OPERATING INSTRUCTIONS

SIM4000

Sensor Integration Machine

SICK
Sensor Intelligence.

Described product

SIM4000

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

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 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 before starting any work on the device, in order to familiarize yourself with the device and its functions.

The instructions constitute an integral part of the product and are to be stored 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 operating the machine or system in which the device is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 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.

1.3 Further information

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

▶ www.sick.com/SIM4000

The following information is available for download there:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawings and diagrams
- 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 devices described here
- Publications dealing with accessories

1.4 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, serial number, etc., to ensure faster processing.

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 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 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-relevant device according to the EC Machinery Directive (2006/42/EC).
- 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:

- Device should be used only in accordance with its intended use.
- All information in these operating instructions must be strictly observed.

2.4 IP technology

NOTE

SICK uses standard IP technology in its products. The emphasis is placed on availability of products and services.

SICK always assumes the following prerequisites:

- The customer ensures the integrity and confidentiality of the data and rights affected by its own use of the aforementioned products.
- In all cases, the customer implements the appropriate security measures, such as network separation, firewalls, virus protection, and patch management.

2.5 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
- Incorrect 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.

2.5.1 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 working 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.

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

- **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. 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:

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 Windows™ operating system in use ▪ 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 these operating instructions 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 sensor must only be connected to a voltage source 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
Dangerous equipotential bonding 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.

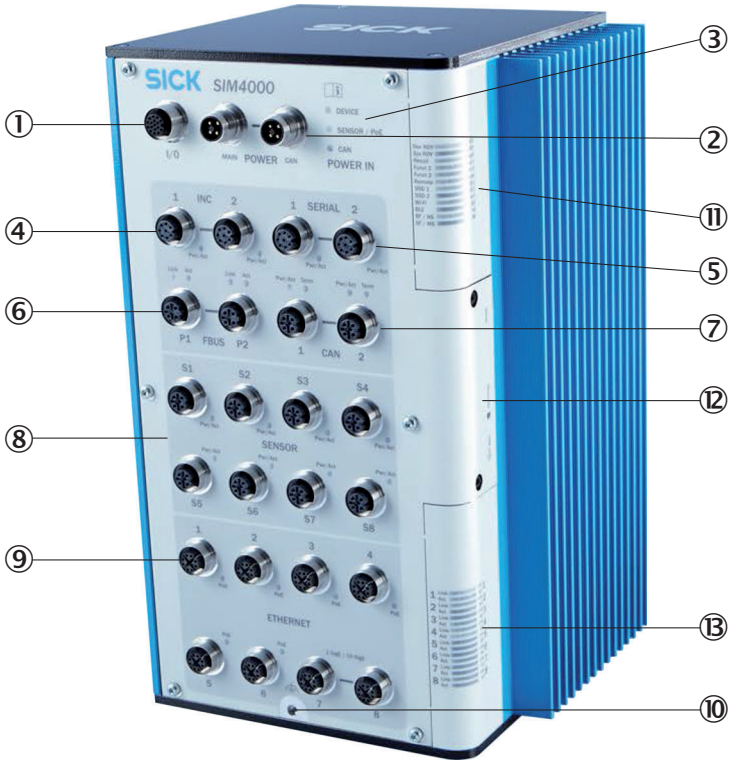
- Work on electrical systems must only be performed by qualified electricians.
- Follow the notes in the operating instructions.
- Install the grounding for the sensor and the system in accordance with national and regional regulations.

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 I/O connection
② POWER main and CAN voltage supply
③ Status indicators of the voltage supply
④ Connections for 1–2 incremental encoders with 1–2 status indicators
⑤ 1–2 serial connections with 1–2 status indicators
⑥ 1–2 fieldbus connections with 1–2 status indicators
⑦ 1–2 CAN connections with 1–2 status indicators
⑧ 1–8 sensor connections with S1–S8 status indicators
⑨ 1–8 Ethernet connections with 1–8 status indicators
⑩ Functional ground connection
⑪ Device status indicators
⑫ Servicing panel: function button, function selector switch, USB connection (for configuration/diagnostics)
⑬ Status indicators of Ethernet connections

3.2 Functionality

The SIM4000 Sensor Integration Machine – part of the SICK AppSpace ecosystem – is opening up new possibilities for application solutions.

Data from SICK sensors such as laser scanners and cameras can be merged into a point cloud, evaluated, archived, and transmitted. 8 Gigabit Ethernet interfaces are available for 2D or 3D cameras, and in some cases feature a voltage supply over Ethernet (PoE).

Sensors can be integrated via IO-Link for distance and height measuring purposes.

Thanks to the high-performance multi-core processor featuring hardware support, the SIM4000 enables image preprocessing and handling of input and output signals in real time.

The integrated HALCON image processing library, plus the open SICK AppSpace software platform, make it possible to develop customized application programs for even the most demanding 2D and 3D vision applications.

The SIM4000 is equipped with industrial-standard, Ethernet-based fieldbus interfaces and can also be integrated into a SICK CAN sensor network. The HMI and data visualization features can be provided on any browser-enabled notebook, PC, or tablet.

The app is developed in the SDKs SICK AppStudio and in HDevelop from MVTec.

3.3 Product features and functions

3.3.1 Functions

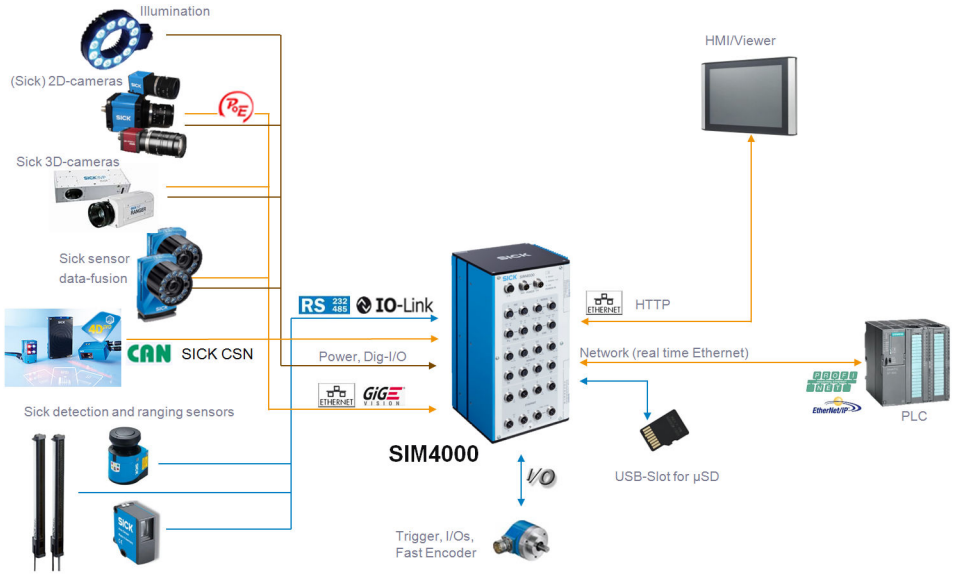


Figure 1: Application examples

The device as part of the SICK AppSpace ecosystem is opening up new possibilities for application solutions.

