ETHERNET 2: 192.168.1.1

Changing the IP addresses

The individual IP addresses can be changed using the WelcomeAPP pre-installed in the device or via the SICK SOPAS ET PC tool.

After completing the device configuration, it is recommended to remove the WelcomeApp from the device using the SICK AppManager.

4 Transport and storage

4.1 Transport

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

NOTICE

Damage to the product due to improper transport.

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

4.2 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.

4.3 Storage

Store the device under the following conditions:

- Do not store outdoors.
- Store in a dry area that is protected from dust.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: see "Technical data", page 41.
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Overview of mounting procedure

NOTE
The mounting procedure described here for the device meets the requirements for use in the target system. Additional or different requirements may become necessary in the laboratory and during preparation, and should be taken into account as necessary, see "Commissioning", page 29. If you have any questions or anything remains unclear in this regard, please contact our service team.

- ► Mounting the bracket, if provided.
- ► Install the device.
- ► Assembling and laying cables.
- ► Connecting peripheral devices.
- ► Connecting the voltage supply.

5.2 Scope of delivery

- SIM2000
- 1x grounding screw
- 1x toothed lock washer
- Safety note
- Optional: ordered accessories

NOTE
For a list of cables suitable for use with the device, see: supportportal.sick.com.

5.3 Preparing for mounting

Mounting requirements

NOTE
Two mounting methods along with the relevant accessories are recommended:

- Via adapter plates (accessory part no. 2084764)
- Via mounting rail (accessory part no. 2084765)

To avoid damage to the device or the connected peripheral devices, avoid ambient temperatures greater than 45 °C.

- Select the mounting site:
  Plan space requirements and sufficient distance from other devices.
  Be aware of the possibility of heat dissipation.
- Unpack the device and allow to acclimatize to avoid formation of condensation.

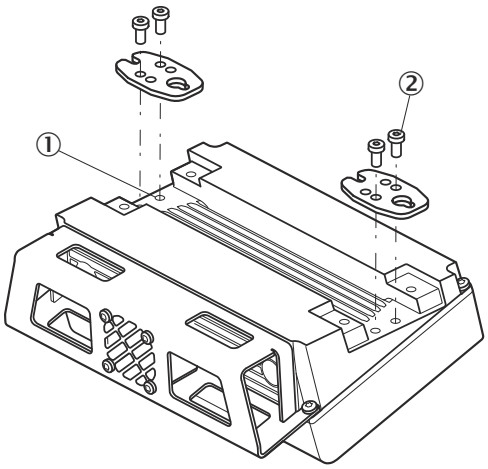
Preparing for mounting with mounting rail

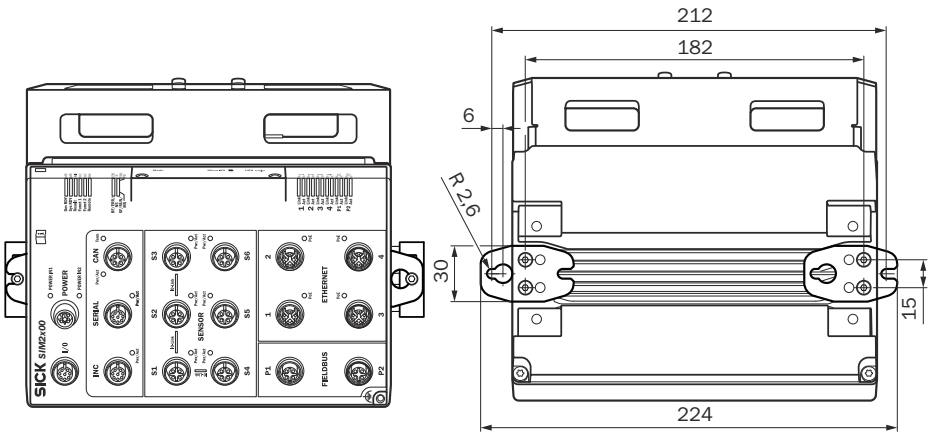
1. Place the mounting rail at the mounting site.
2. Mark the mounting holes.
3. Proceed to drill the mounting holes.

5.4 Mounting the device

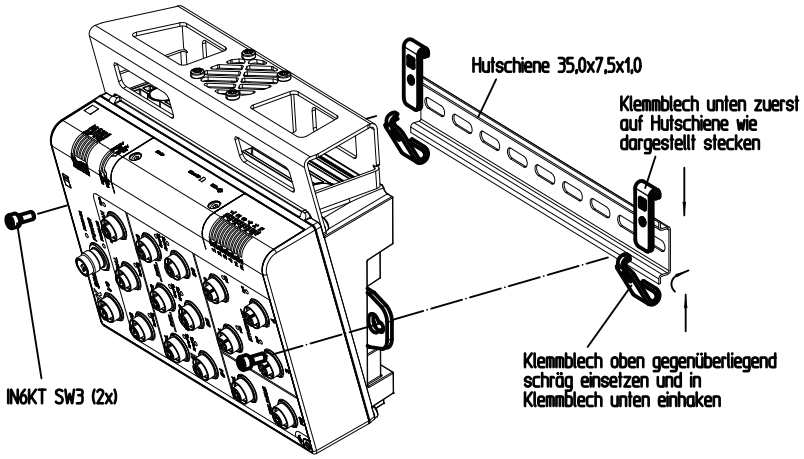
Mounting the device horizontally using a mounting rail

