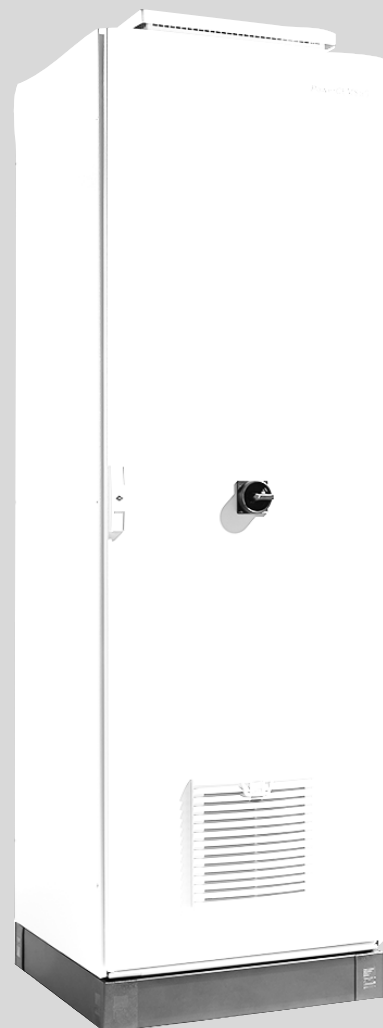


PowerCEMS50

Multi-component Analysis System

Installation, Operation, Maintenance

SICK
Sensor Intelligence.



Document Information

Described Product

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Original Documents

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Legal Information

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Glossary

Wiring diagram: Optionally comprising wiring plan, terminal diagram, gas flow diagram, parts list, view drawings, graphic wiring and function diagram for LOGO! / PLC logic control.

BCU: "Basic Control Unit", local control unit

SCU: "System Control Unit", control unit with remote control

LWL Module: Fiber optics module

DAU: Data acquisition unit (DAU), acquisition of measured data, editing and transmission to the emission PC. Alternatively, the use of field modules is possible for smaller applications.

EPC: Emissions PC with "Windows XP" operating system. Optional connection of up to 16 devices (DAU, field modules, Modbus, OPC etc.). Receiving/sending of data from/to a process control system possible.

MEAC 2000 software: Processing, storage and representation of all calculated values. Operation in Windows standard. Optional display of data in local network possible.

Control: A LOGO! small control system or a PLC control can be optionally used as analyzer cabinet control.

PLC: (Program Logic Controller)

LOGO!: Small control system from the Siemens AG.

Cabinet cooling unit: Referred to as cabinet climate unit (air conditioner).

Sample gas probe: Gas sampling probe / probe

Sample gas line: Heating hose / analysis hose

LEL: Lower Explosion Limit (minimum concentration in a combustible gas or steam above which the gas mixture can be ignited)

UPS: Uninterrupted Power Supply

Raschig rings: Raschig rings are used as filling in gas washers.

CAN Bus: Control Area Network. A field bus.

NOx converter: Gas converter (referred to as NO₂ / NO converter.)

CompactFlash® disc: Memory card.

Ethernet: Computer networking technology. Basis for network protocols, such as TCP/IP.

ESD: Electrostatic Discharge

Fieldbus: An industrial communication system to connect a variety of field equipment such as analyzers, measuring sensors, actuators and drives with a control unit.

Firewall: Safety concept of software and hardware components to restrict access to computer networks.

Modbus®: Field bus communication protocol

PROFIBUS®: Field bus communication protocol

OLE: Object Linking and Embedding. Standardized data interface (Microsoft Corporation)

OPC: Openness, Productivity, Collaboration. Standardized data interface (OPC Foundation).

Span gas: Test gas with a concentration of approx. 75% of the upper measuring range limit.

SOPAS: (SICK Open Portal for Applications and Systems): SICK Parameter Setting and Data Calculation Software.

SOPAS ET: SOPAS PC Engineering Tool. Configuration protocol.

TCP/IP: Network protocol.

Warning Symbols



Hazard (general)



Hazard by corrosive substances



Hazard by voltage



Hazard by explosive substances/mixtures



Hazard for the environment/nature/organic life

Information Symbols



Important technical information for this product



Important information on electrical or electronic functions



Nice to know



Supplementary information



Link to information at another place

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 personal injury or property damage.

NOTICE

Hazard which *could* result in material damage.