Data from SICK sensors and cameras can be merged into a point cloud, evaluated, archived, and transmitted. 8 GigE interfaces are available and in some cases with PoE. Sensors can be integrated via IO-Link for distance and height measuring purposes. Thanks to the powerful multi-core CPU with co-processors for image preprocessing and I/O handling in real time, the device is able to find solutions for sophisticated image processing tasks by using the HALCON library as well as SICK tools.

Features:

- 6 x GigE with PoE to connect to 2D/3D cameras as well as a network or PC
- 2 x 10 GigE to connect to 10 GigE cameras and to quickly archive sensor or process data with high data volume
- Real-time-capable hardware architecture with precise synchronization of I/O signals
- 4 x serial/encoder interfaces
- 2 x Ethernet-based fieldbus interfaces
- Integrated illumination control and supply
- 4 x IO-Link master connections
- Housing with IP65 enclosure rating

- Support for two SICK CAN networks with voltage supply to the sensors connected to the CAN interfaces
- S1 to S8 sensor connections with switchable and electronically monitored LPS (Low Power Supply) pins

Benefits:

- Tailored application development with SICK AppSpace
- High-performance, innovative application solutions thanks to the merging of sensor and camera data
- Integrated HALCON library opens up a whole host of image processing possibilities for every industrial field of application
- Multi-sensor/camera-based data recording and archiving enable quality control, process analysis, and predictive maintenance for vertical integration in Industry 4.0
- Real-time-capable hardware reduces integration work in, for example, time-critical robotics applications
- Quick and easy commissioning thanks to prefabricated cables

3.3.2 SICK AppSpace

Detailed instructions on the SICK AppStudio as well as programming the device can be found at **https://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
- ETHERNET 3: 192.168.2.1
- ETHERNET 4: 192.168.3.1
- ETHERNET 5: 192.168.4.1
- ETHERNET 6: 192.168.5.1
- ETHERNET 7: 192.168.6.1
- ETHERNET 8: 192.168.7.1

- The Ethernet interfaces 7 and 8 are 10 GigE ports and cannot be operated in 1 GigE mode.
- When expanding the 1 GigE interfaces with one or more Ethernet switches, it is essential to use only jumbo-frame compatible 1 GigE switches. Switches limited to just 100 Mb do not support the data packet mode used by cameras and can cause transmission errors.

Changing the IP addresses

The individual IP addresses can be changed using the SICK “SOPAS-ET” PC tool. This is described in detail in the “SIM4000 Getting Started Guide”, which is available for download from the AppSpace area of the SICK Support Portal. This guide also includes further instructions on how to connect SICK sensors and the SICK picoCam and midiCam cameras to the Ethernet interfaces.

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:

- Recommendation: Use the original packaging.
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- So that any residual damp can evaporate, do not package in airtight containers.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: see "Technical data", page 37.
- 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 30. If you have any questions or anything remains unclear in this regard, please contact our service team.

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

5.2 Scope of delivery

- SIM4000
- 1x grounding screw
- 1x toothed lock washer
- 6x sliding nuts
- Safety note
- Optional: ordered accessories

NOTE

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

5.3 Preparing for mounting

Mounting requirements

NOTE

It is recommended to mount the device using the adapter holding plate (part no. 2083419) which is available as an accessory. The following specific mounting instructions must be taken into consideration if the device will be used at elevated ambient temperatures up to max. 50 °C, see "Mounting the SIM4000 (at a critical ambient temperature of max. 50 °C)", page 17.

- 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 acclimatise to avoid formation of condensation.
- Prepare vibration reduction measures, if necessary.

Preparing for mounting with holding plate

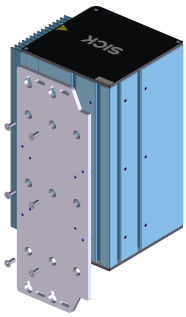
NOTE

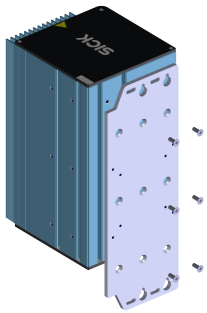
The device can also be mounted onto an aluminum profile without holes.

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

5.4 Mounting the SIM4000

Mounting the SIM4000 with the adapter holding plate, available as an accessory





1. Mount the holding plate on SIM4000 using the supplied screws.
2. Place SIM4000 with the holding plate on the mounting site.

3. Secure the holding plate by tightening the 3 screws.

4. Alternatively: Pre-mount the 4 screws for suspended mounting and mount the holding plate with the device.

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

5.5 Mounting the SIM4000 (at a critical ambient temperature of max. 50 °C)

NOTICE
To prevent damage to the device or the attached peripheral devices at high ambient temperatures of a maximum of 50 °C, the following extended installation conditions must be taken into account when mounting the device.

Prerequisites:

- Device is mounted vertically (device name on top)
- Mounting takes place using the supplied sliding nuts and the holding plate, which is available as an accessory
- Aluminum profiles for mounting on the system (min. 1,200 mm in length)
- No direct sunlight and heat radiation
- Distance to other components or housing walls: min. 400 mm (above, below, to the left), min. 500 mm (on the heat-sink side)

Degradation of ambient temperature

Depending on the following device configurations, degradation of the permitted ambient temperature must be taken into account:

- CPU load ≥75% (can be read using SICK AppStudio)
- PoE load ≥25 W (load of attached camera)
- Load at voltage/switching outputs ≥100 W