1. Attach the mounting plates to the device using two hexagon socket head cap screws (A/F 3) on each





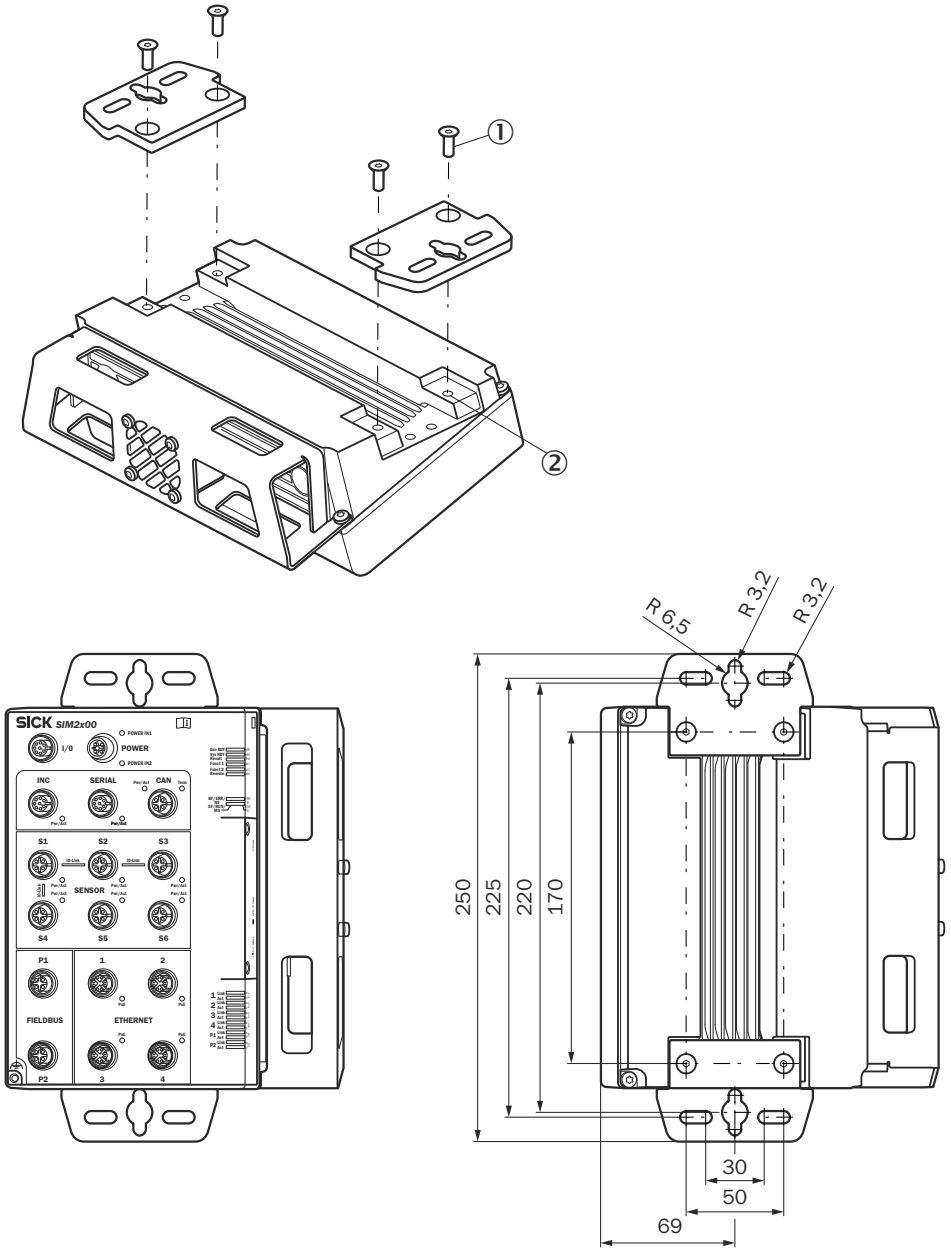
2. Mount the lower clamping plate on the mounting rail.
3. Insert the lower clamping plate on the opposite side at an angle and hook into the lower clamping plate.
4. Use the mounting plates and two hexagon socket heat cap screws (A/F 3) to screw the device securely into the two clamping plates.



NOTICE

Use self-locking or lock nuts on mounting sites that are exposed to vibrations to prevent the holding plates from loosening.

Mounting the device in a vertically suspended or horizontal position using adapter plates



1. Attach the adapter plates to the device using two hexagon socket head cap screws (A/F 3) on each.
2. Mount the device with adapter plates at the mounting location (vertically suspended or horizontal position).
   - for suspended mounting, use the individual screw slots on the adapter plates.
   - for horizontal mounting, use at least 2 of the 4 screw slots on the plates.
3. Mark the mounting holes.
4. Proceed to drill the mounting holes.
5. Mount the device with adapter plates using at least two screws.

6 Electrical installation

6.1 Important notes

WARNING
Risk of injury and damage caused by electrical current!

Due to equipotential bonding currents, incorrect earthing can lead to the following dangers and faults: Voltage is applied to the metal housing, cable fires due to cable shields heating up, the product and other devices become damaged.

- Generate the same ground potential at all grounding points.
- Ground the equipotential bonding via the functional ground connection with a low impedance.

NOTICE
Device damage due to improper supply voltage!

- Only operate the device with the specified supply voltage.
- The voltage supply and all connected signals must meet the requirements for extra-low voltages with safe separation (SELV) as specified in EN 61010. The external voltage supply of the device must bridge a short-term power interruption of 20 ms in order to meet the requirements of EN 60204-1.
- Only devices that are also supplied with safety extra-low voltage must be connected.

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.

6.2 Preparing the electrical installation

To carry out the electrical installation, you will need:

- Connection cables for the peripheral devices, including the corresponding data sheets
- Fan connection (see "Preparatory commissioning", page 29)
- Voltage supply cable
- If customers assemble the cables: crimping tool, ferrules, soldering iron, and other installation material

6.3 Preparing the cables

For a list of cables suitable for use with the device, see the document “SIMxxxx_Cable-Overview” available from: supportportal.sick.com.

Customer assembly of the cables is only necessary in special cases. Ensure a sufficient length of cable is provided, e.g., for strain-relief clamps.

