OPERATING INSTRUCTIONS

MCS200HW

Multicomponent Analysis System

SICK
Sensor Intelligence.

Described product

MCS200HW

Manufacturer

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

Legal information

Original document

This document is an original document of SICK AG.

CE

Contents

1 About this document

1.1 Function of this document

These Operating Instructions describe:

- Device components
- Assembly
- Commissioning
- Operation
- Maintenance work required for reliable operation
- Troubleshooting
- Decommissioning

1.2 Scope of application

These Operating Instructions are only applicable for the measuring device described in the product identification.

They are not applicable for other SICK measuring devices.

The standards referred to in these Operating Instructions are to be observed in the respective valid version.

1.3 Target groups

This Manual is intended for persons commissioning, operating and maintaining the device.

1.4 Further information

- SFU Gas Sampling Unit Operating Instructions
- Sample Gas Line Operating Instructions
- System documentation
- Option: MPR (Meeting Point Router) Operating Instructions
- Option: Instrument Air Conditioning Operating Instructions
- Option: GMS800 FIDOR / FIDORi Operating Instructions
- Option: Condensate Container Operating Instructions

1.5 Symbols and document conventions

1.5.1 Warning symbols

Table 1: Warning symbols

Symbol	Significance
	Hazard (general)
	Hazard by voltage
	Hazard by acidic substances
	Hazard by noxious substances

Symbol	Significance
	Hazard by toxic substances
	Hazard by high temperature
	Hazard for the environment/nature/organic life

1.5.2 Warning levels / Signal words

DANGER

Risk or hazardous situation which will result in severe personal injury or death.

WARNING

Risk or hazardous situation which could result in severe personal injury or death.

CAUTION

Hazard or unsafe practice which could result in less severe or minor injuries.

Notice

Hazard which could result in property damage.

Note

Hints

1.5.3 Information symbols

Table 2: Information symbols

Symbol	Significance
	Important technical information for this product
	Important information on electric or electronic functions

1.6 Data integrity

SICK AG uses standardized data interfaces such as, for example, standard IP technology, in its products. The focus here is on product availability and features.

SICK AG always assumes that the customer is responsible for the integrity and confidentiality of data and rights involved in connection with using the products.

In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and patch management.

2 Safety information

2.1 Basic safety information

Electrical safety

DANGER
Danger to life through electric shock

There is a risk of electric shock when working on the device with the voltage supply switched on.

- Before starting work on the device, ensure the voltage supply can be switched off in accordance with the valid Standard using a power isolating switch/circuit breaker.
- Make sure the disconnector switch is easily accessible.
- An additional disconnecting device is mandatory when the power disconnector switch cannot be accessed or only with difficulty after installation of the device connection.
- Switch off the voltage supply before starting any work on the device.
- After completion of the work or for test purposes, calibration the power supply may only be activated again by authorized personnel complying with the safety regulations.

WARNING
Danger to life by electric voltage

- Only allow an authorized electrician to work on the electric system
- Disconnect the device from the power supply before performing work on the device.

WARNING
Endangerment of electrical safety through power cable with incorrect rating

Electrical accidents can occur when the specifications for installation of a power line have not been adequately observed.

- Always observe the exact specifications in the Operating Instructions (see "Technical data", page 51) for installation of a power line.

Dangerous substances

DANGER
Mortal/health danger as a result of gas path leakage

When the device is used to measure toxic gases: A leak, for example in the purge air supply, can be an acute hazard for persons.

- Regularly check all gas-carrying components for leaks.
- Take suitable safety measures. For example:
  - Attach warning signs to the device.
  - Attach warning signs in the operating area.
  - Safety-oriented instruction of persons that could be in this area.

2.2 Warning information on device

The following safety symbols are on the device:

Table 3: Warning symbols

Symbol	Significance
	Warning for general hazard
	Warning for hazard by electric voltage, possibly also by residual electric voltage
	Warning for hazard through hot surfaces

If you need to work on a subassembly marked with such a symbol:

- ▶ Read the relevant Section in these Operating Instructions
- ▶ Observe all the safety information in the relevant Section

2.3 Intended use

The MCS200HW is a multicomponent analysis system for continuous flue gas monitoring of industrial combustion plants (emission measuring system). The sample gas is extracted at the measuring point and fed through the analysis system (extractive measurement).

The analysis system is designed for indoor installation.

- ▶ Refer to the system documentation delivered for information on the device equipment.

2.4 Responsibility of user

Designated users

see "User qualification", page 10.

Correct project planning

- Basis of this Manual is the delivery of the device according to the preceding project planning (e.g., based on the SICK application questionnaire) and the relevant delivery state of the device (see delivered System Documentation).
  - ▷ If you are not sure whether the device corresponds to the state defined during project planning or to the delivered system documentation: Please contact SICK Customer Service.

Correct use

- ▶ Use the device only as described in “Intended use”.
  The manufacturer assumes no responsibility for any other use.
- ▶ Carry out the specified maintenance work.
- ▶ Do not carry out any work or repairs on the device that are not described in this Manual.
  Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer.
  If you do not observe this:
  - ○ The manufacturer's warranty becomes void.
  - ○ The device could become dangerous.

Special local conditions

In addition to the information in these Operating Instructions, follow all local laws, technical rules and company-internal operating and installation directives applicable wherever the device is installed.

Read the Operating Instructions

- Read and observe these Operating Instructions.
- Observe all safety instructions.
- If anything is not clear: Please contact SICK Customer Service.

Document retention

These Operating Instructions

- Must be kept for reference.
- Must be passed on to new owners.

2.5 User qualification

This Manual is intended for persons commissioning, operating and maintaining the device.

Table 4: Qualification requirements

Tasks	User groups	Qualification
Assembly	Qualified personnel	• General knowledge in measurement technology, specialist device knowledge (possibly customer training at SICK)
Electrical installation	Qualified personnel	• Authorized electrician (authorized skilled electrician or person with similar training) • General knowledge in measurement technology, specialist device knowledge (possibly customer training at SICK)
Initial start-up Returning to operation	Authorized operator	• General knowledge in measurement technology, specialist device knowledge (possibly customer training at SICK)
Decommissioning Operation Troubleshooting	• Operator / system integrator • Authorized operator	• General knowledge in measurement technology, specialist device knowledge (possibly customer training at SICK) Service training • Authorized electrician (authorized skilled electrician or person with similar training) • Service training
Maintenance	Operator / system integrator Authorized operator	• General knowledge in measurement technology, specialist device knowledge (possibly customer training at SICK) • Service training

3 Product description

3.1 Product identification

Product name	MCS200HW
Manufacturer	SICK AG Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany
Type plate	Type plates are located outside on the right of the enclosure. The second type plate states the integrated measuring modules. An additional copy of the type plate can be found on the inside of the cabinet.

MCS200HW type plates

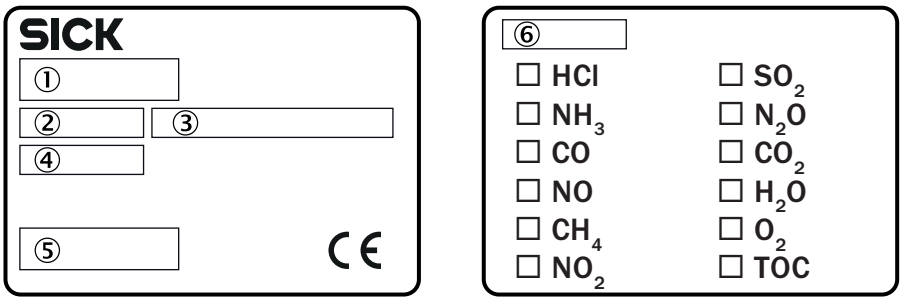


Figure 1: Type plates, schematic representation

① Product name
② Item number
③ Specification on voltage supply
④ Serial number
⑤ Barcode
⑥ Measuring modules

Analyzer type plate

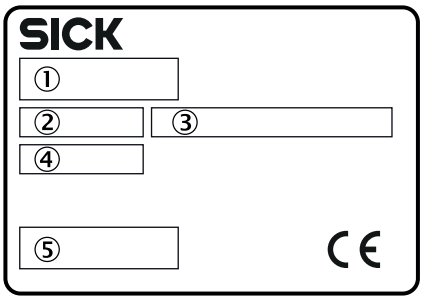


Figure 2: Type plates, schematic representation

① Product name
② Item number
③ Specification on voltage supply
④ Serial number
⑤ Barcode

3.2 Gas supply terminology

Definition of utility gases:

- Zero gas: Gas to adjust the zero point. Instrument air or nitrogen (N_2)
- Span gas: Gas to adjust the measuring range full scale value
- Instrument air: Compressed air free of oil, water and particles

Gas quality: see "Supply gases", page 55

3.3 Layout and function

System overview

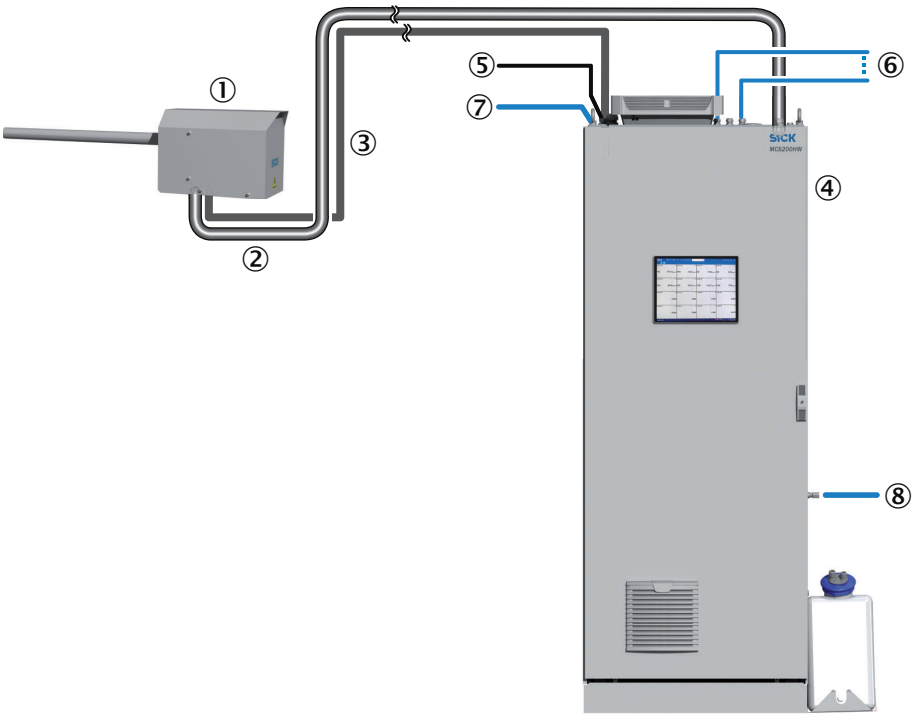


Figure 3: System overview (schematic)

①	Gas sampling unit	see "Gas sampling unit", page 15
②	Heated sample gas line	see "Heated sample gas line", page 15
③	Hose bundle line	see "Hose bundle line", page 15
④	Analyzer cabinet	see "Analyzer cabinet", page 14
⑤	Voltage supply	see "Voltage supply", page 54
⑥	Interfaces	1 x Ethernet: Connections see "Connections in analyzer", page 56 Customer-specific analog and digital inputs and outputs, see wiring diagram
⑦	Instrument air inlet Option: Instrument air conditioning	Observe the quality of the operator's instrument air: see "Supply gases", page 55 A separate instrument air supply can also be connected as zero gas (IR components) or span gas (O_2 sensor).
⑧	Sample gas outlet	

Measuring principle

- IR components: Single-beam infrared photometer with interference filter and gas filter correlation method
- Oxygen: Zirconium dioxide sensor

Measuring components

Output of measured values in mg/m^3 or percentage volume, relative to humid flue gas.

Refer to the system documentation provided for the configuration of your system.

Function

The system operates independently.

Operation is performed using the display in the analysis system door.

Operating states are signaled by status signals and shown on the display.

- Sampling of flue gas at the measuring point with a heated gas sampling unit
- Sample gas feed to the analyzer in a heated sample gas line
- Heating temperature of all parts with sample gas contact: 200 °C
- Pump: Ejector pump in cell (operated with instrument air)
- The analysis system uses status indicators to signal the current operating state: see "", page 31
- The analysis system switches to operating state “System Stop” automatically when a malfunction occurs
  “System Stop” corresponds to classification “Failure”: see "", page 31
  - The sample gas line and the sample gas path in the analyzer are automatically purged with instrument air in this mode.
  - Measured values are updated further.