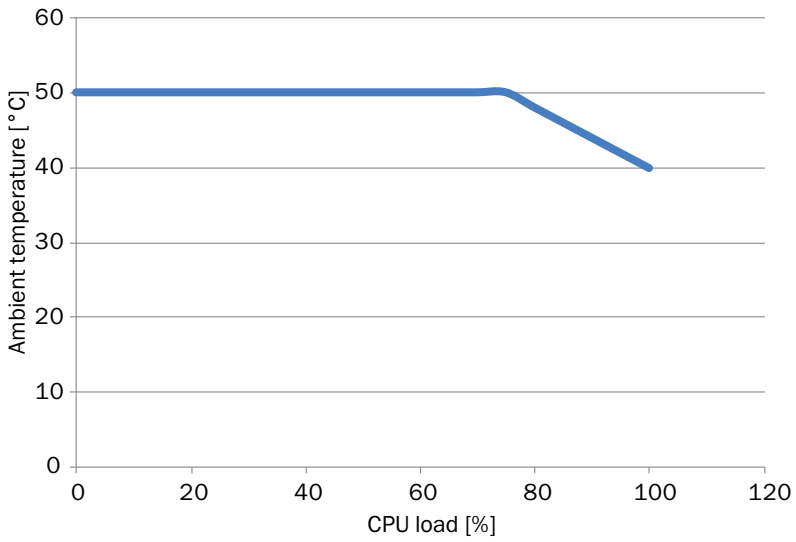


Figure 2: Degradation of ambient temperature depending on the CPU capacity

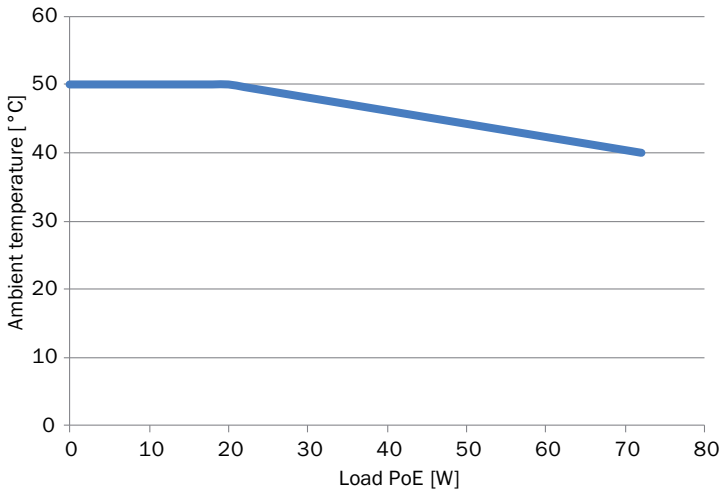


Figure 3: Degradation of ambient temperature depending on the PoE load

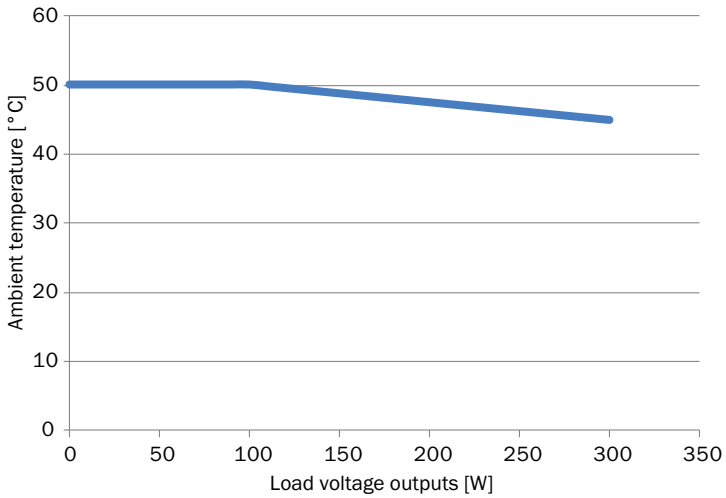
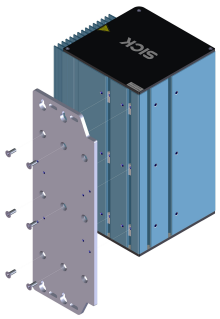


Figure 4: Degradation of ambient temperature depending on the load on the voltage outputs

Mounting steps

1. Click the three sliding nuts into place into each of the vertical slots.



2. Screw the holding plate (or equivalent) to the sliding nuts with 6 screws.
3. Fit the device with the holding plate on the aluminum profile.

CAUTION
Danger from hot surfaces

An ambient temperature greater than 45 °C can lead to contact-critical heat in the lateral heat sink. It must be therefore be ensured that accidental contact is unlikely.

NOTE

Using an external fan (part number 2089755), the maximum ambient operating temperature of the device can be increased from +50 ° C to +60 °C. The fan is available as an accessory at www.sick.com.

6 Electrical installation

6.1 Important information

WARNING
Risk of injury and damage caused by electrical current!

Due to equipotential bonding currents, incorrect grounding 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 (use standard cable lug with M4 hole).

NOTICE
Risk of damage to the device due to incorrect supply voltage

An incorrect supply voltage may result in damage to the device.

- ▶ Only operate the device with the specified supply voltage.
- ▶ All circuits connected to the device must be designed as SELV circuits (in accordance with EN 60950 or ES1 EN 62368-1).

NOTE
Layout of data cables

- Use screened data cables with twisted-pair wires.
- Implement the screening design correctly and completely.
- To avoid interference, e.g. from switching power supplies, motors, clocked drives, and contactors, always use cables and layouts that are suitable for EMC.
- 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
- Voltage supply cable
- If customers assemble the cables: crimping tool, ferrules, soldering iron, and other installation material

6.3 Assembling the cables (optional)

NOTE
Customer assembly of the cables is only necessary in special cases. SICK offers a large range of pre-assembled cables at www.sick.com.

Depending on the peripheral devices to be connected and the connecting interface used, various connection cables must be assembled before installing the device.

Ensure that you plan a sufficient length of cable for strain-relief clamps, for example.