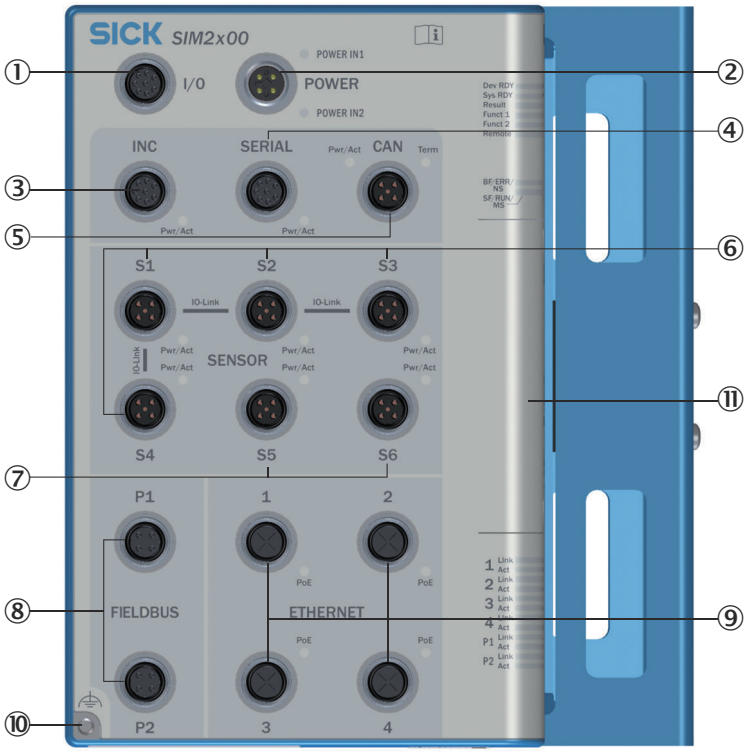
NOTICE

Risk of damage/malfunction due to incorrect PIN assignment

Incorrect wiring of the male connectors/female connectors can lead to damage to or malfunctions in the system.

- Observe data sheets provided by the cable manufacturer.
- Observe the pin assignment.

6.4 Overview of connections



① I/O: Universal port with configurable inputs/outputs, opto-decoupled inputs as well as a voltage supply for peripherals

② POWER: Voltage supply input

③ INC: One incremental encoder In/Out or RS-422 as well as a voltage supply for peripherals

④ SERIAL: One RS-232/RS-422/RS-485 or one INC In/Out as well as a voltage supply for peripherals

⑤ CAN: Connection for the SICK CAN sensor network (receiver/transceiver) as well as a voltage supply for peripherals

⑥ SENSOR 1-4: Four sensor connections with digital inputs/outputs and voltage supply. Alternatively, these can be used as IO-Link master connections or to supply and control the fan.

⑦ SENSOR 5-6: Two sensor connections with two configurable inputs/outputs, one dedicated input as well as a voltage supply. Alternatively, these can be used to supply and control the fan.

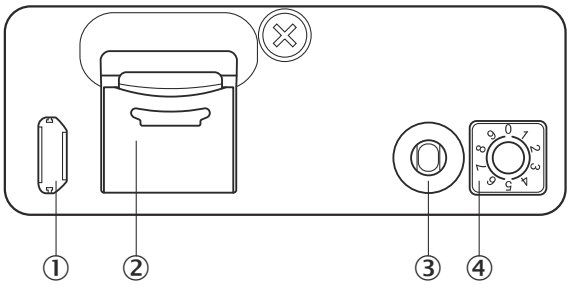
⑧ FIELDBUS: Two Ethernet-based fieldbus interfaces.

⑨ ETHERNET: Four Ethernet connections with PoE

⑩ Functional ground connection: see "Important notes", page 19

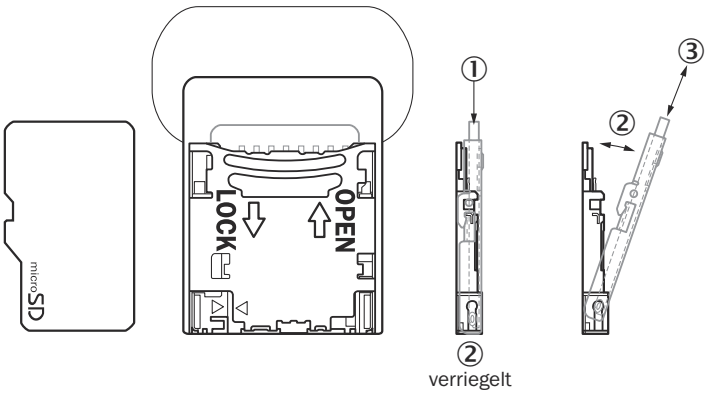
⑪ Servicing panel

Connections/control elements under the servicing panel



① USB connection (Micro-B, for configuration/diagnostics/firmware update)
② microSD card slot
③ Function button
④ Function selector switch (configurable by SensorApp)

Installing/removing a micro-SD card



1. Open the servicing panel by removing the two screws.
2. To install an SD card, gently press the SD card tray to release (1) and then open it (2).

► Insert the card with the contact side facing down (3).
► Close the SD card tray and lock it.

3. To remove the card, release the card tray (1) and open it (2).

► Pull out the SD card (3).
► Close the SD card tray and lock it.

4. Close the service cover and tighten the two screws.

6.5 Functional earth connection

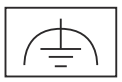


Figure 1: Alternative FE connection

The functional earth (FE) is connected either via the housing or via an FE connection with cable lug.

Alternative FE connection

Screw connection of the alternative functional earth connection

- Screw: M4 x 15

Suitable cable lugs

- Forked cable lug or ring cable lug
- Width ≤ 10 mm
- Hole diameter for screw: typically 4.1 mm

The functional earth must be connected in a low-inductance manner and with an adequate cross-section while keeping the cable length as short as possible.

6.6 Pin allocation of the connections

6.6.1 POWER IN

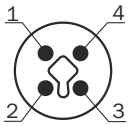


Figure 2: POWER IN pin assignment, M12 - 4-pin T-coded, male

Table 2: POWER IN

PIN	Signal	Color coding on the SIM power cable e.g., 6059939*	Function
1	+ 24 V IN1	BN (brown)	IN1 supply voltage
2	GND IN2	WH (white)	Ground
3	GND IN1	BU (blue)	Ground
4	+ 24 V IN2	BK (black)	IN2 supply voltage (redundant)
Housing	-	-	Screen

* SICK cables in the SIM accessories

Additional notes

- Max. 7.5 A permanent load
- Supply voltage “IN1” and “IN2” can be set up redundantly.

Observe the requirements for the design of overcurrent protective devices according to EN 61010.

