OPERATING INSTRUCTIONS

# SIM2000ST

## Sensor Integration Machine

SICK
Sensor Intelligence.

### Described product

SIM2000ST

### Manufacturer

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

### Legal information



### Original document

This document is an original document of SICK AG.

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# 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/SIM2000

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 or clamped 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<br>▪ Knowledge of the current safety regulations in the workplace |
| Electrical installation, device replacement | ▪ Practical electrical training<br>▪ Knowledge of current electrical safety regulations<br>▪ Knowledge of the operation and control of the devices in their particular application |
| Commissioning, configuration | ▪ Basic knowledge of the Windows™ operating system in use<br>▪ Basic knowledge of the design and setup of the described connections and interfaces<br>▪ 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<br>▪ 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 X1 – IO LINK MASTER: connections for IO-Link and/or GPIO
② X2 – POWER: connections for the device voltage supply
③ X3 – OUTPUT: connections for digital switching outputs
④ X4 – INPUT A: connections for digital switching inputs A
⑤ X5 – INPUT B: connections for digital switching inputs B
⑥ X6 – SERIAL A: serial connections A
⑦ X7 – SERIAL B: serial connections B
⑧ X8 – CAN: connections for SICK CAN sensor network with termination resistor which can be activated
⑨ X9 to X12 – ETHERNET: 4 Ethernet connections
⑩ X13 to X14 – FIELDBUS: 2 connections for Ethernet-based fieldbuses
⑪ Device status indicators
⑫ Servicing panel: function button, function selector switch, USB connection (for configuration/diagnostics)
⑬ Status indicators for Ethernet and fieldbus connections

## 3.2 Functionality

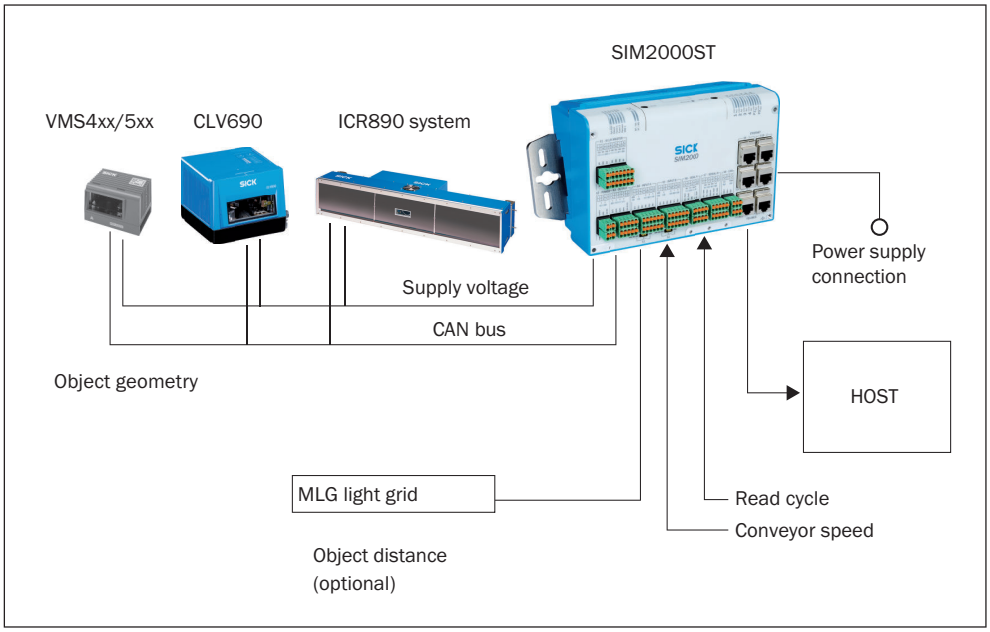
The Sensor Integration Machine – part of the SICK AppSpace eco-system – is opening up new possibilities for customized application solutions.

Data from SICK sensors such as 1D/2D code sensors and VMS4xx/5xx for detecting object geometry can be imported, evaluated, archived, and transmitted. In order to do this, the sensors can be connected to the SIM via the CAN bus. Ethernet-based fieldbus interfaces ensure rapid communication with controls.

Depending on the application, additional sensors can be connected for the read cycle, for detecting the object distance (e.g., MLG, as an alternative to the VMS4xx/5xx), and for generating the increment signal. IO-Link especially is suitable for incorporating the relevant sensors for performing distance and height measurements.

In particular, the high-performance multi-core processor featuring hardware support enables input and output signals to be handled in real time.

The HMI and data visualization features can be provided on any browser-enabled notebook, PC, or tablet.




### 3.2.1 Functions

**Features:**

- Real-time-capable hardware architecture with precise synchronization of I/O signals
- 4 x Ethernet interfaces to connect sensors as well as for connection to a network or PC
- Serial interfaces with support from RS-232/RS-422/RS-485
- 2 x Ethernet-based fieldbus interfaces
- Support of a SICK CAN network for the integration of the 1D/2D code sensors and the VMS4xx/5xx
- 4 configurable digital switching inputs/outputs/IO-Link data (X1)
- 4 digital switching inputs, not isolated (X1)
- 8 digital switching inputs, isolated (X4 & X5)
- 4 digital switching outputs, isolated (X3)

**Connectivity:**

- Data and function interfaces: spring-loaded terminals, RJ45, USB type B
- Supply voltage: spring-loaded terminals

## 3.3 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

# 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 33.
- 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 27. 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

- SIM2000ST
- 1 x grounding screw
- 1 x toothed lock washer
- Safety note

## 5.3 Preparing for mounting

### Mounting requirements

**NOTE**

Two mounting methods along with the relevant accessories are recommended:

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

- 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.
- Prepare vibration reduction measures, if necessary.