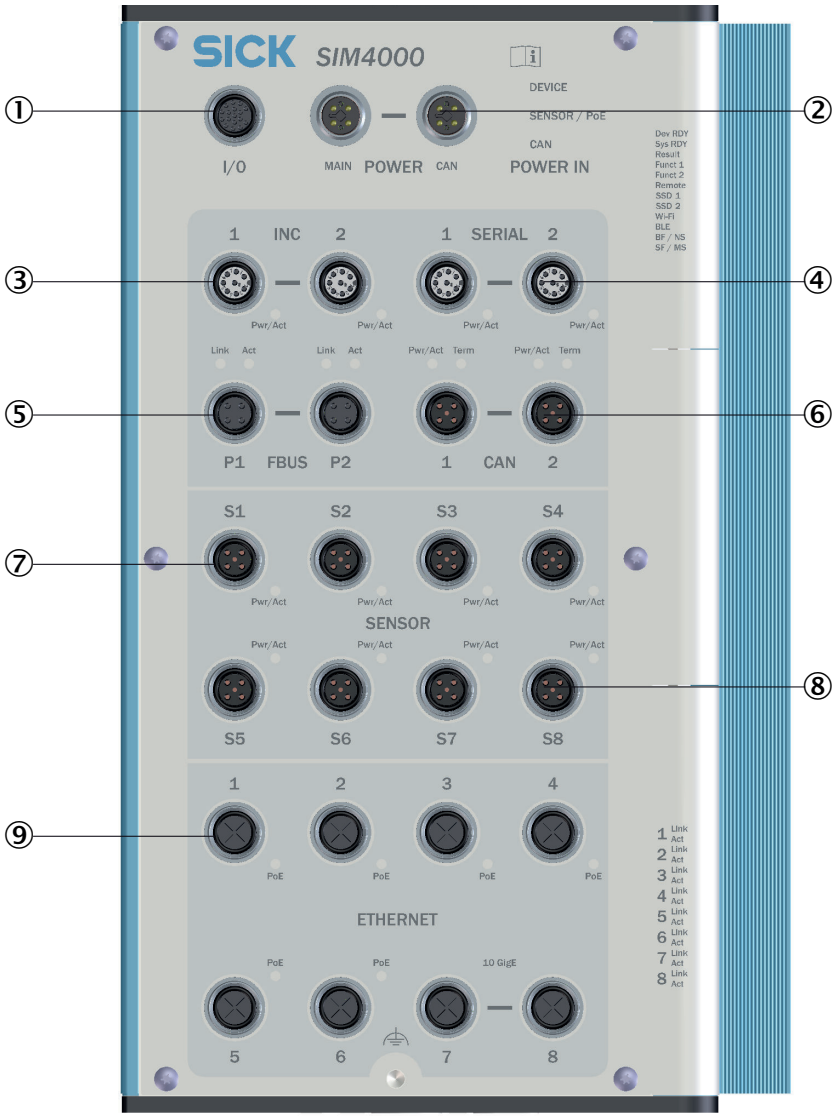
NOTICE

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.

Overview of connections



① **I/O:** Universal input/output with seven configurable inputs/outputs and four opto-decoupled inputs.

② **POWER IN:** Voltage supply input. Up to 4 x 24 V @ 8 A can be connected, whereby the main supply is available at both male connectors.

③ **INC:** 1 x RS-422 or 1 x INC In/Out and a 0.5 A LPS voltage supply are available for each connection to peripherals

④ **SERIAL:** 1 x RS-232/RS-422/RS-485 or 1 x INC In/Out and one 1 A LPS voltage supply are available for each connection to peripherals

⑤ **FBUS:** Two Ethernet-based fieldbus interfaces.

⑥ **CAN**: Two standard CAN receivers/transceivers with one termination resistor per channel, can be activated via software. A 3.4 A LPS voltage supply is available for each connection to peripherals. To enable voltage supply to the peripherals, both PowerIn CAN voltage supply strands must be connected to 24 V.

⑦ **SENSOR 1-4**: 4 sensor connections with digital inputs/outputs and voltage supply. Can be alternatively used as IO-Link master connections. A switchable 1 A LPS voltage supply is available for each connection to connected peripherals.

⑧ **SENSOR 5-8**: Four IO connections with two configurable inputs/outputs and one dedicated input. A 2.5 A LPS voltage supply is available for each connection to peripherals. To enable voltage supply to the peripherals, both PowerIn main voltage supply strands must be connected to 24 V.

⑨ **ETHERNET**: Six 1 Gigabit Ethernet with switchable 15 W PoE and two 10 Gbit Ethernet. To enable PoE voltage supply, both PowerIn main voltage supply strands must be connected to 24 V.

6.4 Pin allocation of the connections

6.4.1 POWER In main/CAN

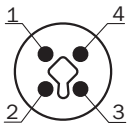


Figure 5: POWER In main/CAN pin assignment, M12 – 4-pin T-coded, male

Table 2: M12 – 4-pin (main, male)

Pin	Signal	Color coding of open-ended SIM cables[1]	Function
1	+24 V U_s	BN (brown)	Supply voltage, system
2	GND U_a	WH (white)	Ground
3	GND U_s	BU (blue)	Ground
4	24 V U_a	BK (black)	Supply voltage, sensor 5–8 + PoE
Housing	–	–	Screen

1 SICK cables in the SIM4000 accessories

Table 3: M12 – 4-pin (male)

Pin	Signal	Color coding of open-ended SIM cables[1]	Function
1	+24 V U_s	BN (brown)	Supply voltage, system
2	GND U_a	WH (white)	Ground
3	GND U_s	BU (blue)	Ground
4	24 V U_a	BK (black)	Supply voltage, CAN
Housing	–	–	Screen

1 SICK cables in the SIM4000 accessories

Additional notes:

- Max. 7.5 A permanent load per connection
- 24 V supply voltage ±10%
- Maximum power consumption for SIM4000: 70 W
- Maximum power output of all connections: 300 W

- System supply voltage can be set up redundantly.
- Power cables must be protected with max. 12 A.

6.4.2 I/O

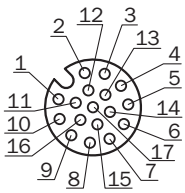


Figure 6: I/O pin assignment, M12 – 17-pin A-coded, female

Table 4: M12 – 17-pin (female)

Pin	Signal	Function	Factory settings	Color coding of open-ended SIM I/O cables[1]
1	GND	Ground	–	BU (blue)
2	24 V OUT	Supply voltage, peripherals	Deactivated	BN (brown)
3	In/Out 1	Configurable switching input/output	All IO connections configured as inputs	GN (green)
4	In/Out 2	Configurable switching input/output		WH (white)
5	In/Out 3	Configurable switching input/output		PK (pink)
6	In/Out 4	Configurable switching input/output		YE (yellow)
7	In/Out 5	Configurable switching input/output		BK (black)
8	In/Out 6	Configurable switching input/output		GY (gray)
9	In/Out 7	Configurable switching input/output		WHBK (white/ black)
10	In 1	Isolated switching input	–	VT (violet)
11	SensGND 1	Isolated GND In 1	–	GYPK (gray/pink)
12	In 2	Isolated switching input	–	RDBU (red/blue)
13	SensGND 2	Isolated GND In 2	–	WHGN (white/ green)
14	In 3	Isolated switching input	–	BNGN (brown/ green)
15	SensGND 3	Isolated GND In 3	–	WHYE (white/ yellow)
16	In 4	Isolated switching input	–	YEBN (yellow/ brown)
17	SensGND 4	Isolated GND In 4	–	WHGY (white/ gray)
Housing	–	Screen	–	