6.6.2 I/O

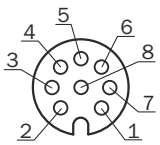


Figure 3: I/O pin assignment, M12 - 8-pin A-coded, female

Table 3: I/O connection

PIN	Signal	Function	Factory settings	Color coding of open-ended SIM I/O cables[1]
1	Input 1	Isolated switching input	–	WH (white)
2	SensGND 1	Isolated GND input 1	–	BN (brown)
3	Input 2	Isolated switching input	–	GN (green)
4	SensGND2	Isolated GND input 2	–	YE (yellow)

PIN	Signal	Function	Factory settings	Color coding of open-ended SIM I/O cables[1]
5	Input 3/Output 3	Configurable switching input/output	All IO connections as inputs	GY (gray)
6	Input 4/Output 4	Configurable switching input/output		PK (pink)
7	24 V OUT	Supply voltage, peripherals	Always enabled	BU (blue)
8	GND	-	–	RD (red)
Housing	–	Screen	–	

1 SICK cables in the SIM accessories

Additional notes:

- Connection to control cabinet to connect devices directly
- 2 GPIOs and 2 isolated inputs
- Max. 0.5 A output for supply voltage connection (compliant with LPS)
- Digital outputs can be configured as inputs
- Outputs:
  - Max. current output: 100 mA
  - Min. high output logic level: VCC - 3 V
  - Max. low output logic level: 3 V
  - Push-pull
  - Max. output frequency: 10 kHz
- Inputs:
  - Min. high input logic level: 12 V
  - Max. low input logic level: 4 V
  - Input 1 - 2 (isolated): maximum 30 kHz
  - Input 3 - 4: Max. input frequency: 30 kHz

6.6.3 INC

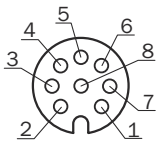


Figure 4: Incremental pin assignment, M12 - 8-pin A-coded, female

Table 4: Incremental connections for encoders, can also be used as serial connections for RS-422

PIN	Mode			
	RS-422*	RS-232	RS-485	INC
1	T-	-	-	A- (in/out)
2	T+	-	-	A+ (in/out)
3	R-	-	-	B- (in/out)
4	R+	-	-	B+ (in/out)
5	-	-	-	Z- (not supported)
6	-	-	-	Z+ (not supported)
7	GND (ground)			
8	24 V (supply voltage for peripherals, configurable, deactivated in factory condition)			

PIN	Mode			
	RS-422*	RS-232	RS-485	INC
Housing	Screen			

* Standard configuration

Additional notes

- Max. 0.5 A output for supply voltage connections (compliant with LPS)
- Frequency: max. 2 MHz
- TTL encoders use RS422 and can be connected via the INC interface.

6.6.4 SERIAL

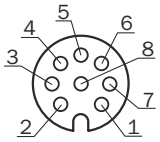


Figure 5: Serial pin assignment, M12 – 8-pin A-coded, female

Table 5: Serial connections, can also be used as an incremental connection

PIN	Mode			
	RS-422	RS232*	RS-485	INC
1	-	-	-	A- (in/out)
2	-	-	-	A+ (in/out)
3	T-	-	Rx/Tx- (B)	B- (in/out)
4	T+	TxD	Rx/Tx+ (A)	B+ (in/out)
5	R-	-	-	Z- (not supported)
6	R+	RxD	-	Z+ (not supported)
7	GND (ground)			
8	24 V (supply voltage for peripherals, configurable, deactivated in factory condition)			
Housing	Screen			

* Standard configuration

Additional notes

- Max. 1 A output for supply voltage connections (compliant with LPS)
- Data transmission rates:
  - RS-232: 115.2 kBaud
  - RS-422: 2 MBaud
  - RS-485: 2 MBaud
- TTL encoders use RS422 and can be connected via the SERIAL interface.

6.6.5 FBUS

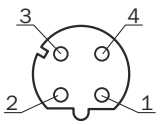


Figure 6: Fieldbus pin assignment, M12 – 4-pin D-coded, female

Table 6: Fieldbus connections

Pin	Signal	Function
1	TD+ (TX1_P)	Transmit data +
2	RD+ (RX1_P)	Receive data +
3	TD- (TX1_N)	Transmit data -
4	RD- (RX1_N)	Receive data -
Housing	-	Screen

Additional notes:

- Designed for line topology
- Data transmission rates: 10/100 Mbit/s
- PROFINET and EtherNet/IP support

6.6.6 CAN

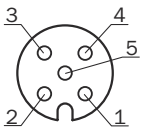


Figure 7: CAN pin assignment, M12 – 5-pin A-coded, female

Table 7: CAN connection

PIN	Signal	Function	Factory settings
1	-	Screen	-
2	+ 24 V	Supply voltage for peripherals, configurable	Deactivated
3	GND	Ground	-
4	CAN_H	CAN HIGH	Termination deactivated *)
5	CAN_L	CAN LOW	
Housing	-	Screen	-

*) Termination controllable via app

Additional notes

- Max. 3.2 A output for supply voltage connections (compliant with LPS)

6.6.7 Sensor 1-4

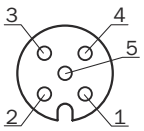


Figure 8: SENSOR 1-4 pin assignment, M12 - 5-pin A-coded, female

Table 8: SENSOR 1-4 connections pin assignment

PIN	Signal	Function	Factory settings
1	+ 24 V	Supply voltage for peripherals, configurable	Deactivated
2	Input 2	Digital input	-
3	GND	Ground	-

PIN	Signal	Function	Factory settings
4	C/Q or input 1 / output 1	C/Q IO-Link or configurable digital input/output	All IO connections configured as inputs
5	NC	Not connected	-
Housing	-	Screen	-

Additional notes

- 4 x IO-Link master (1 x master available per connection)
- S1 to S4 can also be used to control the fan, see "Connecting the fan", page 29
- The digital inputs and output are switchable, regardless of whether the supply voltage is activated at Pin1. A ground connection on Pin3 is required in all cases.
- Digital output:
  - Max. output 100 mA
  - Min. high output logic level: VCC - 3 V
  - Max. low output logic level: 3 V
  - Push-pull switch
  - Max. IO-Link output frequency: 230 kHz
  - Max. IO output frequency: 30 kHz
- Digital inputs:
  - Min. high input logic level: 12 V
  - Max. low input logic level: 4 V
  - Max. IO-Link input frequency: 230 kHz
  - Max. IO input frequency: 30 kHz
- Max. 1 A output for supply voltage connections S1 to S4 (compliant with LPS)
- HTL encoders use push-pull switches and can therefore be connected via the digital inputs.