Check (validation) and adjustment

- Zero point adjustment: see "Performing zero point adjustment", page 28
- Reference point adjustment: see "Performing reference point adjustment", page 29
- Adjustment with internal adjustment filter: see "Performing reference point adjustment", page 29
- Backflush of the gas sampling unit
  - Automatic (configuration with internal trigger, duration e.g., 2 minutes every 4 hours)
  - Manual

Operating using the display

It is also possible to operate the MCS200HW using the display in the door.

Operation via external PC (optional)

Operator menus and measured value displays are also available for easy use on an external PC via the Ethernet connection (with Google Chrome browser and SOPAS Air).

3.3.1 Analyzer cabinet

Figure 4: Exterior and interior view

Analyzer module

① Cell module
- Ejector pump
- Inlet filter

② Optics module
③ Electronics module

Analyzer cabinet

④ Sample gas inlet (heated sample gas line)
⑤ Hose bundle line
⑥ Valve block
⑦ Pressure reducer module
Notice: Observe the quality of the operator's instrument air: see "Supply gases", page 55
⑧ Sample gas outlet
⑨ I/O modules

3.3.2 Gas sampling unit

Figure 5: Gas sampling unit (example with heated gas sampling pipe)

- The gas sampling unit extracts the sample gas from the exhaust duct.
- The gas sampling pipe is:
  - unheated
  - or heated
- The gas sampling unit is thermostatically controlled.
- The analyzer cabinet regulates the heaters.
- When no voltage is applied, the “heated sample gas line” and the analyzer cabinet are flushed with instrument air.

NOTE

▶ Further information on the gas sampling unit: See the provided “Gas Sampling Unit SFU Operating Instructions”

3.3.3 Heated sample gas line

- The heated sample gas line leads the flue gas from the gas sampling system to the analyzer cabinet.
- The sample gas line is thermostatic-controlled to prevent condensation of the flue gas.
  - The analyzer cabinet regulates the heating.

3.3.4 Hose bundle line

The hose bundle line comprises electrical and pneumatic control lines.

3.3.5 Instrument air conditioning (option)

NOTICE

Only feed conditioned instrument air to the analyzer cabinet. The instrument air quality is specified in Annex chapter 13.2.6 . Operation with air not satisfying these specifications voids the warranty and does not ensure proper functioning of the device.

Instrument air conditioning serves to condition the compressed air provided by the operator.

▶ Refer to the Instrument Air Conditioning Operating Instructions delivered with the system for further information

3.3.6 Integrated GMS811 FIDORi (option)

As an option, the MCS200HW can be equipped with an integrated GMS811 FIDORi for measuring the total carbon (TOC). Measured values and operating states can be displayed using the MCS200HW display.

If the GMS811 FIDORi is integrated, it is stated on the type plate by the “TOC” module.

Further information: see GMS800 FIDOR / FIDORi Operating Instructions

3.4 Extended interfaces (optional)

As standard, analog and digital signals are used for device communication with customer peripherals. Alternatively, output can be performed using the Modbus-TCP protocol.

SICK also offers various optional converter modules that can be installed by the customer for communication with the device via MODBUS TCP. Available options

- PROFIBUS / PROFINET

Modbus

Modbus® is a communication standard for digital controls to create a connection between a »Master« device and several »Slave« devices. The Modbus protocol only defines the communication commands, not their electronic transfer; it can therefore be used with differing digital interfaces (Ethernet).

The measuring device is equipped with a digital interface for data transmission in accordance with Guideline VDI 4201, Sheet 1 (General requirements) and Sheet 3 (Specific requirements for Modbus). Refer to the documentation delivered (Modbus signal list) for assignment of the Modbus registers. Only SICK Service may perform parameter settings.

3.5 Remote maintenance (optional)

The SICK Meeting Point Router (MPR) is available for remote diagnostics via the internet.

The MPR links a plant-side machine network with the SICK remote architecture.

A firewall which decouples the machine network from the internet or the operating company network is integrated in the MPR.

NOTE

An internet connection must be available.

Further information, see optional “MPR Operating Instructions”.

4 Transport and storage

4.1 Transport

NOTICE
The device may only be transported and installed by skilled persons who, based on their training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the dangers involved.

Transport and install the device with suitable hoisting equipment (e.g. a crane or jack lift with adequate lifting capacity).

Transport via crane

Analyzer cabinets are transported safely with delivered lifting lugs. The following permissible total loads apply for symmetrical loads:

- For 45° cable pull angle 4 800 N
- For 60° cable pull angle 6 400 N
- For 90° cable pull angle 13 600 N

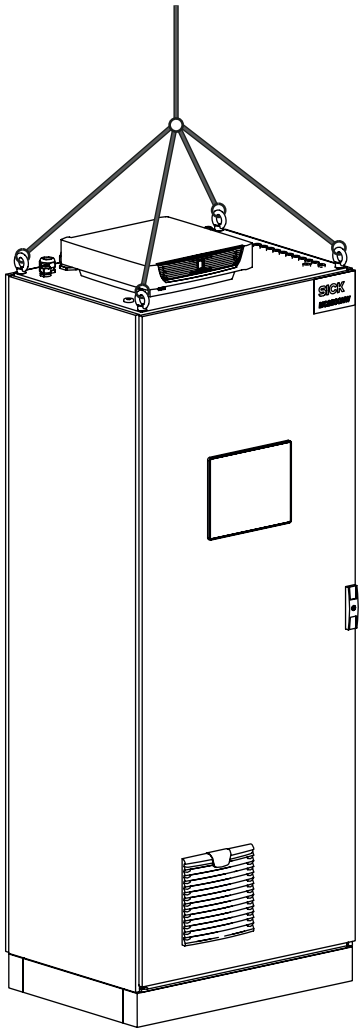


Figure 6: Analyzer cabinet suspension

4.2 Protective measures for long-term storage

- When gas lines were unscrewed: Close all gas connections (with sealing plugs) to protect internal gas paths against moisture, dust or dirt penetrating
- Close off open electrical connections dust-tight
- Protect the display against sharp-edged objects. Possibly attach a suitable protective cover (e.g. made of cardboard or hard foam)
- Select a dry, well-ventilated room for storage
- Wrap the device (e.g. with stretch foil)
- If high air humidity can be expected: Enclose a drying agent (e.g., silica gel) in the packing

5 Mounting

5.1 Safety

NOTICE
The device may only be installed by trained, skilled persons.

5.2 Scope of delivery

Please see the delivery documents for the scope of delivery.

5.3 Checklist for mechanical and electrical installation

NOTICE
Observe the sequence during installation. Connect the gas sampling units on the exhaust duct as last task.

Incorrect assembly can create a risk of contaminating the gas sampling unit. In this case, exhaust gas can penetrate the unheated analyzer and possibly condensate.

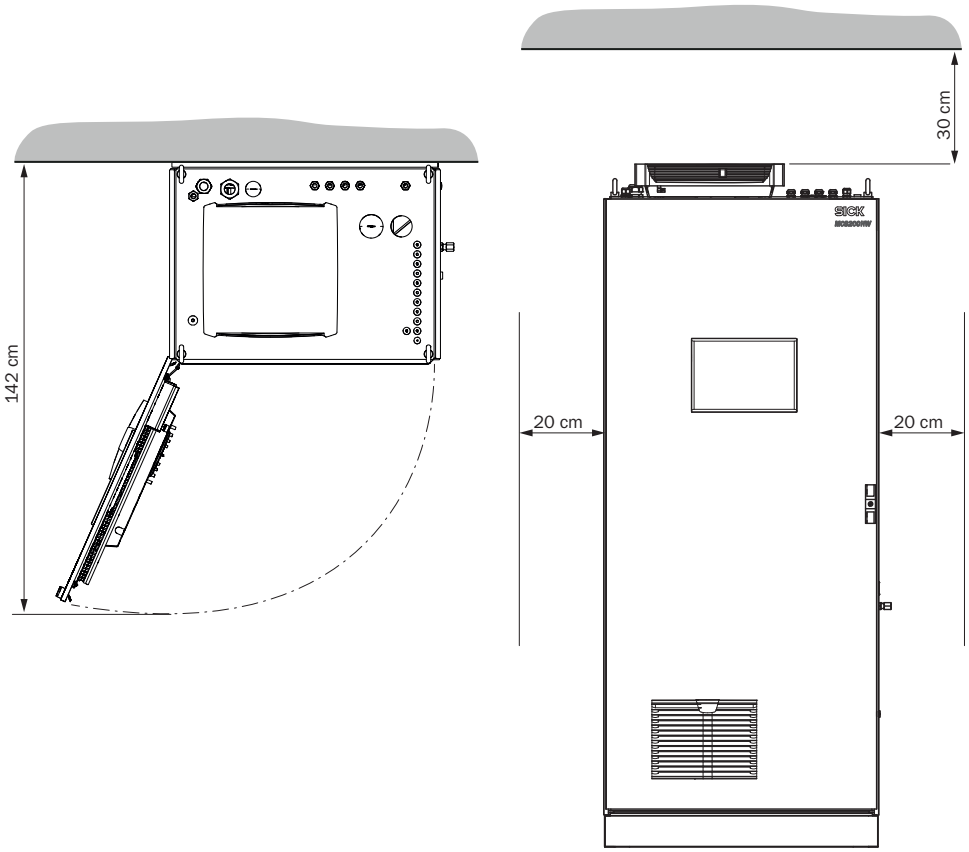
1. First connect instrument air and voltage supply.
2. Then install the gas sampling unit in the exhaust duct.

Observe laying information (Chapter, see "Assembly information for sample gas lines and hose bundle line", page 20).

Table 5: Fitting and connecting system components

System components	Reference
Install analyzer cabinet	see "Installing the analyzer cabinet", page 20
Electrical connections on analyzer	see "Electrical connections", page 26
Connect signal lines to analyzer	see "Connecting the signal lines to the analyzer", page 22
Install SFU gas sampling system	See SFU Operating Instructions
Connect heater hose	
Air and gas connections on analyzer	see "Setting the pressure reducer module", page 22
Connect sample gas line to analyzer	see "Connect the sample gas line to the analyzer", page 21
Sample gas outlet	see "Connect sample gas outlet", page 25

5.4 Installing the analyzer cabinet



- Observe the clearances for the heated sample gas line.
- Install the analyzer in a well ventilated room at a location with temperature conditions in accordance with the specification.
- Observe the relevant ambient conditions: see "Ambient conditions", page 53

- Install the analyzer cabinet on a ground with sufficient load capacity.
- Install the analyzer cabinet horizontally.
- Remove the plastic cover from the base.
- Fasten the analyzer cabinet using 4x M10 screw connections (to the ground).

5.5 Assembly information for sample gas lines and hose bundle line

Installing the sample gas lines

WARNING
Danger to life by electric voltage

- ▶ Only allow an authorized electrician to work on the electric system
- ▶ Disconnect the device from the power supply before performing work on the device.

- ▶ Start laying at the analyzer cabinet.
  - The end **with** the electric connection belongs on the analyzer.
    Important: The screw fitting for the enclosure duct must be located at the end of the electrical connection (analyzer side).
  - The end **without** electrical connection belongs on the gas sampling unit.

Roll up excess length at the gas sampling unit.
Leave enough length for pulling the gas sampling unit.

- ▶ Protect the line from damage (chafing through vibration, mechanical load).
- ▶ Observe a minimum bending radius of 300 mm.

Fitting the hose bundle line

Start laying the hose bundle line at the analyzer. Roll up excess length at the gas sampling unit.

1. Assembly on the analyzer: see "Electrical connections", page 26
2. Lay the hose bundle line to the analyzer cabinet.
   - Roll up excess length at the gas sampling unit.
   - Leave enough length for pulling the gas sampling unit.
   - Protect the line from damage (chafing through vibration, mechanical load).
   - Minimum bending radius: 300 mm.
3. Assembly on the gas sampling unit: SFU Operating Instructions

NOTE
Fit the sample gas lines and hose bundle line on the intended cable strips.

- ▶ Observe the minimum distance and bend radius.

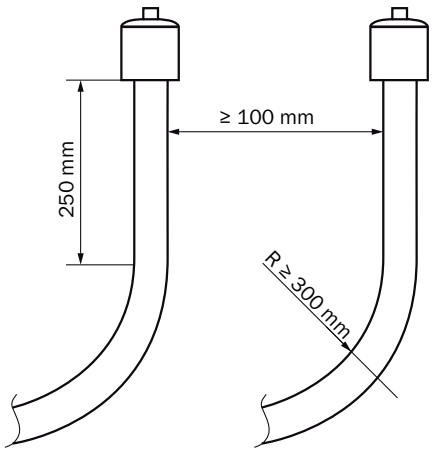


Figure 7: Sample gas line: Distance and radius

5.6 Installation sequence

5.6.1 Connect the sample gas line to the analyzer

Connect heated sample gas line to analyzer

1. Unscrew the counter nut from the cable gland. Remove from sample gas line.
2. Lead sample gas line together with electrical connections from above through the enclosure opening in the analyzer cabinet roof.
3. Push counter nut back over the sample gas line and electric connections.
4. Screw counter nut tight on the cable gland.
5. Unscrew cell cover and remove.
6. Remove protective cap from sample gas line.
7. Insert sample gas line to stop in the clamping ring screw connection on the cell.
8. Screw the sample gas line tight on the clamping ring screw connection.
9. Attach red foam insulation to the clamping ring screw connection. Bind together with a cable clip. No thermal bridges may remain.