1 SICK cables in the SIM4000 accessories

Additional notes:

- Connection to control cabinet to connect devices directly
- 4 isolated inputs and 7 GPIO

- 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, NPN, PNP configurable
  - Max. input frequency: 30 kHz
- Inputs:
  - Min. high input logic level: 12 V
  - Max. low input logic level: 4 V
  - In/Out 1–7: max. input frequency: 30 kHz
  - In 1–4 (isolated): maximum 10 kHz

6.4.3 INC

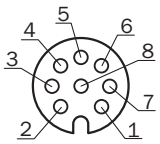


Figure 7: Incremental pin assignment, M12 – 8-pin A-coded, female

Table 5: M12 – 8-pin (female)

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	–	–	–	–
6	–	–	–	–
7	GND (ground)			
8	24 V (supply voltage for peripherals, configurable)			
Housing	Screen			

6.4.4 SERIAL

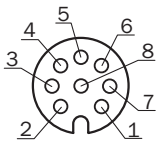


Figure 8: Serial pin assignment, M12 – 8-pin A-coded, female

Table 6: M12 – 8-pin (female)

Pin	Mode			
	RS-422	RS-232	RS-485	INC
1	–	–	–	A- (in/out)
2	–	–	–	A+ (in/out)
3	T-	–	Rx/Tx-	B- (in/out)
4	T+	TxD	Rx/Tx+	B+ (in/out)

Pin	Mode			
	RS-422	RS-232	RS-485	INC
5	R-	–	–	–
6	R+	RxD	–	–
7	GND (ground)			
8	24 V (supply voltage for peripherals, configurable)			
Housing	Screen			

6.4.5 FBUS

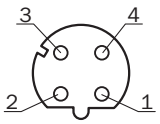


Figure 9: Fieldbus pin assignment, M12 – 4-pin D-coded, female

Table 7: M12 – 4-pin D-coded (female)

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 support

6.4.6 CAN

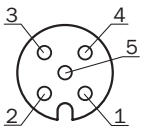


Figure 10: CAN pin assignment, M12 – 5-pin A-coded, female

Table 8: M12 – 5-pin A-coded (female)

Pin	Signal	Function	Factory settings
1	-	Screen	
2	+24 V	Supply voltage for peripherals, configurable	Deactivated
3	GND	Ground	
4	CAN_H	CAN high -	Term active
5	CAN_L	CAN low	
Housing	-	Screen	

Additional notes:

- Access to CANopen I/O modules
- Data transmission rates from 50 Kbit/s up to 1 Mbit/s

- Max. 3.2 A output for supply voltage connections (compliant with LPS)
- Internal termination through programming

6.4.7 SENSOR 1–4

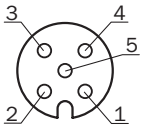


Figure 11: Pin assignment of sensor 1–4, M12 – 5-pin A-coded, female

Table 9: M12 – 5-pin A-coded (female)

Pin	Signal	Function	Factory settings
1	+24 V	Supply voltage for peripherals, configurable	–
2	DI	Input	–
3	GND	Ground	–
4	CQ or DigIn/DigOut	CQ IO-link or configurable switching input/output	All IO connections configured as inputs
5	NC	Not connected	–
Housing	–	Screen	–

Additional notes:

- 4x IO-Link master (1x master available per connection)
- IO-Link stack is implemented in FPGA (SoftCore)
- Max. 1 A output for supply voltage connections S1 to S4 (compliant with LPS)
- Switching output:
  - Max. output 100 mA.
  - Min. high output logic level: VCC – 3 V
  - Max. low output logic level: 3 V
  - Push/pull, NPN, PNP configurable
  - Push/pull, NPN, PNP configurable by user
  - Max. IO-Link output frequency: 230 kHz
  - Max. IO output frequency: 30 kHz
- Switching input:
  - 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

6.4.8 SENSOR 5–8

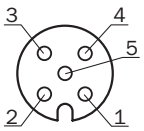


Figure 12: Pin assignment of sensor 5–8, M12 – 5-pin A-coded, female

Table 10: M12 – 5-pin A-coded (female)

Pin	Signal	Function	Factory settings
1	+24 V	Supply voltage for peripherals, configurable	Deactivated
2	IN	Input	–
3	GND	Ground	–
4	I/O 1	Configurable switching input/output	IN
5	I/O 2	Configurable switching input/output	IN
Housing	–	Screen	–

- Max. 2.5 A output for supply voltage connections S5 to S8 (compliant with LPS)
- Switching output:
  - Max. output 100 mA
  - Min. high output logic level: VCC – 3 V
  - Max. low output logic level: 3 V
  - Push/pull, NPN, PNP configurable
  - Push/pull, NPN, PNP configurable by user
  - Max. IO output frequency: 30 kHz
- Switching input:
  - Min. high input logic level: 12 V
  - Max. low input logic level: 4 V
  - Max. IO input frequency: 30 kHz

Illumination control:

- Voltage supply for S5 to S8, configurable
- Reference CSC illumination
- Ramp up: < 10 µs
- Ramp down: < 10 µs
- Delay: < 10 µs
- Max. frequency: 10 kHz
- Max. voltage supply: 1 A

6.4.9 ETHERNET

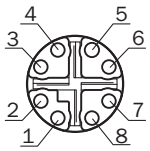


Figure 13: Ethernet pin assignment, M12 – 8-pin X-coded, female

Table 11: M12 – 1 and 10 Gbit Ethernet (female)

Pin	Function
1	D1+
2	D1-
3	D2+
4	D2-
5	D4+
6	D4-
7	D3-

Pin	Function
8	D3+

Additional notes:

- 6x 1 GigE connections with configurable PoE and 2x 10 GigE connections are available.
- The GigE connections can be used to connect to cameras as well as a PC or network.
- The relevant drivers are implemented in the SIM4000 to enable usage of the SICK picoCam and midiCam camera families as well as cameras compatible with GigE Vision.
- The 10 GigE connections are intended for quick data transmission to the archive or other host systems, as well as for connection to the relevant 10 GigE cameras.
- Jumbo frame support is required.

NOTICE

When supplying connected cameras using PoE, both POWER main voltage supplies need to be connected. The total current consumption must not exceed 7.5 A (input at 24 V Main 2).

The sine power may affect the operating temperature.