Recommendation when using S1 to S4 for illumination:

- Short flash times can be achieved by using an illumination unit with signal strobe and by using pin 4 as a switching output signal with a constant supply voltage on pin 1.
- S1 to S4 **do not** support Power Strobe Mode via the "Connector.Power.Gate" API.

6.6.8 SENSOR 5-6

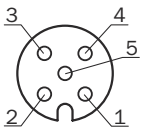


Figure 9: Sensor 5-6 pin assignment, M12 - 5-pin A-coded, female

Table 9: SENSOR 5-6 connections pin assignment

PIN	Signal	Function	Factory settings
1	+24 V	Supply voltage for peripherals, configurable	Deactivated
2	Input 3	Digital input	-
3	GND	Ground	-
4	Input 1 / output 1	Configurable digital input/output	All IO connections configured as inputs
5	Input 2 / Output 2	Configurable digital input/output	All IO connections configured as inputs
Housing	-	Screen	-

Additional notes

- S6 is factory configured for connecting and controlling the device fan, however sensor ports S1 to S5 can also be used for this, see "Connecting the fan", page 29.
- The digital inputs and outputs are only switchable if the supply voltage is activated on pin1, or +24 V is externally applied to pin1. A ground connection on Pin3 is required in both cases.
  Digital outputs:
  - Max. output 100 mA
  - Min. high output logic level: VCC - 3 V
  - Max. low output logic level: 3 V
  - Push-pull switch
  - Max. IO output frequency: 30 kHz

  Digital inputs:
  - Min. high input logic level: 12 V
  - Max. low input logic level: 4 V
  - Max. input frequency for input3: 10 kHz
  - Max. IO input frequency: 30 kHz
- Max. 2.5 A output for supply voltage connections S5 to S6 (compliant with LPS). To enable voltage supply to the peripherals, both voltage supply strands from POWER MAIN must be connected to 24 V.
- HTL encoders use push-pull switches and can therefore be connected via digital inputs.

Recommendation when using S5 to S6 for illumination:

Short flash times can be achieved using two alternative modes:

1. Power Strobe Mode: when using the “Connector.Power.Gate” API (see the API documentation)
2. Signal Strobe Mode: when using pin 4 or pin 5 as a switching output signal with a constant supply voltage on pin 1 (only for illumination units with signal strobe)

6.6.9 ETHERNET

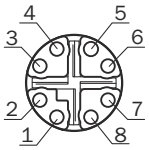


Figure 10: Ethernet pin assignment, M12 – 8-pin X-coded, female

Table 10: Ethernet 1-4 connections

Pin	Function
1	D1+ & DC+ (PoE supply voltage)
2	D1- & DC+ (PoE supply voltage)
3	D2+ & DC- (PoE ground)
4	D2- & DC- (PoE ground)
5	D4+
6	D4-
7	D3-
8	D3+

Additional notes

The Ethernet connections can be used to connect to cameras and SICK LiDAR scanners as well as a PC or network.

The relevant drivers for using SICK LiDAR scanners and the picoCam and midiCam camera families as well as GigE Vision compatible cameras have been implemented in the SIM.

Jumbo frame support is required when using Ethernet switches.

Transmission rates:

ETH1 - 4: 0.01; 0.1; 1, 2.5 Gb/s

ETH1-4: with PoE Out

- PoE voltage supply is factory deactivated

PoE according to class 4

6.7 Connecting peripheral devices

The device can be connected to a wide range of sensors and cameras. The required pin assignments can be found in the data sheets for the peripherals to be connected as well as in the relevant connection descriptions, see "Pin allocation of the connections", page 22.

1. If necessary, assemble connection cables, see "Preparing the cables", page 19.
2. Connect the cables to peripheral devices.
3. Route the cables to the device using installation materials (cable channels, cable ties, etc.). When doing so, pay attention to cable strain relief.
4. Connect cables to the relevant device connections.
5. Seal unused connections with dummy plugs.
6. Ensure that the power output to the sensor via the device does not exceed 140 W.

6.8 Connecting voltage supply

NOTICE

Risk of damage to peripheral devices!

If peripheral devices are connected when the voltage supply is also applied, these devices can become damaged.

- Only connect peripheral devices when the voltage supply is disconnected.

1. Ensure that the voltage has been disconnected by the user.
2. Connect the voltage supply cable(s) to the device.
3. Lay the cable(s) with strain relief.
4. Have the user connect the voltage supply.
5. Have the user activate the voltage.

7 Commissioning

7.1 Preparatory commissioning

Commissioning for preparatory purposes and under laboratory conditions differs in some respects from commissioning in the target system.

In general, all safety and hazard warnings applicable to mounting (see "Mounting", page 15) and electrical installation (see "Important notes", page 19) must also be observed under laboratory conditions. In addition, further notes must be taken into consideration to guarantee the most effective preparation possible:

- Only connect those devices to the product that you want to configure or program.
- Operate the connected device in a controlled and contained network environment for the time being to check network communication if necessary.
- Note the company standards that apply to the use of inspection and testing devices.
- For initial programming, use ideal conditions for sensor or camera recognition.
- Use the largest possible deviations from these ideal conditions to check the programming with respect to its error tolerance and reliability, and to determine error limit values.

Procedure

1. Place the device on a non-slip base.
2. Connect the required peripheral devices, see "Connecting peripheral devices", page 28.
3. Connect the network connection.
4. Connect the voltage supply.
5. Connect the M12 fan plug to the SENSOR port S6. An automatic, intelligent fan control commences after the device start-up time, see "Connecting the fan", page 29.
6. Switch on the voltage supply. The device has a certain time delay before availability or start-up time. Device availability is indicated by a green “Dev RDY” LED.