10. Close cell again.
11. Screw cable gland tight.
12. Push electric lines downwards through the cable duct.
13. Connect power supply of the sample gas line:

5.6.2 Tube screw fittings

Clamping ring screw connection

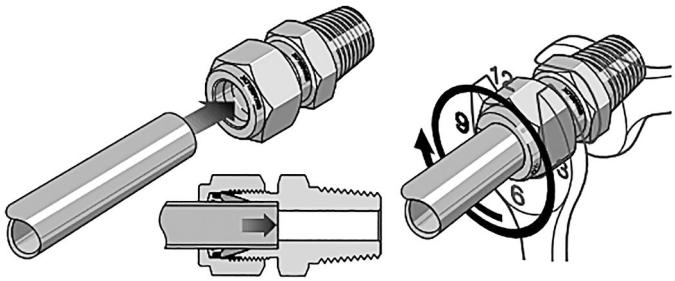


Figure 8: Clamping ring screw connection

- ▶ Push the tube up to the stop in the tube screw fitting.
  Turn the cap nut finger-tight.
- ▶ During initial assembly: Hold the fitting bolt steady and tighten the cap nut with 1 1/4 revolutions.
- ▶ During refitting: Tighten the cap nut to the previous position (the resistance increases noticeably) and then slightly tighten.

Push-in fitting (pneumatic)

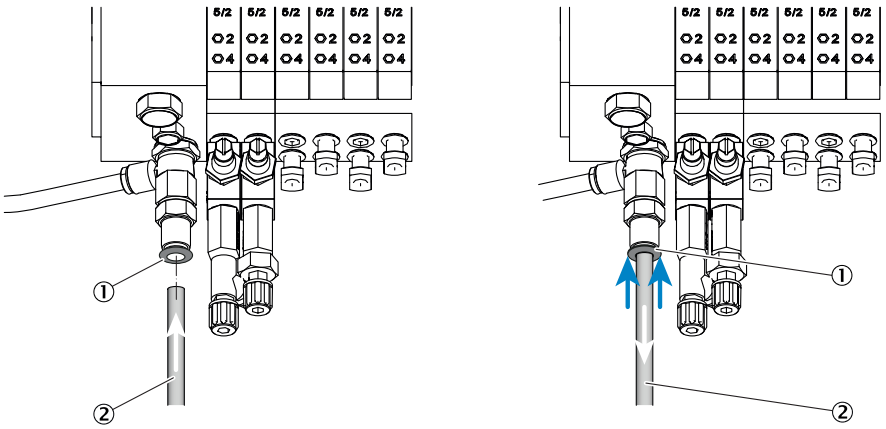


Figure 9: Push-in fitting with retaining ring

① Retaining ring
② Line

- ▶ Inserting the tube: Push tube in.
- ▶ Removing the tube: Press the retaining ring in and pull the tube out.

5.6.3 Connecting the signal lines to the analyzer

Connect the signal lines according to the wiring diagram.

5.6.4 Setting the pressure reducer module

The external air supply is fitted on the pressure reducer module.

- Set the controllers to the pressures shown in the Figure.

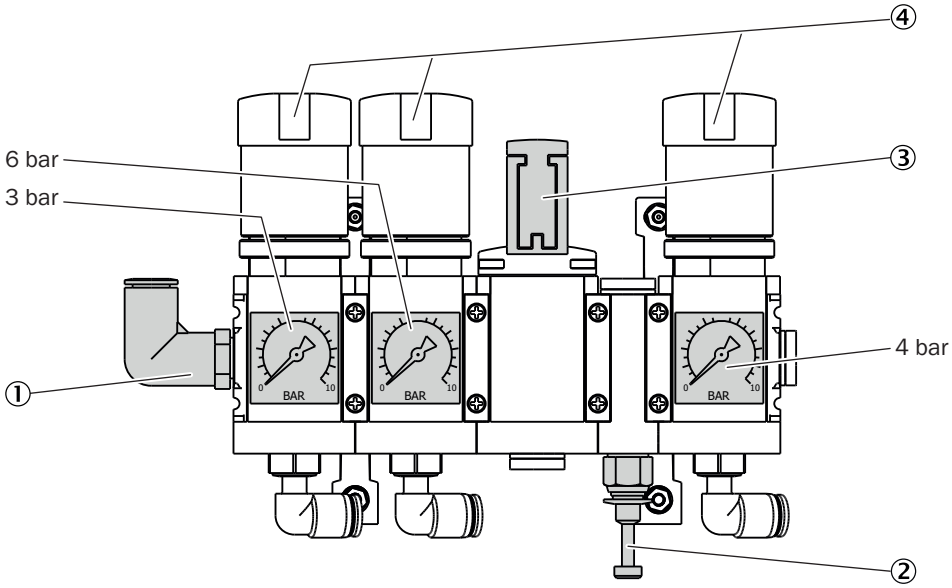


Figure 10: Pressure reducer module

① Inlet of instrument air with zero gas quality
② Inlet of instrument air solely as induction air for ejector
③ Manual valve for instrument air selection (closed position)
④ 3 pressure reducers (adjustable)

The instrument air is used as both induction air for the ejector (cell) and zero/control air.

There are two possibilities of connecting instrument air:

- One (1) common instrument air supply for ejector air and zero/control air (inlet 1)
- Separate instrument air supply for:
  - Ejector air (inlet 2)
  - and zero/control air (inlet 1)

  Instrument air quality
  The quality requirement for instrument air used exclusively as ejector air is lower than for usage as zero/control air (zero gas quality) (see "Supply gases", page 55).
- When connected just as instrument air supply with zero gas quality to be used as common air for both ejector air and zero/control air (on inlet 1):
  ▷ Set manual valve to position “open”.
- When connected as (1) instrument air supply for the ejector (on inlet 2) and as instrument air supply with zero gas quality (on inlet 1):
  ▷ Set manual valve to position “closed”.

5.6.5 Connecting the valve block

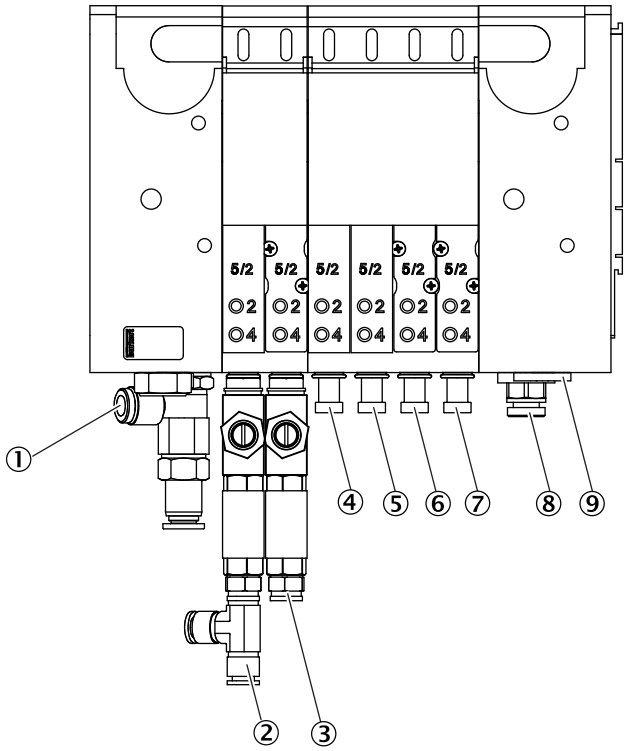
WARNING
Hazard when pressure is too high

Hoses can burst when the pressure is too high.

- Observe the maximum pressures of the gases provided by the operator: see "Supply gases", page 55.

The following are located on the valve block:

- Gas connections of the gas sampling unit hose bundle line



① Inlet: Zero gas
② Outlet: Zero gas measuring point 1
③ Outlet: Zero gas measuring point 2 (option)
④ Outlet: Control air measuring point 1
⑤ Outlet: Backflush air measuring point 1
⑥ Outlet: Control air measuring point 2 (option)
⑦ Outlet: Backflush air measuring point 2 (option)
⑧ Inlet: Control/backflush air
⑨ Inlet: Auxiliary control air

5.6.6 Connecting the span gases

The span gases are connected to the span gas unit.

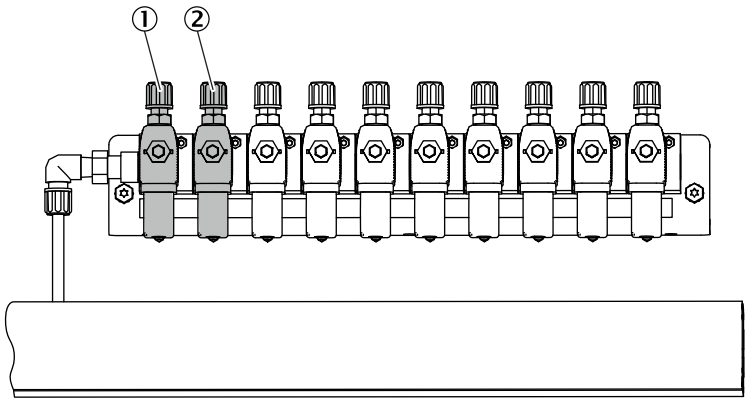


Figure 11: Span gas unit connections

① Span gas connection 1
② Span gas connection 2

The Figure serves as example. It is also possible to connect more than two span gas valves.

Steps

1. Lead the span gas lines through the roof into the enclosure and connect to the span gas unit.
2. Turn the span gas on and set the pressure to approx. 3.5 bar.
3. Check the lines for leak tightness.

5.6.7 Connect sample gas outlet

WARNING
Noxious and aggressive exhaust gases

Exhaust gases can contain components harmful to health or irritating.

- ▶ Lead the measuring system gas outlets outdoors or into a suitable flue.
- ▶ Do not connect the exhaust gas line with the exhaust gas line of sensitive sub-assemblies. Aggressive gases could damage these subassemblies as a result of diffusions.

NOTICE
Condensate could accrue in the exhaust gas line.

- ▶ Use a suitable hose line to run the condensate outlet into an open condensate container or a waste disposal line.
- ▶ Lay the line so that it always runs downwards.
- ▶ Keep the line opening free from any blockages or liquids.
- ▶ Protect the line from frost.

Connect the sample gas outlet at the intended place.

Lay the exhaust gas line in a suitable manner:

- The gas outlet must be open to the ambient pressure; in waste disposal lines it can be laid with a light partial vacuum.
- Do not bend or crimp exhaust gas lines.

6 Electrical installation

6.1 Safety

NOTICE
The device may only be installed by trained, skilled persons.

6.2 Equipment protection

The customer must ensure short-circuit protection according to the valid standards using fuses or automatic circuit breakers with short-circuit protection and overload protection.

6.3 Disconnecting device

Install a disconnector switch or circuit breaker according to the valid standard for disconnecting the voltage supply.

Install an additional disconnecting device if an UPS is used.

Make sure the disconnector switches are easily accessible.

6.4 Socket for Service work

It is recommended to install a socket according to the valid standards for Service work on the device near the analysis system.

6.5 Electrical connections

The lines are led through the roof using cable glands. Refer to the wiring diagram delivered for the line duct and the relevant installation.

Connect power supply

The power supply is located on the left on the analyzer.

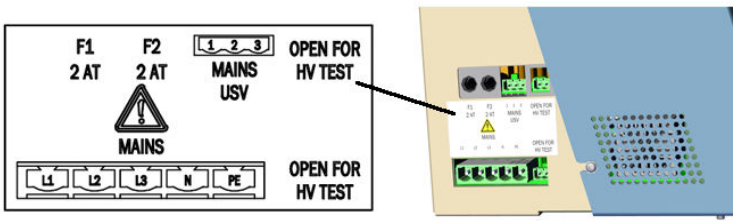


Figure 12: Power supply connections

NOTICE

- Install an external power disconnection unit which disconnects all connectors and fuses near the analyzer.
- The power disconnection unit must be marked clearly and be easily accessible.
- The onsite wiring system to the power source of the system must be installed and fused according to the relevant regulations.
- Always connect a protective ground to PE.

▶ Route the electric lines through the screw fittings of the enclosure.
▶ Connect the electric lines.

As an option, the system can be supplied with power by an UPS. Refer to the delivered wiring diagram for information on how to install it. Install an additional disconnecting device if an UPS is used.