6.5 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 "Assembling the cables (optional)", page 20.
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 and screw together tightly.
5. Seal unused connections with dummy plugs.

6.6 Connecting voltage supply

Block diagram

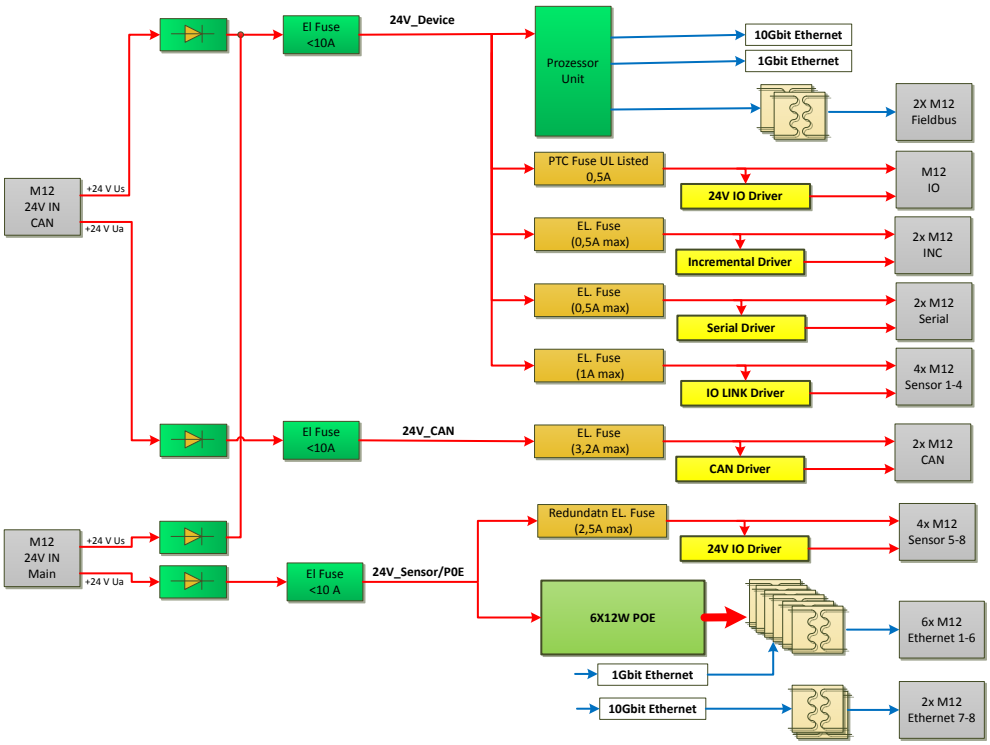


Figure 14: Connection to the power supply

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 SIM4000 and screw together tightly.
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 "Important information", page 20) and electrical installation (see "Mounting", page 15) must also be observed under laboratory conditions. In addition, further information 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 checking 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. Switch on the voltage supply.

8 Operation

8.1 Status LEDs

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

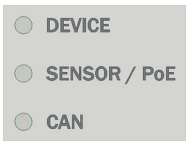
Using these status indicators, the operator can find out quickly and easily whether the device and the peripherals are working properly or whether any faults or errors have occurred.

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.

8.1.1 Situation and function of the LEDs

POWER IN

Table 12: Power status LEDs

Location	Designation	LED behavior	Description
	DEVICE SENSOR/PoE CAN		Voltage not applied to the connection.
			Voltage applied.
			Under/overvoltage detected.

INC

Table 13: 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.

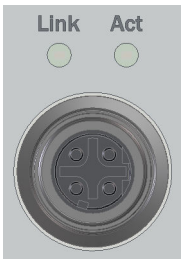
SERIAL

Table 14: 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.

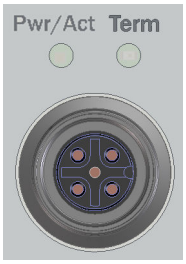
FBUS

Table 15: FBUS status LEDs

Location	Designation	LED behavior	Description
	Link		Connection not established with fieldbus.
			Connection established with fieldbus.
	Act		No activity.
			Data transmission via fieldbus.

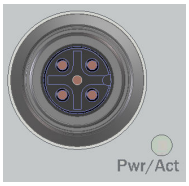
CAN

Table 16: 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.

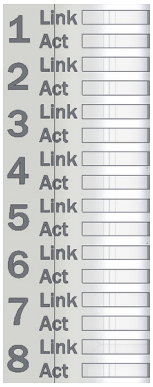
SENSOR S1 – S8

Table 17: S1 to S8 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.

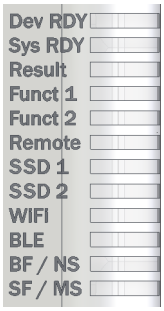
ETHERNET 1 – 8

Table 18: ETHERNET status LEDs

Location	Designation	LED behavior	Description
	Link		Connection not established with Ethernet.
			ETH1-ETH6 only. Connection established with Ethernet.
	Act		No activity.
			Data transmission via Ethernet.
	PoE		Voltage supply via Ethernet.
			Fault in the supply line (overload, short-circuit).

Device status

Table 19: Device status indicators

Location	Designation	LED behavior	Indicator
	Dev RDY		Runlevel READY, no errors detected.
			Runlevel READY, boot process error.
			Device booting
	Sys RDY		User-defined, configurable with AppSpace.
	Result		User-defined, configurable with AppSpace.
	Funct 1		User-defined, configurable with AppSpace.
	Funct 2		User-defined, configurable with AppSpace.
	Remote		Remote maintenance active. Currently not supported.
	SSD 1		Internal SSD connected.
	SSD 2		Internal SSD connected.
	WIFI		Currently not supported.
	BLE		Currently not supported.
	BF / NS		Bus error (fieldbus)
	SF / MS		System error (fieldbus)

9 Maintenance

9.1 Cleaning

NOTICE
Equipment damage due to improper cleaning.

Improper cleaning may result in equipment damage.

- Only use recommended cleaning agents.
- 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 fins are free from dust and dirt. Clean using a dry towel or an industrial vacuum cleaner. Do not use cleaning agents.

9.2 Maintenance

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 20: Maintenance schedule

Maintenance work	Interval	To be carried out by
Check that the unused connections are sealed with blind plugs	Interval 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 commencing disassembly, switch off the device and allow it to cool down as necessary.

Any device 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. Do not dispose of the product along with household waste.

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

Disposing of devices improperly may cause damage to the environment.