NOTE

If S6 is reserved for application purposes, the fan control on this port can be deactivated and the following alternatives without speed control can be configured:

- Connection of the M12 fan plug to one of the SENSOR ports S1 to S4. To use this option, the 24 V source must be activated on the selected SENSOR port.
- Connection of the fan cable to an external 24 V voltage supply. The fan cable has the following pin assignment:
  - Red wire: 24 V
  - Black wire: Ground
  - Yellow wire: Not used

The deactivation of the fan control at S6 as well as the activation of a 24 V supply voltage at S1 to S4 can either be configured via the WelcomeApp, or programmed in the SensorApp using the APIs provided for that purpose.

7.2 Connecting the fan

To avoid overheating of the electronics, the device comes with a fan speed controller. In the factory configuration of the device, sensor port S6 is intended to be used to connect the fan.

If S6 is reserved for application purposes, ports S1 to S5 are also available for active fan control.

The sensor port for the fan can be selected on the “FAN” tab in the WelcomeApp. Make sure that the fan plug is already connected to the relevant sensor port before making the selection. After selecting the sensor port in the WelcomeApp, the fan detection is performed and the green Pwr/Act LED of the selected sensor port lights up permanently. After approx. 30 seconds, the active fan control starts, which is indicated by the blinking of the LED.

To permanently change the sensor port, the options “Save Permanently” and then “Reboot device” must be selected in “SAVE & REBOOT” in the WelcomeApp.

The fan can also be connected to an external 24 V voltage supply, but in this case no speed control occurs.

The fan connecting cable has the following pin assignment:

- Red: 24 V
- Black: Ground
- Yellow: Not used

In this case the fan must be permanently deactivated via the WelcomeApp.

8 Operation

8.1 Status LEDs

When the device is operating, the operational status of the connections is indicated visually by status LEDs.

Using these status indicators, the operator can find out quickly and easily whether the device and the peripherals are working properly or whether any faults or errors have occurred.

Monitoring the visual indicators is part of the routine inspection carried out on the device and the machine/plant area into which the device is incorporated.

Meaning of symbols (applies to all colors)

Icon	Meaning
	LED off
	LED on
	LED flashes
	LED goes out briefly
	LED lights up briefly
	LED flashes bicolored

8.1.1 Situation and function of the LEDs

Device status

Table 11: Device status indicators

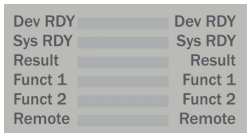
Location	Designation	LED behavior	Description
	Dev RDY		Device is booting; power-up time due to boot process (approx. 50 s)
			Runlevel READY, no errors detected
			Runlevel READY, boot process error
	Sys RDY Result Funct 1 Funct 2		User-defined, configurable using SICK App-Space
	Remote		Remote maintenance app (RSC) not installed
			Remote maintenance app (RSC) installed but not activated
			Remote maintenance app (RSC) installed and activated
			Establishing a connection
			Connection establishment successfull
			Remote maintenance app (RSC) installed but no Internet access or app not functional

Table 12: Device status indicators for PROFINET

Location	Designation	LED behavior	Description
	SF (system error)		No error
			**DCP signal service is triggered via the bus**; Device not configured or not configured correctly; Check configuration
			**Watchdog timeout**; Channel, generic or advanced diagnostics are available; System error
	BF (bus error)		No error
			No data exchange
			No configuration, slow physical connection or no physical connection

Table 13: Device status indicators for EtherNET/IP

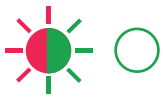
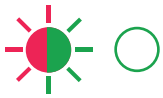
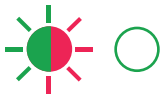
Location	Designation	LED behavior	Description
	MS (module status)		**Device in operation**: The device is in operation and functioning correctly.
			**Standby**: The device has not been configured.
			**Self-test**: The device is running a self-test after being switched on.
			**Flash sequence**: The flash sequence is used to visually identify the device.
			**Serious recoverable error**
			**Serious non-recoverable error**
			**Switched off**: The device is switched off.
	NS (network status)		**Connected**: An IP address is configured, at least one CIP connection (of an arbitrary transport class) is established
			**No connections**: An IP address is configured, however no CIP connections have been established
			**Flash sequence**: The flash sequence is used to visually identify the device.
			**Self-test**: The device is running a self-test after being switched on
			**Timeout of connection**: An IP address is configured and the time limit for an exclusive owner connection to the device was exceeded.
			**Duplicate IP**: The device has detected that its IP address is already in use.
			**Switched off, no IP address**: The device has no IP address (or is switched off).

Table 14: Device status indicators for EtherCAT

Location	Designation	LED behavior	Description
	RUN (RUN status)		**INIT**: The device is in INIT state.
		 Flashing (2.5 Hz)	**PRE-OPERATIONAL**: The device is in the state before operation.
		 Single flashing	**SAFE-OPERATIONAL**: The device is in safe mode.
			**OPERATIONAL**: The device is in operation.
	ERR (error status)		**No error**: The EtherCAT communication of the device is in operation.
		 Flashing (2.5 Hz)	**Invalid configuration**: General configuration error Possible cause: A status change specified by the EtherCAT master is not possible due to the register or object settings.
		 Single flashing	**Local error**: The EtherCAT slave device application has automatically changed the EtherCAT status. Possible cause 1: A host watchdog timeout has occurred. Possible cause 2: Synchronization error, the device changes automatically to safe-operational.
		 Double flashing	**Process data watchdog timeout**: A process data watchdog timeout has occurred. Possible cause: Sync manager watchdog timeout.

FIELDBUS P1 - P2

Table 15: Fieldbus status LEDs

Location	Designation	LED behavior	Description
	Link		The device has no connection to the Ethernet
			The device has a connection to the Ethernet
	Act		The device is not sending/receiving Ethernet frames
			The device is sending/receiving Ethernet frames

POWER IN1 – IN2

Table 16: POWER status LEDs

Location	Designation	LED behavior	Description
	POWER IN1 POWER IN2		Voltage not applied to the connection.
			Voltage applied.
			Under/overvoltage detected.