High voltage test

Remove the bridges, see figure 12, page 26 to avoid incorrect measurements during a high-voltage test.

Insert the bridges again after the high-voltage test.

Connect signal line (optional)

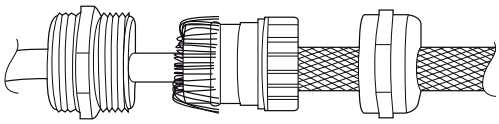


Figure 13: Signal lines connections (shielded)

- Lead cable through the enclosure duct.
- Attach shield as shown in the Figure above.

Connect Ethernet (optional)

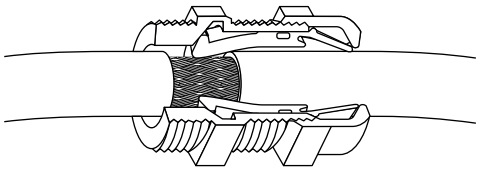


Figure 14: Ethernet connection

- Lead the Ethernet cable into the enclosure through the cable gland for Ethernet cables.
- Establish a safe contact between the shield of the signal cable and the cable gland.

7 Commissioning

7.1 Before switching on

- ▶ Check the measuring device: see "Checking the system", page 40
- ▶ Instrument air must be connected and open
  - If the instrument air supply has changed: Check the instrument air quality. Specified quality: see "Supply gases", page 55
- ▶ Check pressure settings on the pressure reducer unit: see "Setting the pressure reducer module", page 22

7.2 Switching on

1. Switch on the external power disconnection unit:
   - SOPASair loading screen is displayed.
   - A countdown is shown on the display, counting down from 80.
   - The start screen opens.
     Display: System initialization
   - The measuring device heats up:
     Display: System heats
     The status indicator is orange.
     Heating process can take up to 2 hours.
   - Display: Premeasure
     The status indicator is orange
   - The status indicator is green.
     Display: Measure
     The measuring device is ready for operation.
     When the yellow or red status indicator is on: Display logbook and clear error: Error list, see "Error messages and possible causes", page 45.
     The measuring device is in operation.

7.3 Recognizing the safe operating state

The system is in proper operation when:

- A system check (see "Checking the system", page 40) has been carried out according to the Maintenance plan before commissioning and in running operation.
- Only the green status indicator is on and **Measuring** is shown in the status bar. When the yellow or red status indicator is on: Display logbook and clear error: Error list, see "Error messages and possible causes", page 45

7.4 Adjusting

7.4.1 Performing zero point adjustment

Menu: Tasks →Zero point adjustment

As standard, the zero point adjustment is used to adjust the zero points of the measured values while instrument air is fed.

Zero point adjustment runs cyclically (preset) but can also be started manually.

If the deviation is higher than a specified limit value, the system switches to classification “Maintenance request” and the zero point is however corrected.

Steps

1. Click tile “Zero point adjustment”.
✓ The operating state switches to zero point adjustment.
✓ The respective active step is displayed.
✓ The time elapsed and the remaining time of the state and of the respective active step is displayed.
2. The system switches back to original state automatically when adjustment has been completed.

7.4.2 Performing reference point adjustment

Adjustment with internal adjustment filter

Menu: Tasks → Adjustment with internal adjustment filter

During adjustment, concentrations of measuring components are adjusted with an adjustment filter.

Steps

1. Click tile “Adjustment with internal adjustment filter”.
✓ The operating state switches to adjustment with internal adjustment filter.
✓ The respective active step is displayed.
✓ The time elapsed and the remaining time of the state and of the respective active step is displayed.
2. The system switches back to original state automatically when adjustment has been completed.

Adjustment with span gas

Menu: Tasks → Reference point adjustment

During adjustment, the concentrations of the respective measuring component are adjusted using span gas.

Span gas adjustment

1. Compare the span gas concentration set with the certificate of the span gas cylinder and, when necessary, change it in the device: Tasks→ Reference point adjustment - Concentrations.
2. Perform manual update.
3. Use the arrow button to go to the next Figure.
4. Start adjustment with “Reference point adjustment”.
✓ The operating state switches to reference point adjustment.
✓ The time elapsed and the remaining time of the state and of the respective active step is displayed.
5. The system switches back to original state automatically when adjustment has been completed.

O_2 adjustment

Menu: 2 adjustment→ 1 adjustment → O2 adjustment

During adjustment, the concentrations of the respective measuring component are adjusted using instrument air as standard.

O_2 adjustment

1. Start adjustment with “O2 adjustment”.
✓ The operating state switches to O2 adjustment.
✓ The time elapsed and the remaining time of the state and of the respective active

step is displayed.

2. The system switches back to original state automatically when adjustment has been completed.

8 Operation

8.1 Operating concept

The analysis system is equipped with a display with touchscreen.

- All menus and functions are shown on the display.
- The menus and functions are called up using the tiles.
- The current operating state is displayed by the status indicator (Namur).

8.2 User groups

Depending on the user group, different menus are visible on the device.

User group	Task
Operator	System monitoring regarding measured values and status
Authorized client	Configuration, simple error clearance and maintenance

8.3 Display

① Quick access
② Search box
③ Editing and updating tools
④ Display and selection screen
⑤ Display of time and date
⑥ Status indicator (Namur)
⑦ Display of operating state
⑧ Display of user
⑨ Display of menu path

Significance of status indicator (Namur)

Color	Status signal	Significance
	Normal	Valid output signal
	Maintenance request	Maintenance necessary, valid output signal

Color	Status signal	Significance
	Outside specification	Signal outside specified range
	Function check	Sporadically no valid output signal
	Failure	No valid output signal

8.4 Tiles

Symbol	Name	Function
	Login symbol	Calls up the Login menu.
	Menu symbol	Calls up the menu.
	Home symbol	Goes back to start screen (measured value overview).
	Quick access to tasks	Calls up the task menu where the most important functions for the operator are contained.
	Quick access to logbook	Calls up the device logbook.
	Quick access to Measuring Screen	Selection of saved Measuring Screens using a drop-down menu.
	Search box	Enter a search term to call up the relevant display.
	History	Selection of the last six displayed pages using a drop-down menu.
	Refresh	Reloads the called up page.
	“Edit”	Activates editing on the input pages.

8.5 Measuring Screen

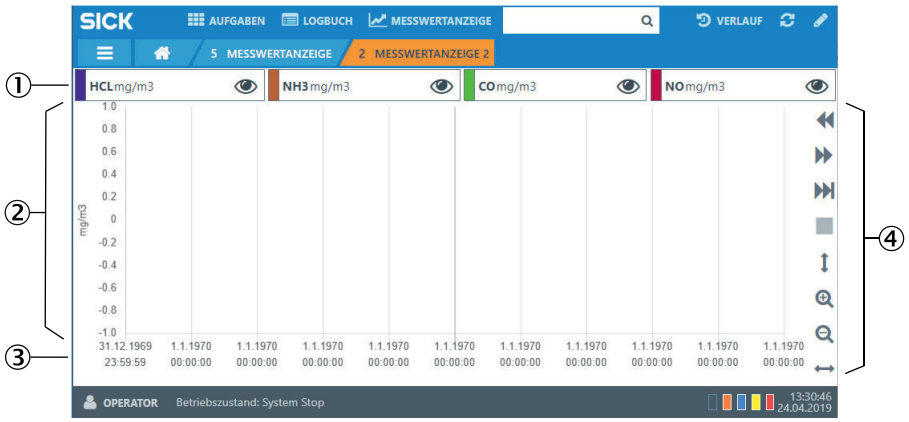


Figure 15: Measuring Screen

① Legend of displayed measured values
② Measured value concentration
③ Measuring time and date
④ Tiles

Measuring Screen tiles

Symbol	Name	Function
	Visibility	Switches the visibility of the measured value curve on and off.
	Move left	Shifts the time axis of the measured value curve.
	Move right	Shifts the time axis of the measured value curve.
	Current value	Jumps to the current measured value of the measured value curve on the time axis.
	Stop	Stops update of measured values.
	Adjust y-axis	Displays the largest preset range of component concentrations of visible components.
	Adjust x-axis	Displays preset range of time.
	Increase	Increases display of time axis.
	Reduce	Reduces display of time axis.

9 Menus

9.1 Password

Configuration is only possible on level “Authorized Client”. Login is performed using tile “Login” and a password prompt.

Password for “Authorized Client”: HIDE (preset)

9.2 Menu tree

	Menu level	Explanation
1	**Tasks**	Quick access to the most important functions for the operator
2	**Adjustment**	
2.1	Adjustment	
2.1.1	Zero point adjustment	The measured value zero points are adjusted while instrument air is fed.
2.1.2	Adjustment with internal adjustment filter	The concentrations of measuring components are adjusted with an adjustment filter.
2.1.3	Reference point adjustment	The concentrations of measuring components are adjusted while span gas is fed.
2.1.4	O2 adjustment	The zero and reference point is adjusted while instrument air is fed.
2.1.5	Pressure adjustment	Adjustment of pressure sensors.
2.2	Validation	
2.2.1	Zero point validation	The measured value zero points are checked while instrument air is fed, but not adjusted.
2.2.2	Validation with internal adjustment filter	The concentrations of measuring components are adjusted with an adjustment filter, but not adjusted.
2.2.3	Reference point validation	The concentrations of measuring components are checked while span gas is fed, but not adjusted.
2.3	Span gas feed	Different reference materials can be controlled. No adjustment or validation is performed.
2.4	Results	
2.4.1	Adjustment factors	Displays the adjustment factors for span gas and adjustment with internal adjustment filter.
2.4.2	Zero point drift	Displays the determined percentage deviation after zero point validation.
2.4.3	Reference point drift (internal adjustment filter)	Displays the determined percentage deviation of measuring component concentration after validation with an adjustment filter.

2.4.4	Reference point drift (span gas)	Displays the determined percentage deviation of measuring component concentration after validation with span gas.
2.5	Settings	
2.5.1	Span gas concentrations	Entry fields for updating the span gas concentrations.
2.5.2	Component-specific parameters	Displays the parameters of the individual measuring components.
2.5.3	Parameters	Displays general parameters and parameters relevant for adjustment.
2.5.4	Cyclic triggers	Displays configured start times of sequences.
3	**Diagnosis**	
3.1	Status	Displays device information and the current status.
3.2	Logbooks	
3.2.1	Device logbook	Logbook of pending messages and status with start and end date.
3.2.2	Customer protocol	Tile “Edit” allows entries by operator and maintenance personnel.
3.3	Device state data	
3.3.1	Operating hours counter	Displays operating hours.
3.3.2	Temperatures	Displays temperatures and their status.
3.3.3	IR source	Displays IR source status.
3.3.4	Motors	Displays motor values.
3.3.5	Pressure	Displays current pressures.
3.3.6	Flow rate	Displays flow rates and their status.
3.3.7	Hardware monitoring	Displays values and hardware status.
3.3.8	O2 sensor	Displays values and O2 sensor status.
3.3.9	Reference energy	Displays reference energy of the individual measuring components.
3.3.10	Intensity	Displays intensities of measuring filters and reference filters.
3.4	Interfaces	
3.4.1	Analog outputs	Displays current mA of the individual analog outputs.
3.4.2	Analog inputs	Displays current mA of the individual analog inputs.
3.4.3	Digital outputs	Displays digital output status. Digital outputs switched off are marked with “.” , those switched on with “I”.

3.4.4	Digital inputs	Displays digital input status. Digital inputs switched off are marked with “.” , those switched on with “I”.
3.4.5	Modbus outputs	Displays values of the individual Modbus outputs.
3.4.6	Modbus inputs	Displays values of the individual Modbus inputs.
3.5	Signals	
3.5.1	Measuring signals	Displays measuring signals of the measuring components.
3.5.2	Boolean values	
3.5.3	Real values	
3.5.4	Filtered values	
3.5.5	Integer values	
3.5.6	Real constants	
3.6	Diagnosis files	
3.6.1	Export of measured value history	Option for exporting the Measuring Screen history.
4	**Parameters**	
4.1	Display settings	Tile “Edit” serves to adjust the Measuring Screen layout.
4.1.1	Measuring Screen 1	
4.1.2	Measuring Screen 2	
4.1.3	Measuring Screen 3	
4.1.4	Measuring Screen 4	
4.1.5	Measuring Screen 5	
4.1.6	Measuring Screen 6	
4.1.7	Measuring Screen 7	
4.1.8	Measuring Screen 8	
4.2	Measuring components	Displays definitions of measuring components and monitoring limits.
4.3	Interfaces	Displays information on the different interfaces.
4.3.1	Analog outputs	
4.3.2	Analog inputs	
4.3.3	Digital outputs	
4.3.4	Digital inputs	
4.3.5	Modbus outputs	
4.3.6	Modbus inputs	

4.3.7	Modbus	
4.3.8	OPC outputs	
4.3.9	LAN	
4.3.10	Hardware plan (CAN)	
4.4	Date and time	Set date and time.
4.5	Device information	Displays device information.
5	**Measuring Screen**	Displays individual preset Measuring Screens.
5.1	Measuring Screen 1	
5.2	Measuring Screen 2	
5.3	Measuring Screen 3	
5.4	Measuring Screen 4	
5.5	Measuring Screen 5	
5.6	Measuring Screen 6	
5.7	Measuring Screen 7	
5.8	Measuring Screen 8	
6	**Maintenance**	
6.1	Maintenance signal	Switch Maintenance signal on and off.
6.2	Restart	Restart the device.
6.3	Data backup	
6.3.1	Backup	
6.3.2	Restore	
6.4	Protocol	Tile “Edit” allows entries by operator and maintenance personnel.
6.5	Functions	Trigger sequences and states. • A sequence can be started from any state except standby. • States must be terminated or changed actively.
6.6	Reset	
6.6.1	Confirm active messages	
7	**Settings**	Tile “Edit” serves to make settings.