### Preparing for mounting with mounting rail

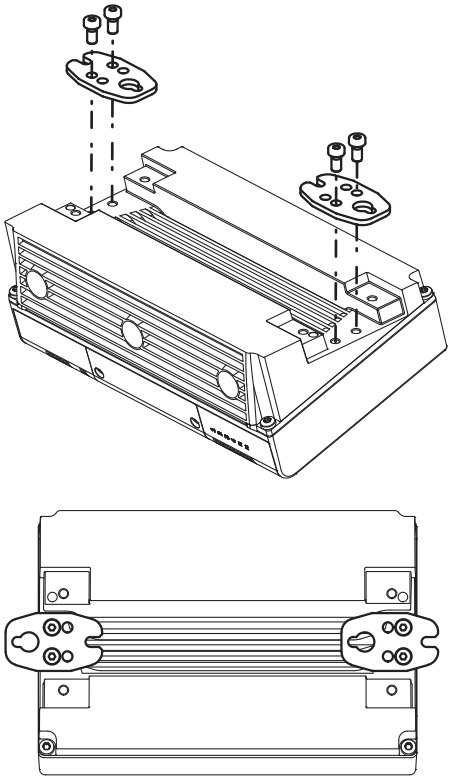
1. Place the mounting rail at the mounting site.
2. Mark the mounting holes.
3. Proceed to drill the mounting holes.

### Preparing for mounting with adapter plate

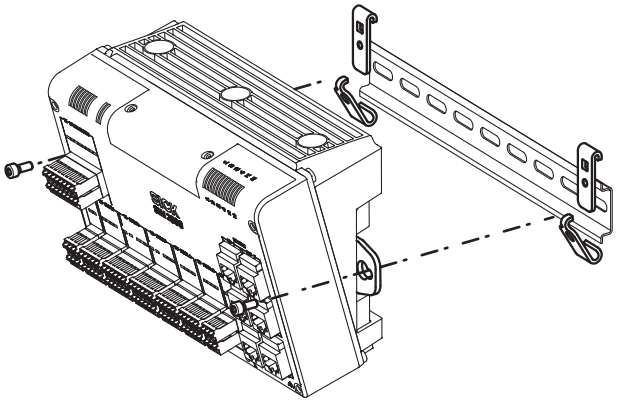
1. Place the adapter plate at the mounting site.
2. Mark the mounting holes.
3. Proceed to drill the mounting holes.

## 5.4 Mounting the device

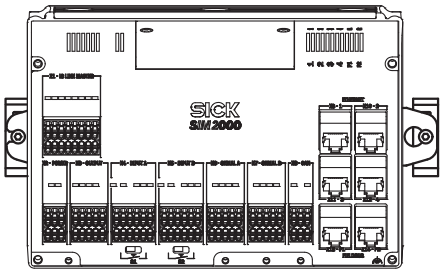
**Mounting the device with mounting rail**

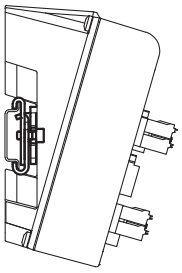


1. Attach the mounting plates using two hexagon socket head cap screws (A/F 3) on each.

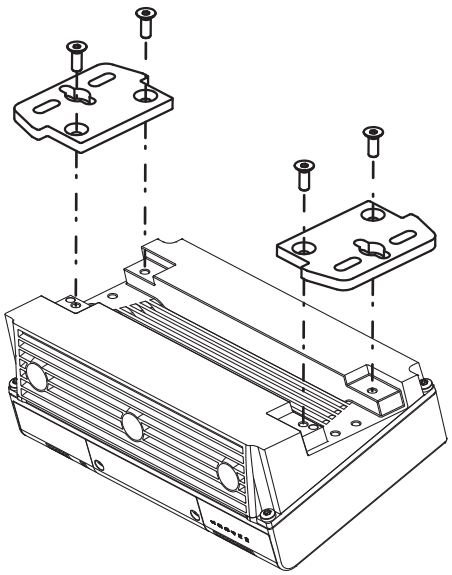


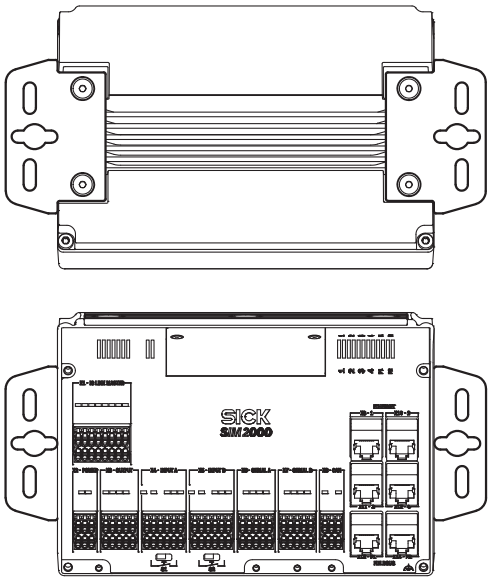
2. Mount the lower clamping plate on the mounting rail.
3. Insert the lower clamping plate on the opposite side at an angle and hook into the lower clamping plate.
4. Use the mounting plates and two hexagon socket heat cap screws (A/F 3) to screw the device securely into the two clamping plates.