INC

Table 17: INC status LEDs

Location	Designation	LED behavior	Description
	PWR/ACT		Voltage not applied to the connection.
			Voltage applied. No signal activity.
			Voltage applied. Signal activity.
			Voltage not applied to the connection. Signal activity.
			Overvoltage or short-circuit detected. No signal activity.
			Overvoltage or short-circuit detected. Signal activity.

SERIAL

Table 18: SERIAL status LEDs

Location	Designation	LED behavior	Description
	PWR/ACT		Voltage not applied to the connection.
			Voltage applied. No signal activity.
			Voltage applied. Signal activity.
			Voltage not applied to the connection. Signal activity.
			Overvoltage or short-circuit detected. No signal activity.
			Overvoltage or short-circuit detected. Signal activity.

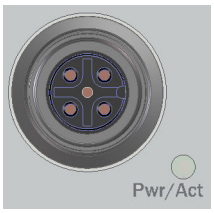
CAN

Table 19: CAN status LEDs

Location	Designation	LED behavior	Description
	PWR/ACT		Voltage not applied to the connection.
			Voltage applied. No signal activity.
			Voltage applied. Signal activity.
			Voltage not applied to the connection. Signal activity.
			Overvoltage or short-circuit detected. No signal activity.
			Overvoltage or short-circuit detected. Signal activity.
	Term		Termination resistor not activated.
			Termination resistor activated.

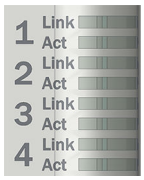
SENSOR S1 – S6

Table 20: SENSOR status LEDs

Location	Designation	LED behavior	Description
	PWR/ACT		Voltage not applied to the connection.
			Voltage applied. No signal activity.
			Voltage applied. Signal activity.
			Voltage not applied to the connection. Signal activity.
			Overvoltage or short-circuit detected. No signal activity.
			Overvoltage or short-circuit detected. Signal activity.

ETHERNET 1 - 4

Table 21: ETHERNET status LEDs

Location	Designation	LED behavior	Description
	Link		The device has no connection to the Ethernet
			The device has a connection to the Ethernet
	Act		The device is not sending/receiving Ethernet frames
			The device is sending/receiving Ethernet frames
	PoE		ETH1-ETH4: Voltage supply via Ethernet.
			ETH1-ETH4: Error in the supply line (overload, short-circuit)

9 Maintenance

9.1 Cleaning

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.

► The device must be cleaned regularly from the outside to guarantee heat dissipation and therefore operation. Particular attention must be paid to ensure that the cooling ribs and, if present, the fan are free from dust and dirt. Clean using a dry towel or an industrial vacuum cleaner. Do not use cleaning agents.

9.2 Maintenance plan

During operation, the device works maintenance-free.

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

Table 22: 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.	Depends on ambient conditions and climate.	Specialist
Clean any fans and check their function	Depends on ambient conditions and climate. 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

10 Decommissioning

10.1 Disposal

CAUTION

Risk of injury due to hot device surface.

The surface of the device can become hot during operation.

- 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.

Battery not removable.

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 page can be accessed 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

Feature	Parameter
Task	data recording, evaluation, and archiving
Supported devices/excerpt	2D and 3D cameras from SICK or based on the GigE machine vision standard, encoders, code readers, SICK LiDAR scanners
Technology	**Embedded hardware architecture:** • 8-core ARM Cortex-A72 CPU with NEON accelerator • FPGA for I/O handling • Dedicated fieldbus controller
	Software: • Can be programmed within the SICK AppSpace environment • SICK Interface & Algorithm API
Random Access Memory	4 GB DDR4
Flash memory	7 GB eMMC, of which 5 GB are available for applications
memory card (optional)	Industry-grade microSD memory card (flash card) **Supported microSD memory cards:** • max. 2 TB (SDXC, SDHC, SD); FAT 12/16/32, EXT 2/3/4
Programming software	SICK AppStudio
Sensor data processing	based on SICK Interface & Algorithm API

11.2 Interfaces

Feature	Parameter
User interfaces	Web server (GUI), SICK AppStudio (programming), SICK AppManager (app installation, firmware update)
Data storage and retrieval	Image and data logging via MicroSD memory card, internal RAM, and external FTP
SERIAL (RS-232 / RS-422 / RS-485)	
Quantity	1, also configurable as an encoder port
Function	RS-232 / RS-422 / RS-485 / INC-In/Out
Maximum data transmission rate	RS-232: 115.2 kBaud RS-422: 2 MBaud RS-485: 2 MBaud
INC (Incremental)	
Quantity	1, also configurable as RS-422
Function	Incremental encoder (In/OUT), RS-422 interface
Maximum frequency	2 MHz

Feature	Parameter
FIELDBUS (fieldbus)	
Quantity	2
Function	Ethernet-based fieldbus
Data transmission rate	10/100 Mbit/s
Protocol	ProfiNet, Ethernet/IP, EtherCAT
ETHERNET	
Quantity	4
Function	Data output, configuration, firmware update, 4 x PoE PSE 12 W max.
Data transmission rate	ETH1 – 4: 0.01; 0.1; 1; 2.5 Gb/s with PoE
Protocol	TCP/IP, FTP (image transfer), OPC-UA, MQTT, GigE machine vision/ GenICAM
CAN	
Quantity	1
Function	SICK CAN sensor network (master/slave, multiplexer/server), termination controllable via app
Data transmission rate	20 kbit/s ... 1 Mbit/s
Protocol	CSN (SICK CAN sensor network)
IO-Link	
Quantity	4 (SENSOR S1 to S4)
Function	IO-Link Master V1.1
Data transmission rate	max. 230 kBaud
Digital inputs/outputs	
I/O	Inputs: 2 opto-decoupled, max. frequency: 30 kHz Inputs/outputs: 2 (configurable), max. frequency: 30 kHz
SENSOR S1-S4	Inputs: 1 each, max. frequency: 30 kHz Inputs/outputs: 1 each (configurable), max. frequency: 30 kHz
SENSOR S5-S6	Inputs: 1 each, max. frequency: 10 kHz Inputs/outputs: 2 each (configurable), max. frequency: 30 kHz
USB	USB 2.0 (Micro-B) for configuration, diagnostics, firmware update