10 Maintenance

10.1 Important information

Requirements for the maintenance personnel

- Only allow an authorized electrician to work on the electrical system or electrical subassemblies.
- The technician must be familiar with the exhaust gas technology of the operator's plant (hazard by overpressure and toxic and hot flue gases) and be able to avoid hazards when working on gas ducts.
- The technician must be familiar with handling compressed gas cylinders (span gases).
- The technician must be able to avoid hazards caused by noxious span gases.
- The technician must be familiar with gas lines and their screw fittings (be able to ensure gas-tight connections).

NOTICE
Observe voltage variants

Some spare parts are available in different voltage variants, 115 V or 230 V.

▶ Check spare parts for voltage dependency before fitting: see "Voltage supply", page 54

The power voltage of your system is shown on the type plates.

DANGER
Danger to life through electric shock

There is a risk of electric shock when working on the device with the voltage supply switched on.

▶ Before starting work on the device, ensure the voltage supply can be switched off in accordance with the valid standard using a power isolating switch/circuit breaker.
▶ Switch off the voltage supply before starting any work on the device.
▶ After completion of the work or for test purposes or calibration, the power supply may only be activated again by authorized personnel complying with the safety regulations.

NOTICE
Hazard of severe damage to electronic subassemblies through electrostatic discharge (ESD)

When touching electronic subassemblies, there is a hazard of severe damage to the subassembly by electric potential equalization.

▶ Make sure you have the same electric potential as the subassembly (e.g. by grounding) before touching the subassembly.

CAUTION
Risk of chemical burns by acid gas

Acid condensate could escape when working on the sample gas lines and the associated subassemblies.

- ▶ Take appropriate protective measures for work (e.g., by wearing a safety mask, protective gloves and acid resistant clothes)
- ▶ In case of contact with the eyes, rinse immediately with clear water and consult a doctor.

NOTICE
Risk of contamination of analyzer

The gas sampling unit and analyzer are flushed with instrument air when the system is not in measuring operation.

When the instrument air is switched off, there is the risk of contamination of the analyzer.

- ▶ Pull the gas sampling unit out of the exhaust duct when instrument air is not available for a longer period of time.

WARNING
Risk of burns on hot surfaces

Surface can become hot through operation of the device.

- ▶ Switch analyzer off and allow to cool down

or

- ▶ wear suitable protective clothes, for example, heat-resistant gloves.

Observe the following:

- ▶ After working on the gas path: Perform a leak tightness check.
- ▶ After exchanging a span gas cylinder: Check the compliance with the span gas concentration set in the menu: 2 Adjustment → 5 Settings → 1 Concentrations

10.1.1 Information on span gases

CAUTION
Before working on span gas cylinders or span gas lines: Relieve the span gas pressure.

- ▶ Shut off the span gas cylinder.
- ▶ Open the span gas valve: Menu: 2 Adjustment → 3 Span gas feed.
- ▶ Wait for about 1 minute until the pressure in the lines has been relieved.
- ▶ Close the span gas valve: Menu: 2 Adjustment → 3 Span gas feed.

10.2 Cleaning

NOTICE
Device damage through incorrect cleaning.

Incorrect cleaning can lead to device damage.

- Only use recommended cleaning agents.
- Do not use sharp objects for cleaning.

Clean surfaces and parts with media contact:

- Remove loose contamination with compressed air.
- Remove adhering contamination with a mild soap solution and a soft cloth. Ensure the electric parts do not come into contact with liquids.

Cleaning the display

- Regularly clean the display from outside to ensure heat dissipation and thus operation.
- It is recommended to clean the surfaces with a damp, soft cloth and wipe them with a dry, soft cloth.
- In case of heavier contamination, do not use acidic or abrasive cleaning agents as these corrode the surface structure. Use neutral soap sud or limescale remover specially suitable for the surface.
- Use 2-propanol/isopropanol (isomeric alcohol) for disinfection.

10.3 Maintenance plan

NOTICE

This Maintenance plan describes the maintenance work specified by the manufacturer.

Perform checks in accordance with the guidelines to be applied by the operator in accordance with the intervals described therein.

Table 6: Maintenance intervals

Interval	Maintenance work	Remark
Quarterly	Gas sampling unit: • Check fine filter and seals. • Clean or renew if necessary.	See SFU Operating Instructions
	Instrument air (option): • Replace filter elements if required.	See Instrument Air Conditioning Operating Instructions
	Note Depending on the system, it may be necessary to perform the following maintenance tasks more frequently:	
	Check the analysis system.	see "Checking the system", page 40
	Instrument air (option): ▶ Check oil and water. ▶ Clean drains if required. ▶ Clean filter housing if required. ▶ Check pressure.	See Instrument Air Conditioning Operating Instructions
	One filter pad each in the fan and air outlet ▶ Check fine filter and seals. ▶ Clean or renew if necessary.	see "Replacing the filter pads", page 42
Every 6 months	Gas sampling unit: • Replace the filter element and seals.	See SFU Operating Instructions

10.4 Checking the system

Check subassemblies

- Check complete measuring system (from sample gas sampling to exhaust gas) for outer damage.
- Check sample gas outlet for continuity.
- Check system cabinet for cleanness, dryness and freedom from corrosion.
- Check grounding conductors are free from corrosion.

- Check valve block and pressure reducer unit for leak tightness:
  - No permanent hissing noise should be noticeable.
  - Check no air is escaping from the connections, e.g., with leakage spray

Check external instrument air supply

- Check pressure, oil, particle and water content according to the specification (see "Supply gases", page 55).
- If an external instrument air conditioning is provided:
  Check condition of filters: Refer to the Instrument Air Conditioning Operating Instructions delivered

Check span gases

- Check span gases (when used)
  - Use-by date
  - Cylinder pressure fill level
  - Condition of cylinders

Check environment

- Check room ventilation.
- Check ambient conditions of analyzer and gas sampling unit: Temperature, humidity, vibrations

Check gas sampling unit

- Visually check state from the outside and clean as necessary.
- Check sample gas line for outside damage.

Check measured values (when system in operation)

- Check display for pending error messages.
- Check measured values for plausibility.
- Check external instrument air conditioning (optional).

10.5 Maintaining the instrument air conditioning

Maintaining the instrument air conditioning (optional).

1. Switch on the analyzer maintenance signal: Tasks → Maintenance signal on/off
2. Flush system for 10 minutes in this state.
3. Close off operator's instrument air supply.

NOTICE
The probe tube is not purged when no instrument air is available.

▶ Only close off the instrument air supply for a short time (several minutes).

4. Perform maintenance on the instrument air conditioning according to the provided manufacturer's instructions.
5. Open instrument air supply again.
6. Switch the maintenance signal off again.

External instrument air conditioning (optional)

1. Check the external instrument air conditioning for correct function.

NOTICE

▶ Observe quality requirements for instrument air.

10.6 Replacing the filter pads

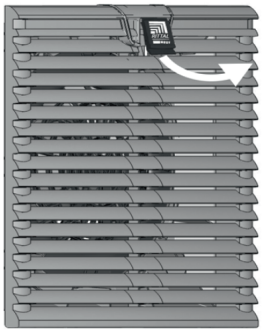


Figure 17: Lower fan grill

Figure 16: Fan grill position

① Upper fan grill
② Lower fan grill

The device is equipped with two different fans with different filter pads.

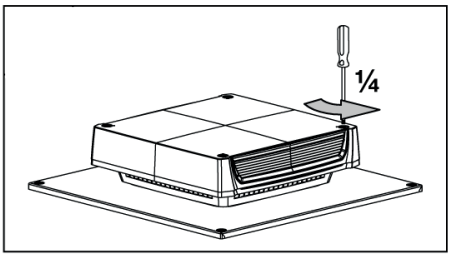
Tools required

- Torx screwdriver set

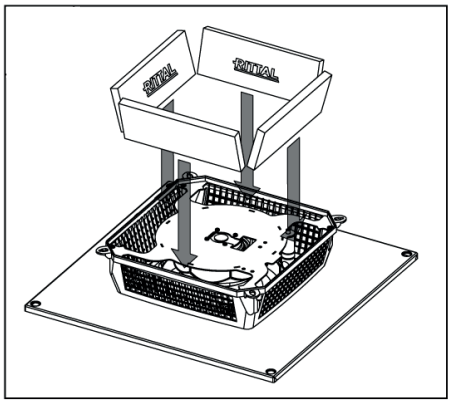
NOTICE
Only replace the filter pads when the device is switched off.

Replacing the upper filter pads:

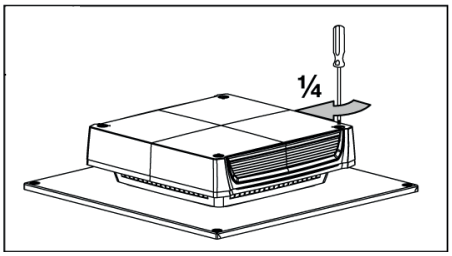
1. Loosen 4 screws on the fan grill (1/4 turn).



2. Take fan grill off.
3. Replace the filter pads (face in) on all four sides.



4. Fit the fan grill again and screw tight.



Replacing the lower filter pad:

1. Take fan grill off.
2. Take filter pad out.
3. Immediately fit new filter pad (face in).
4. Press fan grill back on.

11 Troubleshooting

11.1 Important information

Requirements for the maintenance personnel

- Only allow an authorized electrician to work on the electrical system or electrical subassemblies.
- The technician must be familiar with the exhaust gas technology of the operator's plant (hazard by overpressure and toxic and hot flue gases) and be able to avoid hazards when working on gas ducts.
- The technician must be familiar with handling compressed gas cylinders (span gases).
- The technician must be able to avoid hazards caused by noxious span gases.
- The technician must be familiar with gas lines and their screw fittings (be able to ensure gas-tight connections).

NOTICE
Observe voltage variants

Some spare parts are available in different voltage variants, 115 V or 230 V.

▶ Check spare parts for voltage dependency before fitting: see "Voltage supply", page 54

The power voltage of your system is shown on the type plates.

NOTICE
Hazard of severe damage to electronic subassemblies through electrostatic discharge (ESD)

When touching electronic subassemblies, there is a hazard of severe damage to the subassembly by electric potential equalization.

▶ Make sure you have the same electric potential as the subassembly (e.g. by grounding) before touching the subassembly.

CAUTION
Risk of chemical burns by acid gas

Acid condensate could escape when working on the sample gas lines and the associated subassemblies.

▶ Take appropriate protective measures for work (e.g., by wearing a safety mask, protective gloves and acid resistant clothes)
▶ In case of contact with the eyes, rinse immediately with clear water and consult a doctor.

NOTICE
Risk of contamination of analyzer

The gas sampling unit and analyzer are flushed with instrument air when the system is not in measuring operation.

When the instrument air is switched off, there is the risk of contamination of the analyzer.

▶ Pull the gas sampling unit out of the exhaust duct when instrument air is not available for a longer period of time.

Observe the following:

- After exchanging subassemblies: Switch the system on according to the switch-on procedure: see "Switching on", page 28
- After exchanging a span gas cylinder: Check the compliance with the span gas concentration set in the menu: 2 Adjustment → 5 Settings → 1 Concentrations

11.2 Error messages and possible causes

Current pending messages are shown on the device display.

NOTE

The following Table only includes those messages with classification "X" that are important for information.

Messages not included in the following Table have no further significance for operation.