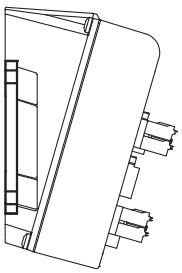



**Mounting the device with adapter plate**






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



2. Use the mounting plates to attach the device at the intended mounting site.

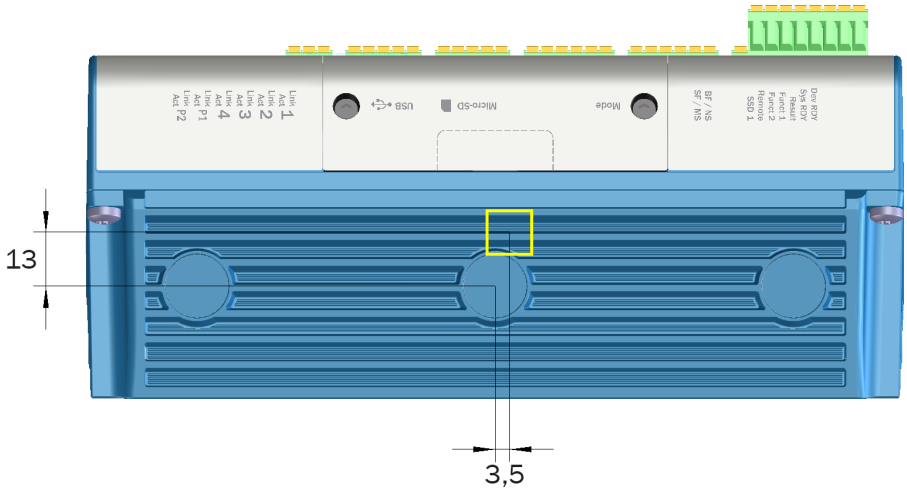
## 5.5 Mounting the device (at a critical ambient temperature of max. 50 °C)

**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. 600 mm in length)
- No direct sunlight and heat radiation
- Distance to other components or housing walls: Min. 400 mm

- Contrary to the conditions described above, operation is also possible provided the test of the housing temperature at the position specified in the graphic does not result in values above 75 °C outside on the cooling element during a period of time of 4 hours of operation.