Therefore, observe the following information:

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

11 Technical data

NOTE

The relevant online data sheet for your product, including technical data, dimensions, and connection diagrams can be downloaded, saved, and printed at:

▶ www.sick.com/SIM4000

11.1 Features

Feature	Parameter
Task	Data recording, evaluation, and archiving
Supported devices/excerpt	2D and 3D cameras, encoders, code readers, laser scanners, photoelectric sensors, etc.
Technology	Embedded hardware architecture: • 16/8-Core PowerPC CPU (virtual/physical cores) • FPGA for image (pre-)processing • FPGA for I/O handling • Dedicated fieldbus controller
	Software: • Can be programmed within the SICK AppSpace environment • Integrated HALCON image processing library • SICK vision tools
Random Access Memory	8 GB
Flash memory	512 MB in total, 490 MB of which available for applications
Memory card (optional)	Industry-grade microSD memory card (flash card), max. 16 GB
Programming software	SICK AppStudio
Image processing algorithms	based on HALCON and/or the SICK Algorithm API

11.2 Interfaces

Feature	Parameter
Data storage and retrieval	Image and data logging via optional internal SSD, microSD memory card, internal RAM and external FTP
Serial (RS-232/RS-422/RS-485)	
Quantity	2, also configurable as an encoder output port
Function	RS-232 / RS-422 / RS-485
maximum data transmission rate	RS-232: 115.2 kBaud RS-422: 2 MBaud RS-485: 2 MBaud
Incremental	
Quantity	2
Function	Incremental encoder (In/OUT), RS-422 interface
Maximum frequency	2 MHz
Fieldbus	
Quantity	2
Function	Ethernet-based fieldbus
Data transmission rate	10/100 MBit/s

Feature	Parameter
Protocol	ProfiNet, Ethernet/IP, EtherCAT
Ethernet	
Quantity	8
Function	Host, AUX, image transmission, 6x PoE PSE 12 W max. (to 1 GigE interfaces)
Data transmission rate	6 x [10/100/1,000 Mbit/s] 2 x 10,000 Mbit/s
Protocol	TCP/IP, FTP (image transmission), GigE vision, GeniCam
CAN	
Quantity	2
Function	SICK CAN sensor network (master/slave, multiplexer/server) with termination resistor which can be activated CAN functional modes: Mode 1: 2 separate CAN networks Mode 2: 1 CAN network with 2x power-out
Data transmission rate	20 kbit/s ... 1 Mbit/s
Protocol	CSN (SICK CAN sensor network)
IO-Link master	
Quantity	4 (S1 to S4)
Data transmission rate	max. 230 kBaud
Protocol	IO-Link master 1.1
Digital switching inputs/outputs	
I/O	Inputs: 4 opto-decoupled, max. frequency: 10 kHz Inputs/outputs: 7 (configurable), max. frequency: 30 kHz
S1–S4	Inputs: 1 each, max. frequency: 10 kHz Inputs/outputs: 1 each (configurable), max. frequency: 30 kHz
S5–S8	Inputs: 1 each, max. frequency: 30 kHz Inputs/outputs: 2 each (configurable), max. frequency: 30 kHz
USB	AUX (USB 2.0), for configuration/diagnostics and image transmission

11.3 Mechanics and electronics

Feature	Parameter
Optical indicators	15 x red/green status indicators 6 x red/green PoE indicators 8 x orange activity indicators 10 x green Link indicators 12 x red/green device status indicators
Operating elements	1 selector switch (under the front right-hand flap)

Feature	Parameter
Electrical connection	I/O: 1 x M12, 17-pin female connector POWER MAIN and CAN: 2 x M12, 4-pin male connector, T-coded INC: 2 x M12, 8-pin female connector, A-coded SERIAL: 2 x M12, 8-pin female connector, A-coded FBUS: 2 x M12, 4-pin female connector, D-coded CAN: 2 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–S8: 4 x M12, 5-pin female connector, A-coded Ethernet GigE with POE: 6 x M12, 8-pin female connector, X-coded Ethernet 10GigE: 2x M12, 8-pin female connector, X-coded
Operating voltage	24 V DC, ± 10% SELV in accordance with EN 60950-1
Power consumption	60 W type, without connected sensors
Power output	Total 300 W max. (all connections)
Output current	
S1–S8, IO	Max. output current to switching output pins: 100 mA
S1–S4	Max. output current to power supply pins: 1 A, LPS in accordance with EN 60950-1
S5–S8	Illumination switched via the power supply pin: I_{max} = 1 A, LPS in accordance with EN 60950-1 with rise time < 10 µs, fall time < 10 µs, delay < 10 µs Illumination switched via digital output: I_{max} = 2.5 A, LPS in accordance with EN 60950-1
CAN	Max. output current to power supply pins: 3.2 A, LPS in accordance with EN 60950-1
Serial, incremental	Max. output current to power supply pins: 1 A, LPS in accordance with EN 60950-1
IO	Max. output current to power supply pins: 500 mA, LPS in accordance with EN 60950-1
Housing material	Aluminum die cast
Housing color	Light blue (RAL 5012)
Protection class	II with functional ground
Weight	5120 g
Dimensions (W x D x H)	164.5 x 147 x 272 mm