NOTE

Display of current device state data: Logbook

Procedure

1. Clear messages with status “F” first.
2. Close the logbook and open it again to check whether the error is cleared.

Trigger: System

C = Classification

F = Failure

M = Maintenance request

Table 7: Error codes - System

Code	Error text	K	Description	Possible clearance
S001	Temperature too high	F	Measuring cell temperature too high	When T ≥ 360.7 °C: Check plug-in connectors. When ok: Call SICK Service.
				When T < 360.7 °C: Call SICK Service.
			Optic head temperature too high	When T ≥ 151.2 °C: Check plug-in connectors. When ok: Call SICK Service.
				When T < 151.2 °C: When cabinet temperature ≥ 55 °C: Check cabinet fan / replace filter pad. Otherwise, call SICK Service.
			Temperature of heating for a subassembly too high	Check device documentation to clarify which subassembly is affected.
				When T ≥ 360.7 °C: Check plug-in connectors. When ok: Call SICK Service.
				When T < 360.7 °C: Call SICK Service.
			LPMS01 (1/2 control) temperature too high	When enclosure temperature ≥ 55 °C: Check cabinet fan / replace filter pad.
				When enclosure temperature < 55 °C: Check fan of electronics unit / clean or replace filter pad. Otherwise, call SICK Service.
			LPMS02 (power electronics) temperature too high	When enclosure temperature ≥ 55 °C: Check cabinet fan / replace filter pad.
				When enclosure temperature < 55 °C: Call SICK Service.
			LPMS03 temperature too high	When no error message for optic head temperature: Call SICK Service. Otherwise, see optic head error clearance

Code	Error text	K	Description	Possible clearance
S002	Temperature too low	F		Check system documentation to clarify which subassembly is affected (heating circuit 1 ..7). Check circuit breaker • Circuit breaker has triggered: Check all affected lines for damage. Check the plugs. When ok: Perform reset of circuit breaker. Check all plugs are plugged correctly. • Circuit breaker has not triggered: When heating hose affected: Connect new PT100. Otherwise, call SICK Service.
S004	Flow too low	F		When pressure error, clear it first. Sample gas flow too low and purge/zero gas flow ok: Check/replace sampling filter
				Sample gas flow and purge/zero gas flow too low: Call SICK Service.
				Purge/zero gas flow too low and sample gas flow ok: Check all hose connections. When ok: To be checked by SICK Service.
S005	Cell pressure too high	F		Only sample gas pressure too high: • Ensure sample gas pressure within device specification. • When not possible: Call SICK Service.
				Purge/zero gas and sample gas pressure too high: • Exhaust gas hose crimped/blocked? • Counter-pressure in exhaust duct too high? • Check all hose connections. When ok: Call SICK Service.
				Only purge/zero gas pressure too high: • Set correct pressure on pressure reducer unit. When ok: Call SICK Service.
S006	Cell pressure too low	F		Call SICK Service.
S008	Chopper	F	Chopper frequency not regulated.	Call SICK Service.
S009	Motor filterwheel 1	F	Filterwheel motor does not detect reference position.	Call SICK Service.
S010	Motor filterwheel 2			
S011	Motor filterwheel 3			
S012	IR source	F	Voltage or current outside tolerance	Call SICK Service.
S013	5 Volt power	F	Outside tolerance	Call SICK Service.
S014	24 Volt power	F	Outside tolerance	Call SICK Service.
S015	Detectorsignal	F		Call SICK Service.
S016	Ref.energy too low	F		Call SICK Service.
S018	O_2 sensor failure	F		Check plug connection. When ok: Call SICK Service.
S019	O_2 adj. factor too high	F		Perform O_2 adjustment again. When message is still pending: Call SICK Service.
S024	No active component	F	When “active” checkmarks of all components are inactive	When current backup available: Load backup. Otherwise: Call SICK Service.
S025	Evaluation module failure	F	Evaluation module can not be started.	When current backup available: Load backup. Otherwise: Call SICK Service.
S026	Evaluation mod. file error	F	Files for evaluation module not created	When current backup available: Load backup. Otherwise: Call SICK Service.

Code	Error text	K	Description	Possible clearance
S027	No result	F		When current backup available: Load backup. Otherwise: Call SICK Service.
Maintenance				
S033	Dev. zero point too high	M	Parameters set for measured component	Check zero gas for pressure and cleanness. Perform maintenance on compressed air conditioning unit. Perform manual zero point adjustment twice (menu: 2 Adjustment → 1 Adjustment → 1 Zero point adjustment). When message occurs again during next automatic zero point adjustment: Call SICK Service.
S034	Config. I/O mod.	M	Configuration error, found module does not correspond to that of the nominal configuration	Check IO modules, check plug connectors and voltage supply, load backup if necessary. Otherwise: Call SICK Service.
S035	Ref.energy too low	M		Call SICK Service.
S036	O_2 sensor failure	M		Call SICK Service.
S038	Current invalid	M	Analog output: Desired current not reached. Analog input: Current outside valid range.	Check connections on the Analog module.
S039	Current invalid	M		
S040	Flow too high	M		Call SICK Service.
S041	Flow too low	M		When pressure error, clear it first. Sample gas flow too low and purge/zero gas flow ok: Check/replace sampling filter
				Sample gas flow and purge/zero gas flow too low: Call SICK Service.
				Purge/zero gas flow too low and sample gas flow ok: Check all hose connections. Check zero gas needle valve setting. When ok: To be checked by SICK Service.
S043	IR source weak	M	Voltage or current outside tolerance	Call SICK Service.
S045	Dev. span adjust too high	M	Gas adjustment not performed because it is outside the tolerable range; parameters set for measured component	Check that correct span gas is connected, span gas concentration is entered correctly and the certificate is still valid. Perform new span gas adjustment, when message is still pending: Call SICK Service.
S046	Dev. int. adjust too high	M	Adjustment with internal adjustment filters not performed because it is outside the tolerable range; parameters set for measured component	Check instrument air and zero gas quality. Perform adjustment again with internal adjustment filters. When message is still pending: Call SICK Service.
S047	Dev. O_2 adjust too high	M	O_2 adjustment not performed because it is outside the tolerable range; parameters set for measured component	Perform O_2 adjustment again, when message is still pending: Call SICK Service.
S048	Alarm O_2 measured value	M	The current O_2 measured value is outside the alarm limits.	
S049	SD card not detected	M		Check the SD-card seat. When ok: Call SICK Service.
S050	Adjust factor is zero	M		Check entry of span gas concentration.
S055	O_2 adjust factor too high	M	O_2 adjustment factor is above warning limit.	Call SICK Service.
Error				
S113	Check sum error	F	Error in communication between CAN node and I/O module	Check I/O modules, cable damage.
S114	Communication error	F	Interruption in communication between CAN node and I/O module	
S116	Connection was interr.	F	Signals that the output was switched free from current because of the time-out.	Check I/O modules, cable damage.

This Table contains solution proposals that can only be processed by specially trained personnel.

11.3 Measured values erroneous

Possible cause	Notes
Device does not measure the sample gas	Check sample gas path and all valves (e.g. switch from test to sample gas).
Sample gas path leaky/clogged	Check installations: Leak tightness, corrosion, blockages
Device not adjusted correctly	Perform adjustment (see "Adjusting", page 28). Check span gases first (nominal value, service life, flow rate, configuration in menu (2 Adjustment → 5 Settings → 1 Concentrations))
Check ambient conditions	• Check temperature, humidity, vibrations • Check instrument air quality

11.4 Replacing the electronics filter pad

NOTICE
Only replace the filter pad when the device is switched off.

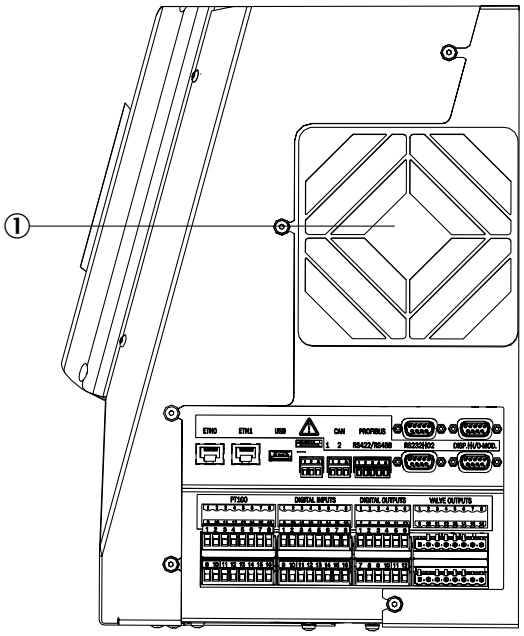


Figure 18: Electronic housing (right side)

1. Pull cover ① off.
2. Replace the filter pad inside.

12 Decommissioning

12.1 Switch-off states

Switch-off

Switch off the system, e.g. to perform maintenance work.

- ▶ Switch system off at the external power disconnection unit.

NOTICE
Do not switch off the instrument air supply. If this is not possible:

- ▶ Purge system for a minimum of 10 minutes
- ▶ Pull the SFU out of the measuring point.
- ▶ Ensure no sample gas reaches the analyzer.

The gas sampling unit is still purged with instrument air.

The thermostatic control of the gas sampling unit is switched off.

Shutdown

- ▶ Switch system off: See above
- ▶ Ensure the gas sampling unit can not be contaminated (e.g. by pulling the probe tube)
- ▶ Switch external instrument air off
- ▶ Close off gas inlets and outlets gas-tight

12.2 Shipping for repair

Before shipping:

- ▶ Contact your local SICK representative. The addresses are on the back cover of the Operating Instructions.
- ▶ Your SICK representative can advise you whether the defective device can be repaired locally or whether it would more advantageous for you to return the device for repair.
- ▶ Observe the following when returning the device to SICK:
  - Flat rates for repairs (concerning duration and costs)
  - Safety protection for the transport
  - Replacement devices or putting the device back into operation by SICK Service

NOTICE
Correct device preparation for return delivery

- ▶ Clean all device components.
- ▶ Use the original packaging for the transport.
- ▶ Complete the Non-Risk Declaration (NRD) and lay these clearly visible in the packaging.

Without the Non-Risk Declaration, the device will either be cleaned by a third-party company at the customer's expense or the package will not be accepted.

Clean the device before returning

Prerequisite: Switch device free from voltage

Clean surfaces and parts with media contact:

- ▶ Remove loose contamination with compressed air
- ▶ Remove adhering contamination with a mild soap solution and a soft cloth

NOTICE
Close the enclosure before cleaning so that no fluid can penetrate.

12.3 Transport

- Protect the enclosure before transport.
- Use the original packaging for transport or alternatively a suitable padded stable packaging.
- A transport container with adequate stability can also be used.
  Use padding to protect the device against jolts and vibration and to fix the device securely in the transport container.
  Make sure there is adequate clearance from the sides of the transport container.

NOTE
Accompanying documents when shipping for repairs: see "Shipping for repair", page 49.

12.4 Disposal

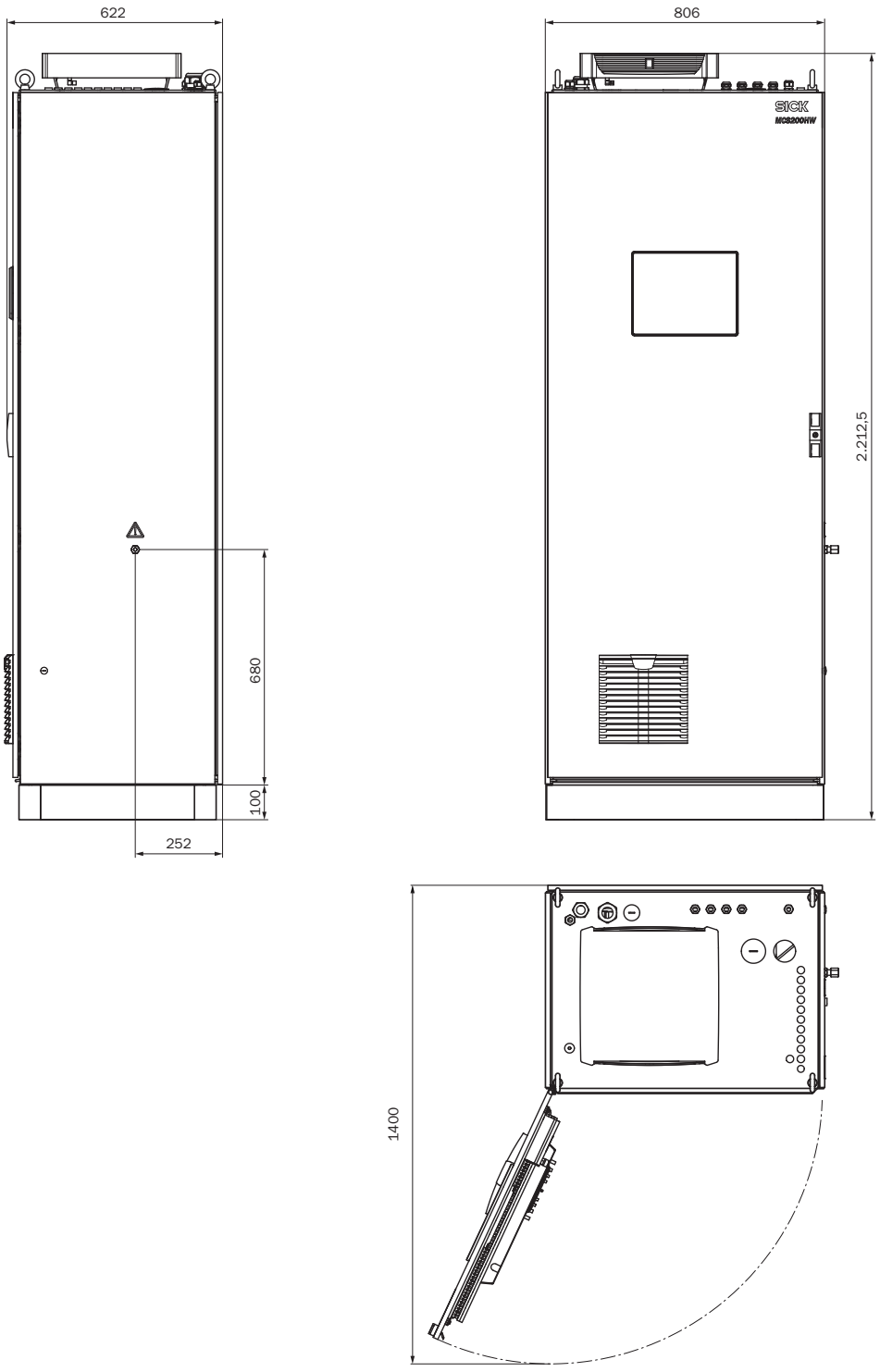
The device can easily be disassembled into its components which can then be sent to the respective raw material recycling facilities.