**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)

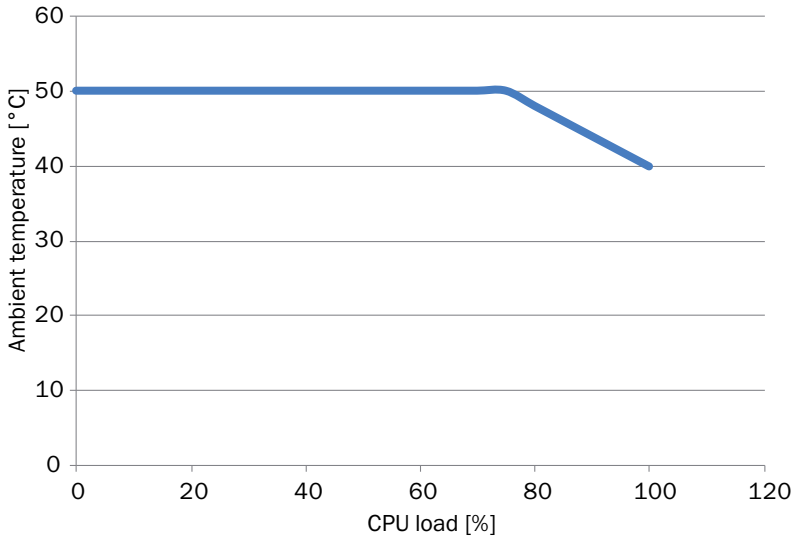



*Figure 1: Degradation of ambient temperature depending on the CPU capacity*

# 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

## 6.3 Assembling the cables (optional)

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

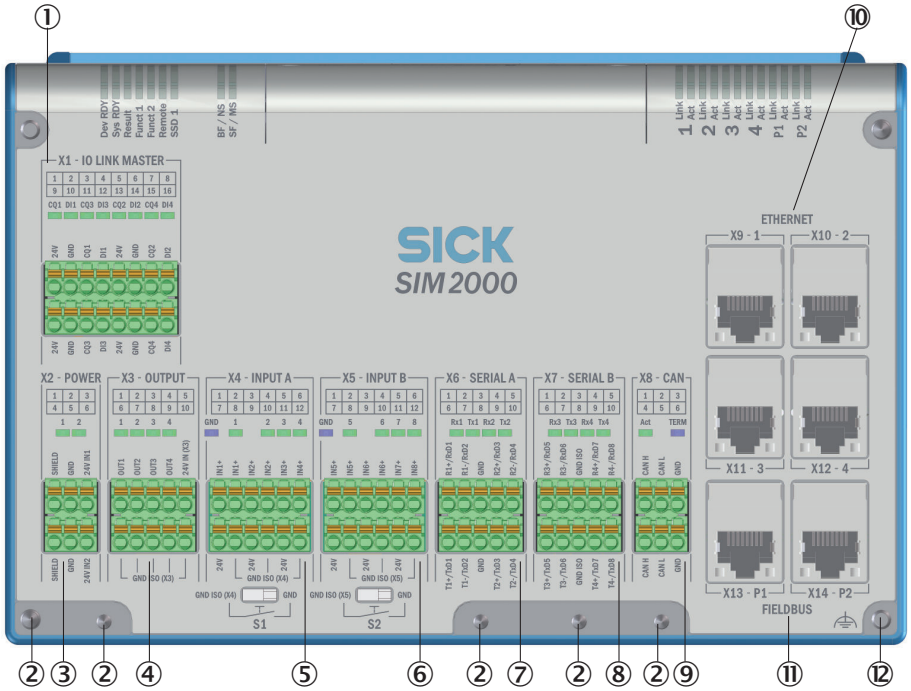
Ensure that you plan a sufficient length of cable for strain-relief clamps, for example.

**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 X1 – IO LINK MASTER
② Shield connection (e.g. via screening clamps)
③ X2 – POWER
④ X3 – OUTPUT
⑤ X4 – INPUT A
⑥ X5 – INPUT B
⑦ X6 – SERIAL A
⑧ X7 – SERIAL B
⑨ X8 – CAN
⑩ X9 to X12 – ETHERNET
⑪ X13 ... X14 – FIELDBUS
⑫ Ground connection

## 6.4 Pin allocation of the connections

### 6.4.1 X1 – IO LINK MASTER

| Pin | Signal | Function |
|---|---|---|
| 1 | 24V | Supply voltage |
| 2 | GND | Ground |
| 3 | CQ1 | IO-Link data or GPIO |
| 4 | DI1 | Digital input |
| 5 | 24V | Supply voltage |
| 6 | GND | Ground |
| 7 | CQ2 | IO-Link data or GPIO |
| 8 | DI2 | Digital input |
| 9 | 24V | Supply voltage |
| 10 | GND | Ground |

| Pin | Signal | Function |
|---|---|---|
| 11 | CQ3 | IO-Link data or GPIO |
| 12 | DI3 | Digital input |
| 13 | 24V | Supply voltage |
| 14 | GND | Ground |
| 15 | CQ4 | IO-Link data or GPIO |
| 16 | DI4 | Digital input |

**Additional notes:**

- CQn: IO-Link data or configurable GPIO (not isolated)
- DIn: dedicated digital input (not isolated)
- 4 x IO-Link master
- IO-Link stack is implemented in FPGA (SoftCore)
- Max. 0.7 A total output for 24 V supply voltage connections
- 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
  - 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
- The digital inputs and outputs are not reverse polarity protected. The voltage at the X1 inputs and outputs must never be higher than the 24 V supply voltage of the SIM2000ST to prevent feedback.

### 6.4.2 X2 – POWER

| Pin | Signal | Function |
|---|---|---|
| 1 | Shield | Shield |
| 2 | GND | Ground |
| 3 | 24V IN1 | Supply voltage 1 |
| 4 | Shield | Shield |
| 5 | GND | Ground |
| 6 | 24V IN2 | Supply voltage 2 |

**Additional notes:**

- 24V IN1 and 24V IN2 are designed with redundancy

### 6.4.3 X3 – OUTPUT

| Pin | Signal | Function |
|---|---|---|
| 1 | OUT1 | Insulated digital switching output |
| 2 | OUT2 | Insulated digital switching output |
| 3 | OUT3 | Insulated digital switching output |
| 4 | OUT4 | Insulated digital switching output |
| 5 | 24 V IN (X3) | Supply voltage for switching outputs |

| Pin | Signal | Function |
|---|---|---|
| 6 | GND ISO (X3) | Insulated reference potential for switching outputs and 24 V IN (X3) |
| 7 | GND ISO (X3) | Insulated reference potential for switching outputs and 24 V IN (X3) |
| 8 | GND ISO (X3) | Insulated reference potential for switching outputs and 24 V IN (X3) |
| 9 | GND ISO (X3) | Insulated reference potential for switching outputs and 24 V IN (X3) |
| 10 | GND ISO (X3) | Insulated reference potential for switching outputs and 24 V IN (X3) |

**Additional notes:**

- OUT 1 to OUT 4: isolated 0.6 A high side (PNP) outputs
- Min. high output logic level: VCC – 3 V
- Max. frequency: 1 kHz (1 kohm load resistance)