11.4 Ambient data

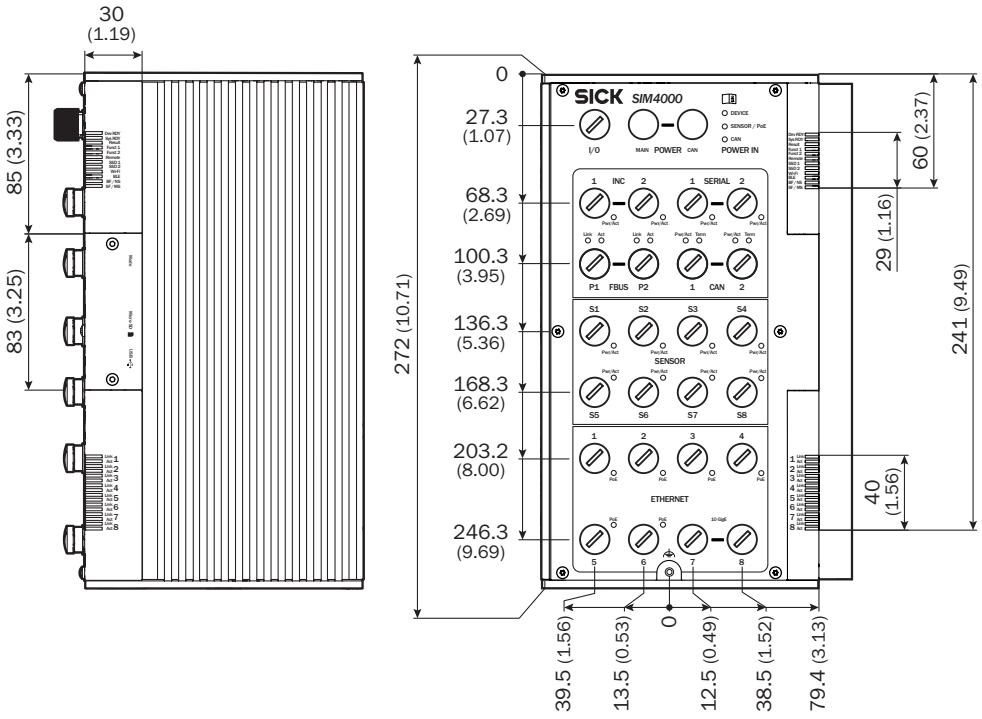
Feature	Parameter
Electromagnetic compatibility (EMC)	EN 61000-6-2:2005-08 EN 61000-6-4:2007 + A1:2011 EN 61131-9:2013-12
Shock resistance	EN 60068-2-6
Electrical safety	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 +AC:2011 + A2:2013
Enclosure rating	IP65 in accordance with EN 60529-2000-09 (requires blind plugs to be inserted into unused connections)
Ambient operating temperature	0 °C ... +50 °C, taking the described mounting requirements into account, see "Mounting the SIM4000", page 16
Storage temperature	-20 °C ... +70 °C

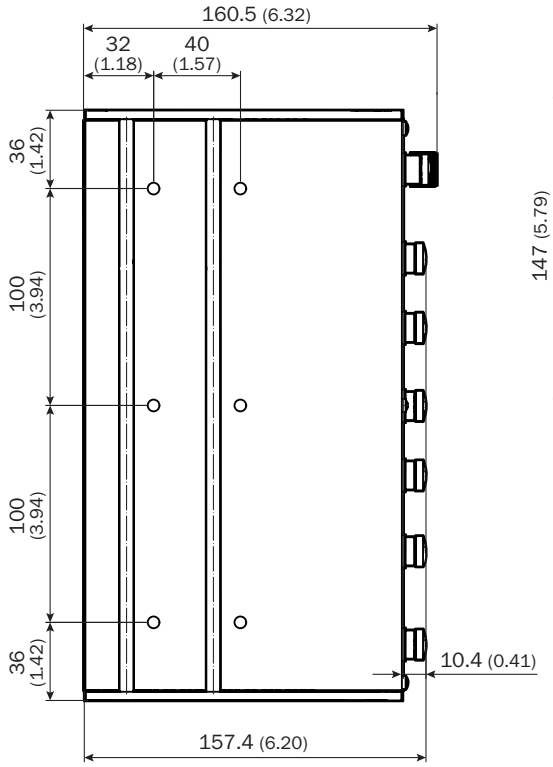
Feature	Parameter
Permissible relative humidity	90%, non-condensing

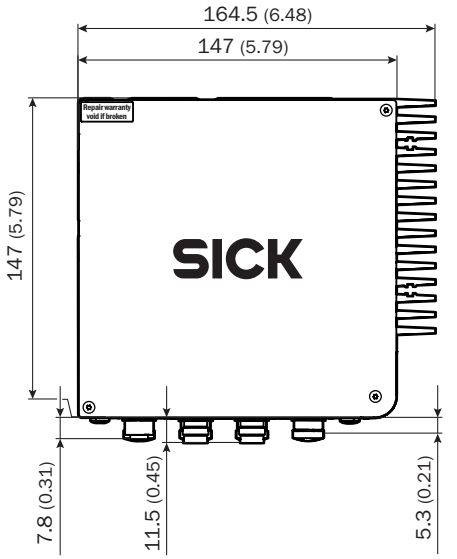
12 Annex

12.1 Dimensional drawings

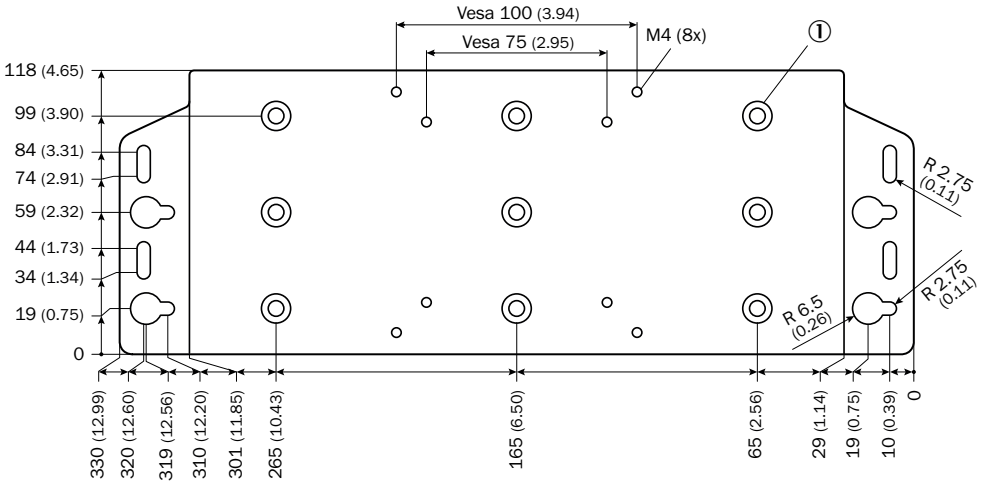
All measurements in mm.







Adapter holding plate (available as accessory)



① Counterbore M5 (9x)

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Australia
Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil
Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada
Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile
Phone +56 2 2274 7430
E-Mail info@schadler.com

China
Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland
Phone +358-9-2515 800
E-Mail sick@sick.fi

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany
Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong
Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary
Phone +36 1 371 2680
E-Mail office@sick.hu

India
Phone +91 22 6119 8900
E-Mail info@sick-india.com

Israel
Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy
Phone +39 02 274341
E-Mail info@sick.it

Japan
Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia
Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico
Phone +52 (472) 748 9451
E-Mail mario.garcia@sick.com

Netherlands
Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand
Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway
Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland
Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania
Phone +40 356 171 120
E-Mail office@sick.ro

Russia
Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore
Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia
Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 788 49
E-Mail office@sick.si

South Africa
Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain
Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden
Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan
Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand
Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey
Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates
Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom
Phone +44 1727 831121
E-Mail info@sick.co.uk

USA
Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam
Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at **www.sick.com**

SICK AG | Waldkirch | Germany | www.sick.com

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