NOTE
The following subassemblies contain substances that may have to be disposed of separately:

- Electronics: Capacitors, rechargeable batteries, batteries.
- Display: Liquid of LC display.
- Sample gas filter: Sample gas filters could be contaminated by pollutants.
- All lines with sample gas contact could be contaminated with pollutants.

13 Technical data

13.1 Dimension drawings



All dimensions in the dimension drawing are in mm.

NOTICE
Observe clearances:

- Top: 30 cm
- Page:20 cm

13.2 Technical data

NOTE
The Technical data depend to some extent on the individual equipment of your analyzer.

▶ See the system documentation provided for the configuration of your analyzer.

13.2.1 Measuring parameters

Table 8: Measured variables

Number of measured variables	
Number of measured variables	10 IR components + O_2 + TOC (optional)

Table 9: Measuring method

Measuring method	
Measuring method	Hot extractive

Table 10: Sample volume

Sample volume	
Sample volume	200 ... 400 l/h

Table 11: Measuring ranges

Component	Measuring range
HCl	0 ... 9 ppm; 0 ... 1840 ppm
NH_3	0 ... 15 ppm; 0 ... 650 ppm
CO	0 ... 60 ppm; 0 ... 8.000 ppm
NO	0 ... 110 ppm; 0 ... 1.865 ppm
CH_4	0 ... 70 ppm; 0 ... 700 ppm
NO_2	0 ... 25 ppm; 0 ... 240 ppm
CO_2	0 ... 25% by volume; 0 ... 50% by volume
SO_2	0 ... 26 ppm; 0 ... 875 ppm
H_2O	0 ... 40% by volume
O_2	0 ... 25% by volume
N_2O	0 ... 50 ppm; 0 ... 1.015 ppm
TOC	0 ... 15 mg/m³; 0 ... 10,000 mg/m³

Table 12: Certified measuring ranges in accordance with EN15267-3

Component	Certified measuring ranges	Additional measuring ranges
HCl	0 ... 15 mg/m³	0 ... 3,000 mg/m³
NH_3	0 ... 10 mg/m³	0 ... 500 mg/m³
CO	0 ... 75 mg/m³	0 ... 10,000 mg/m³
NO	0 ... 150 mg/m³	0 ... 2,500 mg/m³
CH_4	0 ... 50 mg/m³	0 ... 500 mg/m³

Component	Certified measuring ranges	Additional measuring ranges
NO_2	0 ... 50 mg/m³	0 ... 500 mg/m³
SO_2	0 ... 75 mg/m³	0 ... 2,000 mg/m³
N_2O	0 ... 100 mg/m³	0 ... 2,000 mg/m³
CO_2	0 ... 25% by volume	–
H_2O	0 ... 40% by volume	–
O_2	0 ... 25% by volume	–
TOC	0 ... 15 mg/m³	0 ... 50/150/500 mg/m³

Table 13: Measured value characteristics

Measured value characteristics	
Measuring principle	Photometric
Measuring precision	< 2% of the respective full scale value
Detection limit	< 2% of the respective full scale value
Sensitivity drift	< 2% of the respective full scale value per week
Zero point drift	< 2% of the respective full scale value per week
Span drift	< 2% of the respective full scale value per week
Setting time t_{90}	< 200 s, total measuring path as from probe extraction

13.2.2 Ambient conditions

Table 14: Ambient conditions - in operation

Ambient conditions in operation	
Installation location	Indoor installation
Ambient temperature	+5 ... +40 °C
Relative humidity	< 90% (without condensate)
Air pressure	850 ... 1100 hPa
Degree of protection	IP 54

Table 15: Ambient conditions - in storage

Ambient conditions in storage	
Ambient temperature	-20 ... +70 °C
Relative humidity	< 90% (without condensate)

13.2.3 Design

Table 16: Design

Design	
Design	1 x stand-alone enclosure
Material, general	Steel plate, aluminium cast
Dimensions	see "Dimension drawings", page 51
Installation	Upright
Weight	Approx. 200 kg
Materials with media contact	• Stainless steel 1.4571 • PTFE • Aluminium (coated)
Degree of protection	IP 54
Impact resistance	IK08

13.2.4 Interfaces and protocols

Table 17: Interfaces and protocols

Operation and interfaces	
Operation	Via display or Google Chrome browser with SOPASair software, several operating levels, password-protected
Display and input	Foiled color display with touchscreen
Analog inputs/outputs	Optional
Digital inputs/outputs	Optional
Data interface	1 x Modbus TCP/IP
Profibus	Configurable
Profinet	Configurable
Remote support	SICK MPR (optional)
PC operation	Browser Google Chrome with SOPASair via Ethernet

13.2.5 Voltage supply

Table 18: Voltage supply

Voltage supply	
Power input • Analyzer • Heated sample gas line • Gas sampling unit • Heated probe tube	Power input • Approx. 1000 VA • Approx. 95 VA/m • Approx. 450 VA • Approx. 450 VA

Table 19: Line cross-sections

Line cross-sections (relative to leads with ferrules)	
• CAN • RS485	Line cross-section: 0.14 ... 1.5 mm² AWG28 ... AWG16
• Pt100 inputs • 24 V DC valve outputs • Digital inputs • Relay outputs (potential-free)	Line cross-section: 0.25 ... 2.5 mm² AWG30 ... AWG12
• External heating circuits	Line cross-section: 0.25 ... 4.0 mm² AWG30 ... AWG10
• Voltage supply	Line cross-section: 0.5 ... 6.0 mm² AWG20 ... AWG7

Table 20: Optional interfaces

Interfaces (optional)	
Digital outputs	4 outputs, 24 V, 0.5 A
Digital inputs	Electrically isolated, 24 V, 0.3 A

Table 21: Cable glands

Cable glands	
Hose bundle line	M40x1.5 D22 -32 IP68 PA-GR
Main power supply	M32x1.5 D18 -25 IP68 PA-GR
UPS power supply	M20x1.5 D10 -14 IP68 PA-GR
External I/O lines (digital/analog)	M20x1.5 D10 -14 IP68 EMC
Ethernet interface	M20x1.5 D6 -12 IP68 EMC-D

13.2.6 Supply gases

NOTICE
Risk of contamination of analyzer

- Observe the specified quality of the instrument air.
- If required, provide an instrument air conditioning.

Table 22: Supply gases

Gas	Quality	Inlet pressure	Flow rate
Instrument air (zero gas quality)	Particle size max. 1 µm Oil content max. 0.1 mg/m³ Pressure dew point max. –40 °C Purity class 2 (ISO 8573)	600 ... 700 kPa (6.0 ... 7.0 bar)	Approx. 350 l/h
Instrument air solely as induction air for ejector	Particle size max. 5 µm Oil content max. 1 mg/m³ Pressure dew point max. +3 °C Purity class 3 (ISO 8573)	500 ... 700 kPa (5.0 ... 7.0 bar)	Approx. 1300 l/h
External span gas	Span gas must comply with the specifications of the standards to be applied	Max. 400 kPa (3.5 bar)	Approx. 350 l/h

13.2.7 Tube connections

Table 23: Tube connections

Connection	Dimension
Sample gas inlet	Clamping ring screw connection 6 mm
Ejector induction air	DN 6/8
Span gas inlet	Clamping ring screw connection 6 mm
Gas outlet	DN 8/10

13.2.8 Sample gas conditions

Table 24: Sample gas characteristics

Sample gas at the measuring point	Characteristic
Process temperature	10 ... 550 °C
Sample gas temperature subassembly: • Sample gas probe • Sample gas line • Cell	Temperature: • Approx. 200 °C • Approx. 200 °C • Approx. 200 °C
Process pressure	-20 ... +200 hPa relative
Dust load	< 200 mg/m³

13.2.9 Heated sample gas lines

Table 25: Sample gas line - characteristics

Sample gas line	
Length	Max. 50 m certified, longer sample gas lines on request
Ambient temperature	–20 ... 80 °C
Working temperature	Max. 200 °C

Sample gas line	
Temperature control	1 x Pt100
Voltage supply	115 V or 230 V
Power input	90 VA/m
Degree of protection	IP 54

13.2.10 Connections in analyzer

Power supply - connection / fuses

The power supply is located on the left on the analyzer.

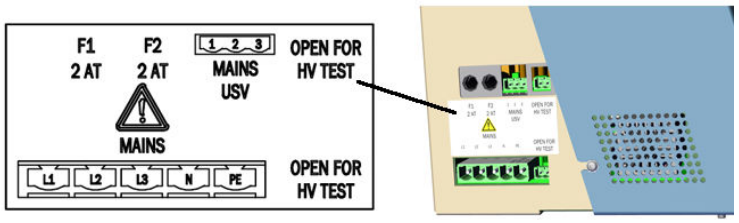


Figure 19: Power supply connections

Table 26: Power supply - connections

Name	Supply
MAINS USV (3-pole)	Power supply for electronics unit (internal)
MAINS (5-pole)	External power supply
F1	Internal
F2	Internal

Electronics fuses

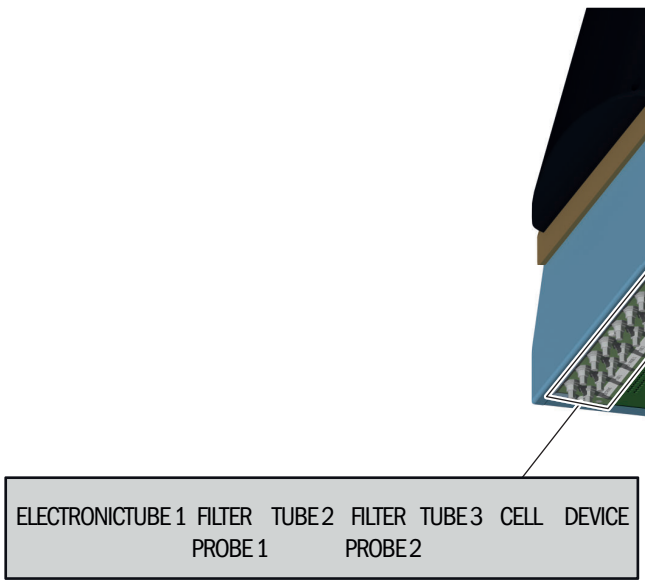


Table 27: Electronics connections

Name	Fuse for
ELECTRONIC	Electronics
TUBE 1	Sample gas line 1
FILTER/PROBE 1	Filter heater 1

Name	Fuse for
TUBE 2	Sample gas line 2
FILTER/PROBE 2	Filter heater 2
TUBE 3	Sample gas line 3
CELL	Sample gas cell
DEVICE	Device