### 6.4.4 X4 – INPUT A

| Pin | Signal | Function |
|---|---|---|
| 1 | IN1+ | Isolated digital switching input |
| 2 | IN1+ | Isolated digital switching input |
| 3 | IN2+ | Isolated digital switching input |
| 4 | IN2+ | Isolated digital switching input |
| 5 | IN3+ | Isolated digital switching input |
| 6 | IN4+ | Isolated digital switching input |
| 7 | 24 V | Non-insulated supply voltage for external sensors |
| 8 | GND ISO (X4) | Insulated reference potential for switching inputs (X4)[1] |
| 9 | 24 V | Non-insulated supply voltage for external sensors |
| 10 | GND ISO (X4) | Insulated reference potential for switching inputs (X4)[1] |
| 11 | 24 V | Non-insulated supply voltage for external sensors |
| 12 | GND ISO (X4) | Insulated reference potential for switching inputs (X4)[1] |

[1] S1 switch in GND position: Reference potential also for 24 V (X4)

**Additional notes:**

- IN1 and IN2 are designed with redundancy
- Max. 0.7 A total output for all 24 V supply voltage connections
- Min. high input logic level: 12 V
- Max. low input logic level: 4 V
- Input frequency: 10 kHz

S1 switch

- GND ISO: volt-free connection
- GND: GND of the connected device connected to SIM2000-GND

### 6.4.5 X5 – INPUT B

| Pin | Signal | Function |
|---|---|---|
| 1 | IN5+ | Isolated digital switching input |
| 2 | IN5+ | Isolated digital switching input |
| 3 | IN6+ | Isolated digital switching input |

| Pin | Signal | Function |
|---|---|---|
| 4 | IN6+ | Isolated digital switching input |
| 5 | IN7+ | Isolated digital switching input |
| 6 | IN8+ | Isolated digital switching input |
| 7 | 24 V | Non-insulated supply voltage for external sensors |
| 8 | GND ISO (X5) | Insulated reference potential for switching inputs (X5)[1] |
| 9 | 24 V | Non-insulated supply voltage for external sensors |
| 10 | GND ISO (X5) | Insulated reference potential for switching inputs (X5)[1] |
| 11 | 24 V | Non-insulated supply voltage for external sensors |
| 12 | GND ISO (X5) | Insulated reference potential for switching inputs (X5)[1] |

1 S2 switch in GND position: Reference potential also for 24 V (X5)

**Additional notes:**

- IN5 and IN6 are designed with redundancy
- Max. 0.7 A total output for all 24 V supply voltage connections
- Min. high input logic level: 12 V
- Max. low input logic level: 4 V
- Input frequency: 10 kHz

S2 switch

- GND ISO: volt-free connection
- GND: GND of the connected device connected to SIM2000-GND

### 6.4.6 X6 – SERIAL A

**Not isolated**

| Pin | Signal | Mode | | | | |
|---|---|---|---|---|---|---|
| | | RS-422 | RS-232 | LED | RS-485 | LED |
| 1 | R1+/RxD1 | R1+ | RxD1 | Rx1 | – | – |
| 2 | R1-/RxD2 | R1- | – | | – | – |
| 3 | GND | GND (ground) | | – | GND (ground) | – |
| 4 | R2+/RxD3 | R2+ | RxD3 | Rx2 | – | – |
| 5 | R2-/RxD4 | R2- | – | | – | – |
| 6 | T1+/TxD1 | T1+ | TxD1 | Tx1 | Rx1+/Tx1+ | Receive: Rx1 Transmit: Tx1 |
| 7 | T1-/TxD2 | T1- | – | | Rx1-/Tx1- | |
| 8 | GND | GND (ground) | | – | GND (ground) | – |
| 9 | T2+/TxD3 | T2+ | TxD3 | Tx2 | Rx2+/Tx2+ | Receive: Rx2 Transmit: Tx2 |
| 10 | T2-/TxD4 | T2- | – | | Rx2-/Tx2- | |

**NOTE**

RxD2, RxD4 as well as TxD2 and TxD4 are not supported by the device.

### 6.4.7 X7 – SERIAL B

**Isolated**

| Pin | Signal | Mode | | | | |
|---|---|---|---|---|---|---|
| | | RS-422 | RS-232 | LED | RS-485 | LED |
| 1 | R3+/RxD5 | R3+ | RxD5 | Rx3 | – | – |
| 2 | R3-/RxD6 | R3- | – | | – | – |
| 3 | GND ISO | Insulated reference potential | | – | GND (ground) | – |
| 4 | R4+/RxD7 | R4+ | RxD7 | Rx4 | – | – |
| 5 | R4-/RxD8 | R4- | – | | – | – |
| 6 | T3+/TxD5 | T3+ | TxD5 | Tx3 | Rx3+/Tx3+ | Receive: Rx3 Transmit: Tx3 |
| 7 | T3-/TxD6 | T3- | – | | Rx3-/Tx3- | |
| 8 | GND ISO | Insulated reference potential | | – | GND (ground) | – |
| 9 | T4+/TxD7 | T4+ | TxD7 | Tx4 | Rx4+/Tx4+ | Receive: Rx4 Transmit: Tx4 |
| 10 | T4-/TxD8 | T4- | – | | Rx4-/Tx4- | |

**NOTE**
RxD6, RxD8 as well as TxD6 and TxD8 are not supported by the device.

### 6.4.8 X8 – CAN

| Pin | Signal | Function |
|---|---|---|
| 1 | CAN H | CAN high |
| 2 | CAN L | CAN low |
| 3 | GND | Ground |
| 4 | CAN H | CAN high (redundant) |
| 5 | CAN L | CAN low (redundant) |
| 6 | GND | Ground |

**Additional notes:**

- 1 x CAN (IN/OUT) not isolated

## 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 21.

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.