11.3 Mechanics and electronics

Feature	Parameter
Control elements	1 selector switch, 1 function button (under the servicing panel)
Electrical connection	I/O: 1 x M12, 8-pin female connector, A-coded POWER: 1 x M12, 4-pin male connector, T-coded INC: 1 x M12, 8-pin female connector, A-coded SERIAL: 1 x M12, 8-pin female connector, A-coded FIELDBUS: 2 x M12, 4-pin female connector, D-coded CAN: 1 x M12, 5-pin female connector, A-coded SENSOR S1–S4, IO-Link master: 4 x M12, 5-pin female connector, A-coded SENSOR S5–S6: 2 x M12, 5-pin female connector, A-coded Ethernet with POE: 4 x M12, 8-pin female connector, X-coded USB: Micro-B
Supply voltage	24 V DC, ± 10% SELV in accordance with EN 61010, also applies to digital inputs

Feature	Parameter
Operating current	Must be limited by external power supply unit to max. 8 A
Power consumption	Typ. 45 W, without connected sensors
Power output	Max. 140 W total (all connections)
Output current	
SENSOR S1-S6, I/O	≤ 100 mA, on digital output pins
SENSOR S1-S4	≤ 1 A, on power supply pins
SENSOR S5-S6	≤ 2.5 A, on power supply pins, switching times when using the “Connector.Power.Gate” API: Rise time/fall time/delay < 10 µs, max. frequency: 10 kHz
CAN	≤ 3.2 A, on power supply pins
SERIAL	≤ 1 A, on power supply pins
INC	≤ 0.5 A, on power supply pins
I/O	≤ 500 mA, on power supply pins
Battery	Type: TL-2450; 3.7 V; firmly soldered; not rechargeable Chemical system: Lithium thionyl chloride (Li-SOCl2)
Housing material	Aluminum die cast
Housing color	Light blue (RAL 5012)
Protection class	III
Weight	1995 g
Dimensions (W x D x H)	176 x 83 x 196 mm

11.4 Ambient data

Feature	Parameter
Electromagnetic compatibility	IEC 61000-6-2:2016 / EN IEC 61000-6-2:2019 IEC 61000-6-3:2020
Vibration resistance	IEC 60068-2-6:2007
Shock resistance	IEC 60068-2-27:2008
Electrical safety	IEC 61010-1:2010 + Cor.: 2011 IEC 61010-2-201:2017
Enclosure rating	IP65 in accordance with EN 60529-2000-09 (requires blind plugs to be inserted into unused connections)
Ambient conditions	
Operation site Height position Contamination rating	Use inside buildings max. 2,000 m 1
Ambient operating temperature	0 °C ... +50 °C, when the described mounting requirements are taken into account, see "Mounting the device", page 16
Storage temperature	-20 °C ... +70 °C
Permissible relative humidity	90%, non-condensing

12 Annex

12.1 Dimensional drawings

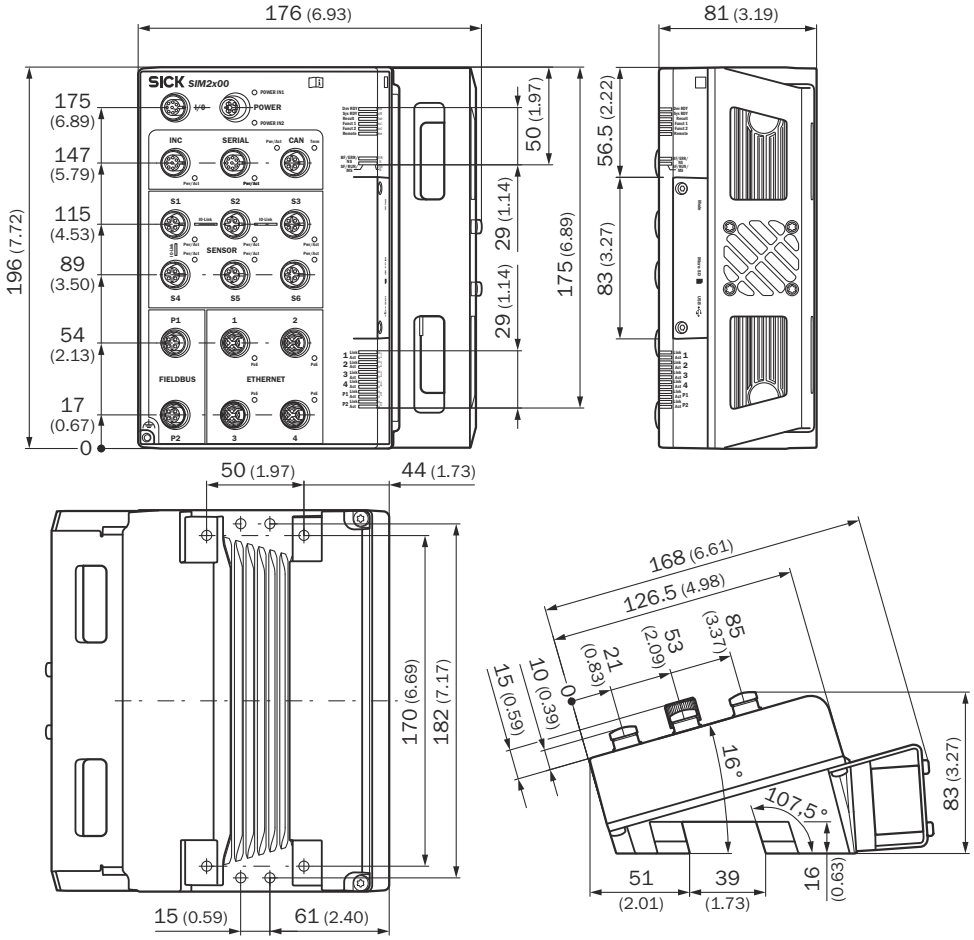


Figure 11: Device dimensions, unit: mm (inch), decimal separator: period

12.2 Licenses

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8023297/1J8G/2023-07-21/en

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