Connections for heated components

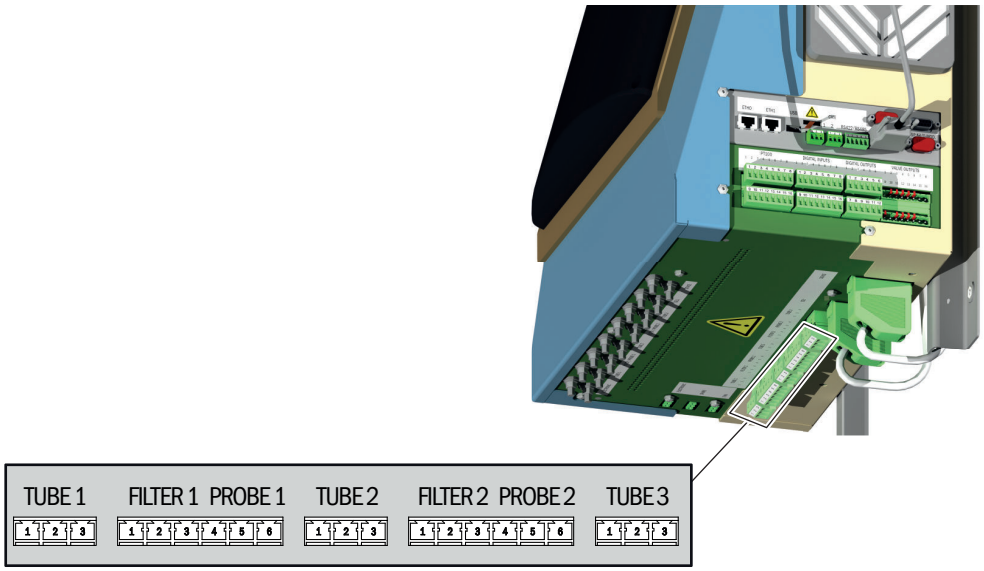


Table 28: Connections - pin assignment

Plug	Subassembly	Pin	Assignment
TUBE 1	Sample gas line 1	1	L (L)
		2	N (L)
		3	PE
FILTER1	Gas sampling unit filter 1 (Lines from hose bundle line)	1	L (L)
		2	N (L)
		3	PE
PROBE1	Gas sampling unit probe tube 1 (Lines from hose bundle line)	4	L (L)
		5	N (L)
		6	PE (not connected)
TUBE2	Sample gas line 2	1 ... 3	As for TUBE1
FILTER2	Gas sampling unit filter 2	1 ... 3	As for FILTER1
PROBE2	Gas sampling unit gas sampling probe 2	4 ... 6	As for PROBE1
TUBE3	Sample gas line 3		

1 The connections must match the connections on the gas sampling unit.

Connections for interfaces and SD card

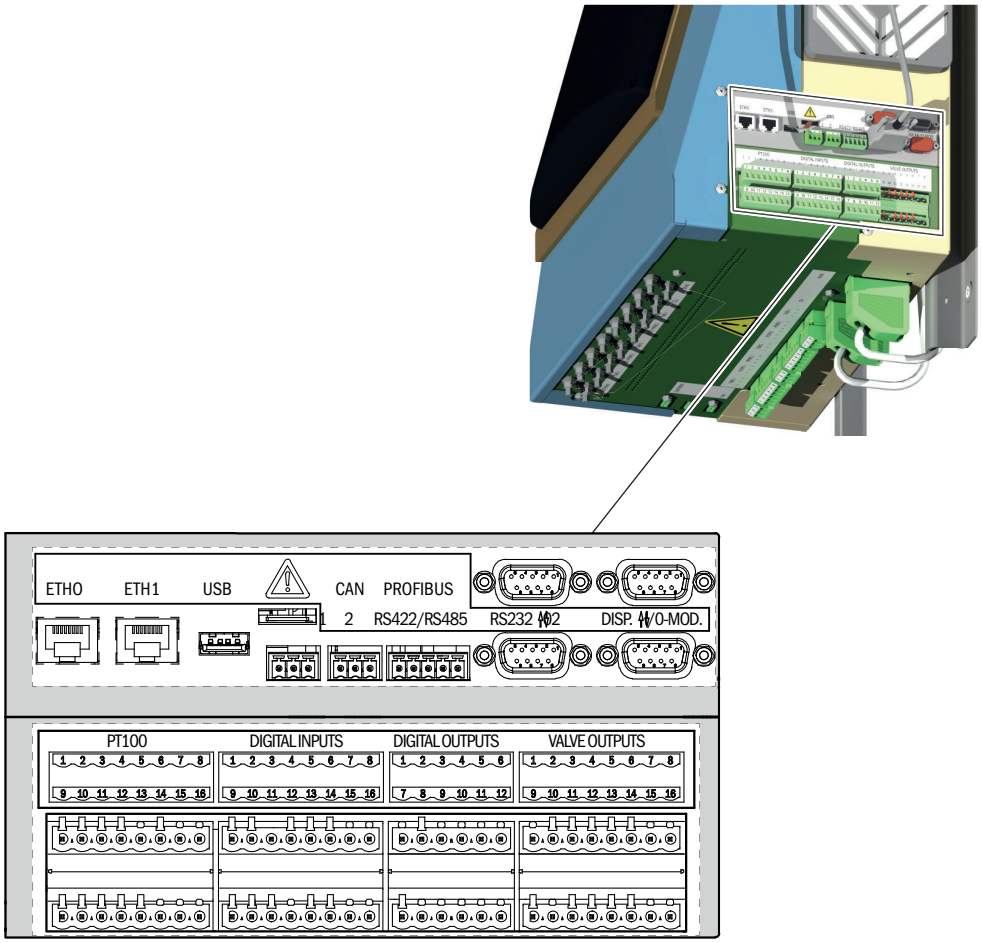


Table 29: Data interfaces - overview

Plug	Connection for
ETH0	Ethernet (e.g. SOPAS ET), MPR (remote maintenance), communication via Modbus TCP
ETH1	Internal
USB	Internal
SD card	SD card (on the right, next to USB)
CAN1	Internal
CAN2	Internal
RS422, RS485	Internal
RS232 (top plug)	Internal
O2 (bottom plug)	O_2 sensor
DISP (top plug)	Display
I/O-MOD (bottom plug)	Internal

Pt100 and signal connections

Table 30: Overview - pin assignment and signals

Plug	Subassembly	Pin	Assignment
Pt100	Sample gas line 1	1	Pt100 +
		2	Pt100 –
	Gas sampling unit filter 1	3	Pt100 +
		4	Pt100 –
	Gas sampling unit probe tube 1	5	Pt100 +
		6	Pt100 –
	Not connected	7	
		8	
	Sample gas line 2	9, 10	As above
	Gas sampling unit filter 2	11, 12	As above
	Gas sampling unit probe tube 2	13, 14	As above
	Sample gas line 3	15	Pt100 +
		16	Pt100 –
DIGITAL INPUTS	Digital input 1	1	+ 24 V
		2	+ Signal
		3	- Signal
		4	GND
	Digital input 2	5 ... 8	As above
	Digital input 3	9 ... 12	As above
	Digital input 4	13 ... 16	As above
DIGITAL OUTPUTS	Digital output 1	1	NC
		2	COM
		3	NO
	Digital output 2	4 ... 6	As above
	Digital output 3	7 ... 9	As above
	Digital output 4	10 ... 12	As above
VALVE OUTPUTS	Valves		Internal

[1] The connections must match the connections on the gas sampling unit.

13.2.11 Circuit breakers

The circuit breakers are located at the bottom of the electronics unit.

The circuit breakers are labeled.

When a circuit breaker has triggered:

- ▶ Press the circuit breaker pin back in again.
  If this does not work:
  - ▷ Wait for a few minutes (cooling down phase) and then press the pin back in again.
    If this does not work: Check the subassembly and replace when necessary.

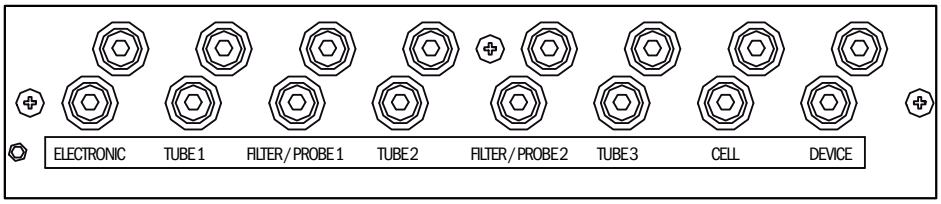


Figure 20: Circuit breakers

13.2.12 Torques

Tighten all screw connections, for which no tightening torque or no pretension force is specified in drawings or Assembly Instructions, according to VDI 2230.

Exceptions to this rule are all connections with screws that are not screw connections in the real sense. This includes hose clips, cable glands, screw fittings, gas connections, screws for circuit boards etc. Tighten these screw fittings as evenly as possible with a much lower torque (hose clips 1 Nm, other screw fittings according to manufacturer specifications).

Select the next lowest torque valid for the screw for mixed materials and special screws such as relieved screws.

The friction coefficient serving as basis is (screw fitting without lubrication) μk=μG=0.14. The calculated values are valid for room temperature (T=20 °C).

Table 31: Torques

Size M	Pitch P	Tightening torque Ma (Nm)					
		3.6	**4.6**	**5.6**	**8.8, A2 u. A4-80**	**10.9**	**12.9**
1.6	0.4	0.05		0.05	0.17		0.28
2	0.45	0.1		0.11	0.35		0.6
2.5	0.45	0.21		0.23	0.73		1.23
3	0.5		0.54	1	1.3	1.7	2
3.5	0.6		0.85	1.3	1.9	2.6	3.2
4	0.7		1.02	2	2.5	4.4	5.1
5	0.8		2	2.7	5	8.7	10
6	1		3.5	4.6	10	15	18
8	1.25		8.4	11	25	36	43
10	1.5		17	22	49	72	84
12	1.75		29	39	85	125	145
14	2		46	62	135	200	235
16	2		71	95	210	310	365
18	2.5		97	130	300	430	500
20	2.5		138	184	425	610	710
22	2.5		186	250	580	830	970
24	3		235	315	730	1050	1220
27	3		350	470	1100	1550	1800
30	3.5		475	635	1450	2100	2450
33	3.5		645	865	2000	2800	3400
36	4		1080	1440	2600	3700	4300
39	4		1330	1780	3400	4800	5600

14 Annex

14.1 Conformities

Conformities

- EC Directive: LVD (Low Voltage Directive)
  EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
- EC Directive: EMC (Electromagnetic Compatibility)
  EN 61326: Electrical equipment for measurement, control and laboratory use, EMC requirements

Further standards and directives: See Declaration of Conformity provided with the device.

14.2 Licences

Liability disclaimer

The firmware for this device has been developed using Open Source Software. Any changes to the Open-Source components are in the general responsibility of the user. All warranty claims are excluded in this case.

The following liability disclaimer is valid for the GPL components in relation to the copyright holders: This program is distributed in the hope that it will be of use but, however, without any warranty; also without the implicit warranty for marketability or suitability for a particular purpose. Refer to the GNU General Public Licence for details.

With regard to the other Open-Source components, we refer to the liability disclaimers of the copyright holders in the licence texts on the CD delivered.

Software licences

In this product, SICK uses unchanged and, as far is necessary and in compliance with relevant licence conditions, changed Open Source Software.

The firmware of this device is therefore subject to the copyrights listed on the CD delivered. Please refer to the CD delivered for a complete list of the Open Source programs used as well as the relevant licence conditions.

Source codes

The source codes for the Open Source programs used in this device can be requested using the following email address: info.pa@sick.de. Please enter as subject “Open Source Software”.

8021889/AE00/V2-0/2019-08/en

Australia
Phone +61 (3) 9457 0600
1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 (0) 2236 62288-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 (0) 2 466 55 66
E-Mail info@sick.be

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

Canada
Phone +1 905.771.1444
E-Mail cs.canada@sick.com

Czech Republic
Phone +420 234 719 500
E-Mail sick@sick.cz

Chile
Phone +56 (2) 2274 7430
E-Mail chile@sick.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 +358-9-25 15 800
E-Mail sick@sick.fi

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

Germany
Phone +49 (0) 2 11 53 010
E-Mail info@sick.de

Greece
Phone +30 210 6825100
E-Mail office@sick.com.gr

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

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

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

Israel
Phone +972 97110 11
E-Mail info@sick-sensors.com

Italy
Phone +39 02 27 43 41
E-Mail info@sick.it

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

Malaysia
Phone +603-8080 7425
E-Mail enquiry.my@sick.com

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

Netherlands
Phone +31 (0) 30 229 25 44
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 +40 356-17 11 20
E-Mail office@sick.ro

Russia
Phone +7 495 283 09 90
E-Mail info@sick.ru

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

Slovakia
Phone +421 482 901 201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 78849
E-Mail office@sick.si

South Africa
Phone +27 10 060 0550
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321/4
E-Mail infokorea@sick.com

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 2 645 0009
E-Mail marcom.th@sick.com

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

United Arab Emirates
Phone +971 (0) 4 88 65 878
E-Mail contact@sick.ae

United Kingdom
Phone +44 (0)17278 31121
E-Mail info@sick.co.uk

USA
Phone +1 800.325.7425
E-Mail info@sick.com

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

Detailed addresses and further locations at **www.sick.com**

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

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