## 6.6 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 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 "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 25.
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.

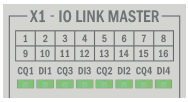
Using these status indicators, the operator can find out quickly and easily whether the device and the peripherals are working properly or whether any faults or errors have occurred.

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

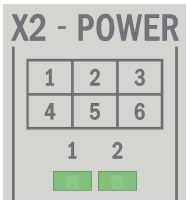
#### X1 – IO-Link master

*Table 2: Power status LEDs*

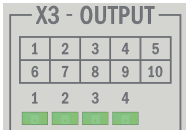
| | | | |
|---|---|---|---|
|  | CQ1<br>DI1<br>CQ3<br>DI3<br>CQ2<br>DI2<br>CQ4<br>DI4 | ○ | IO LINK mode: no data activity<br>Dig-IO mode: status of current signal level = low |
| | | ☀ | IO LINK mode: data activity<br>Dig-IO mode: status of current signal level = high |

#### X2 – POWER

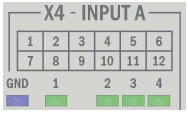
*Table 3: X2 – POWER*

| | | | |
|---|---|---|---|
|  | 1<br>2 | ○ | Supply voltage not applied |
| | | ☀ | Supply voltage applied |

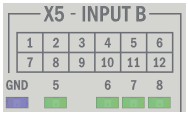
#### X3 – OUTPUT

| | | | |
|---|---|---|---|
|  | 1<br>2<br>3<br>4 | ○ | No voltage applied to connection |
| | | ☀ | Voltage applied to connection |

#### X4 – INPUT A

| | | | |
|---|---|---|---|
|  | GND | ○ | GND S1 switch to GND ISO |
| | | ☀ | GND S1 switch to GND |
| | 1<br>2<br>3<br>4 | ○ | Current signal level = low |
| | | ☀ | Current signal level = high |

### X5 – INPUT B

| | | | |
|---|---|---|---|
|  | GND | ○ | GND S2 switch to GND ISO |
| | | ☀ | GND S2 switch to GND |
| | 5<br>6<br>7<br>8 | ○ | Current signal level = low |
| | | ☀ | Current signal level = high |

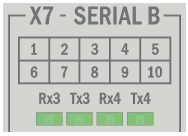
### X6 – SERIAL A

*Table 4: SERIAL status LEDs*

| | | | |
|---|---|---|---|
|  | Rx1<br>Tx1<br>Rx2<br>Tx2 | ○ | No signal activity |
| | | ○ ○ ◐ ○ ○ | Signal activity |

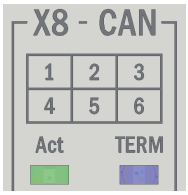
### X7 – SERIAL B

*Table 5: SERIAL status LEDs*

| | | | |
|---|---|---|---|
|  | Rx3<br>Tx3<br>Rx4<br>Tx4 | ○ | No signal activity |
| | | ○ ○ ◐ ○ ○ | Signal activity |

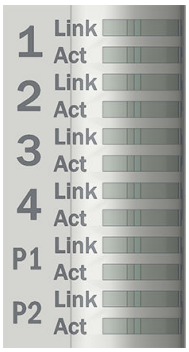
### X8 – CAN

*Table 6: CAN status LEDs*

| | | | |
|---|---|---|---|
|  | Act | ○ | No signal activity |
| | | ○ ○ ◐ ○ ○ | Signal activity |
| | TERM | ○ | Termination resistor not activated |
| | | ☀ | Termination resistor activated |

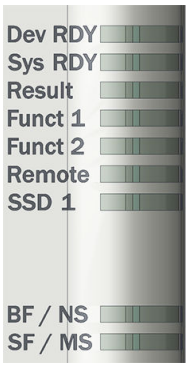
### X9 – X12 ETHERNET 1 – 4, fieldbus 1 – 2

*Table 7: ETHERNET and FIELDBUS status LEDs*

| | | | |
|---|---|---|---|
|  | Link | ○ | Connection not established with Ethernet |
| | | ☀ | ETH1-ETH4 only. Connection established with Ethernet |
| | Act | ○ | No activity |
| | | ◐ | Data transmission via Ethernet |

### Device status

*Table 8: Device status indicators*

| | | | |
|---|---|---|---|
|  | Dev RDY | | Runlevel READY, no errors detected |
| | | | Runlevel READY, boot process error |
| | | | Runlevel READY not reached |
| | Sys RDY | | User-defined, configurable with SICK AppSpace |
| | | | |
| | | | |
| | Result | | User-defined, configurable with SICK AppSpace |
| | | | |
| | | | |
| | Funct 1 | | User-defined, configurable with SICK AppSpace |
| | | | |
| | | | |
| | Funct 2 | | User-defined, configurable with SICK AppSpace |
| | | | |
| | | | |
| | Remote | | Remote maintenance active. Currently not supported |
| | SSD 1 | | Internal SSD connected. 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 9: 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, dimensional drawing, and connection diagrams can be downloaded, saved, and printed at:

▶ www.sick.com/SIM2000

## 11.1 Features

| Feature | Parameter |
|---|---|
| Task | Data recording, evaluation, and archiving |
| Supported devices/excerpt | Encoders, code readers, laser scanners, photoelectric sensors, etc. |
| Technology | Embedded hardware architecture:<br>• 4-core PowerPC CPU<br>• FPGA for I/O handling<br>• Dedicated fieldbus controller |
| | Software:<br>• Can be programmed within the SICK AppSpace environment |
| Random Access Memory | 2 GB |
| Flash memory | 512 MB in total, 427 MB of which available for applications |
| Memory card (optional) | Industry-grade microSD memory card (flash card), max. 16 GB |
| Programming software | SICK AppStudio |

## 11.2 Interfaces

| Feature | Parameter |
|---|---|
| **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 | 4, also configurable as an encoder port |
| Function | RS-232 / RS-422 / RS-485 |
| Maximum data transmission rate | RS-232: 115.2 kBaud<br>RS-422: 2 MBaud<br>RS-485: 2 MBaud |
| **Fieldbus** | |
| Quantity | 2 |
| Function | Ethernet-based fieldbus |
| Data transmission rate | 10/100 Mbit/s |
| Protocol | ProfiNet, Ethernet/IP, EtherCAT |
| **Ethernet** | |
| Quantity | 4 |
| Function | Host, AUX, image transmission |
| Data transmission rate | 4 x [10/100/1,000 Mbit/s] |
| Protocol | TCP/IP, FTP (image transmission) |
| **CAN** | |
| Quantity | 1 |

| Feature | Parameter | |
|---|---|---|
| Function | SICK CAN sensor network (master/slave, multiplexer/ server) with termination resistor which can be activated<br>1 x CAN (IN/OUT) not isolated | |
| Data transmission rate | 20 kbit/s to 1 Mbit/s | |
| Protocol | CSN (SICK CAN sensor network) | |
| **IO-Link master** | | |
| Quantity | 4 x IO-Link to X1 male connector | |
| Data transmission rate | max. 230 kBaud | |
| Protocol | IO-Link master 1.1 | |
| **Digital switching inputs/outputs** | | |
| X1 | 4 configurable inputs/ outputs incl. IO-Link | 4 inputs |
| X3 | 4 isolated outputs (high side) | |
| X4 | 4 isolated inputs | |
| X5 | 4 isolated inputs | |
| **USB** | AUX (USB 2.0) for configuration/diagnostics | |

## 11.3 Mechanics and electronics

| Feature | Parameter |
|---|---|
| Optical indicators | 31 x green status indicators<br>3 x blue status indicators<br>6 x green Link indicators<br>6 x orange activity indicators<br>9 x red/green device status indicators |
| Operating elements | 1 selector switch present under the servicing panel<br>2 S1 and S2 switches for GND ISO/GND |
| Electrical connection | X1 – IO-Link, GPIOs: spring terminals<br>X2 – POWER: spring terminals<br>X3 – OUTPUT: spring terminals<br>X4 – INPUT A: spring terminals<br>X5 – INPUT B: spring terminals<br>X6 – SERIAL A: spring terminals<br>X7 – SERIAL B: spring terminals<br>X8 – CAN: spring terminals<br>X9 to X14: RJ-45 |
| Supply voltage | 24 V DC, ± 10% ES1 in accordance with EN 62368-1 or SELV in accordance with EN 60950-1 |
| Power consumption | Typ. 20 W, without connected sensors |
| Power output | Max. 50 W (input A & B, IO-Link) |
| Output current for switching outputs | X1: 100 mA per output<br>X3: 700 mA in total |
| Output current for supply voltages | X1: max. 700 mA<br>X4, X5: 700 mA in total |
| Housing material | Aluminum die cast |
| Housing color | Light blue (RAL 5012) |
| Protection class | III |
| Weight without accessories | 1,532 g |
| Dimensions (W x D x H) | 196 x 137 x 81 mm |

## 11.4 Ambient data

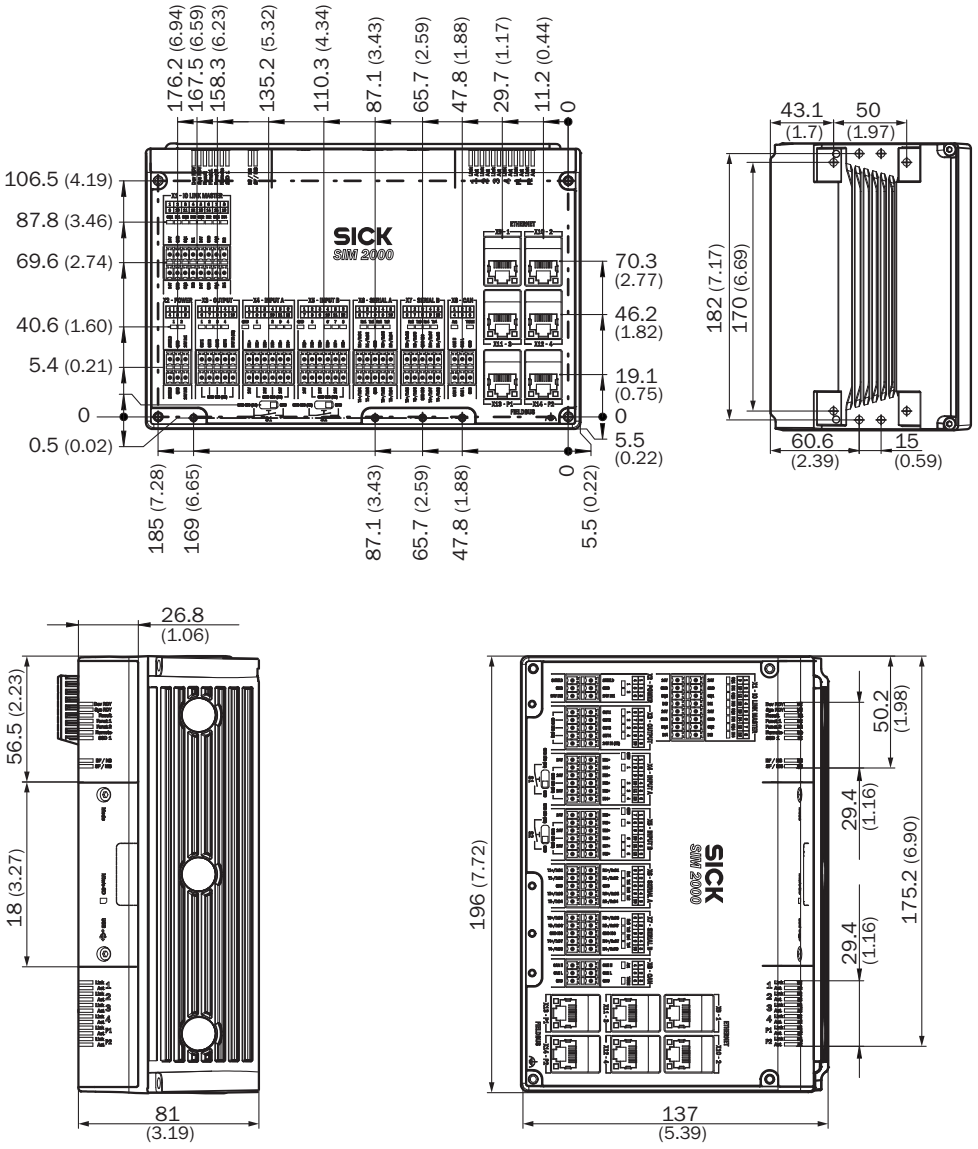
| Feature | Parameter |
|---|---|
| Electromagnetic compatibility (EMC) | EN 61000-6-2:2005-08<br>EN 61000-6-4:2007+A1:2011<br>EN 61131-9:2013-12 |
| Shock resistance | EN 60068-2-6 |
| Electrical safety | EN 62368-1 |
| Enclosure rating | IP 20 |
| Ambient operating temperature | 0 °C to +50 °C, taking the described mounting requirements into account, see "Mounting the device", page 16 |
| Storage temperature | -20 °C to +70 °C |
| Permissible relative humidity | 90%, non-condensing |

# 12 Annex

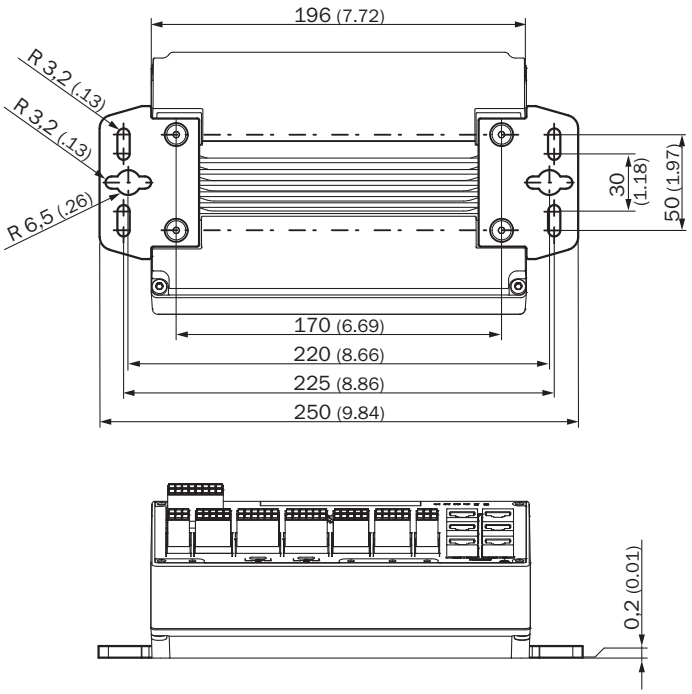
## 12.1 Dimensional drawings

### Dimensions without accessories

All measurements in mm (inch).



**Dimensions with adapter plate**

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