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PowerCEMS50

1 Important Information

Main operating information
Intended use
Own responsibility

1.1 Intended use

1.1.1 Purpose of the device

The PowerCEMS50 is a multi-component analysis system designed for continuous flue gas and emission monitoring for power plants fired with gas, biomass, coal and light oil.

The sample gas is taken from a sampling point and fed through the analysis system (extractive measurement).

1.1.2 Product identification

Product name	PowerCEMS50
Manufacturer	SICK AG Erwin-Sick-Str. 1 · 79183 Waldkirch · Germany

- PowerCEMS50 with integrated control unit (→ p. 12, §2.2).

The type plate is normally located at the top on the right cabinet side.

The type plate can however be located somewhere else specific to the system.



It is possible that your PowerCEMS50 has a different configuration to that described in this manual.

- ▶ Refer to the System Documentation (→ p. 10, §1.3) delivered with your PowerCEMS50 for the individual configuration of your system.

1.1.3 Application limitations



WARNING: Risk of explosions

- ▶ Do not operate the device in potentially explosive atmospheres.



WARNING: Risk of explosions when explosive sample gas is used

Risk of explosions when the gas path is not gas-tight.

- ▶ Do not deactivate the detonation flame arrester function integrated in the system when using the PowerCEMS analysis system to measure explosive gases. (sample gas inlet and outlet).

1.2 Responsibility of user

Intended users

The PowerCEMS50 may only be installed and put into operation by skilled persons who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the dangers involved.

Correct use

- ▶ Use the device only as described in these Operating Instructions.
The manufacturer bears no responsibility for any other use.
- ▶ Carry out the specified maintenance work.
- !▶ Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer. Otherwise
 - the manufacturer's guarantee becomes invalid
 - the device could become dangerous

Special local conditions

- ▶ Follow all local laws, regulations and company-internal operating directives applicable at the installation location of the equipment.

Responsibility for dangerous sample gases



WARNING: Mortal/health danger as a result of a gas path leakage

When the device measures toxic gases: A leak in the gas path can cause acute danger for persons.

- ▶ Take suitable safety measures.
- ▶ Make sure these safety precautions are followed.

Keeping documents

These Operating Instructions:

- ▶ Must be available for reference.
- ▶ Must be passed on to new owners.

1.3

Additional documentation/information

The following documents are applicable in addition to these Operating Instructions:

Instructions delivered with the system

- PowerCEMS50:
 - Operating Instructions S700 or SIDOR
- Electronic Device Passport Analyzer module(s)
- Wiring diagram, PowerCEMS analysis system (control cabinet)

System component instructions accompanying the System Documentation

Supplementary instructions (optional):

- Operating Instructions, sampling probe (option)
- Operating Instructions / Data Sheets, sample gas line (option)
- Operating Instructions of the supply unit / components for temperature control of external (heated under control) sample gas line (option)
- Operating Instructions, NOx converter (option)
- Operating Instructions / Data Sheets for the components for sample gas conditioning and test gas feeding, such as:
 - Sample gas pump
 - Sample gas cooler (including condensate pump)
 - Test gas valves (solenoid valves)
 - Washing bottles (option)
 - Humidifier container (zero gas humidification) (option)
 - Sample gas monitoring (flow) in the analyzer
 - Water traps (humidity separator)
 - Cylinder pressure reducer (option)
- Operating Instructions / Data Sheets for components of the control cabinet climate control and lighting, such as.:
 - Control cabinet cooler (option)
 - Cabinet fan
 - Control cabinet light
- Operating Instructions / Data Sheets for components supplementing the system (option)
- Data Sheets for additional components for power supply / mains supply and (electr.) protection devices, such as:
 - Transformers (option)
 - Lightning protection / overvoltage element (option)
- Operating Instructions for modules for measured value computer connection (option)
- Project-specific recording and processing of measured data
 - Operating Instructions, MEAC2000 (option) (including data acquisition unit / DAU)
 - Data Sheet, computer hardware (emission PC / EPC) (option)

PowerCEMS50

2 Product Description

Product identification

Functional principle

Characteristics

2.1

Characteristics

The multi-component analysis system PowerCEMS is an analysis system for measuring and monitoring gaseous components.

The PowerCEMS works extractive, i.e. the gas to be measured is taken from the gas duct using a gas sampling probe or probes and fed to the analysis system via (heated) sample gas line(s).



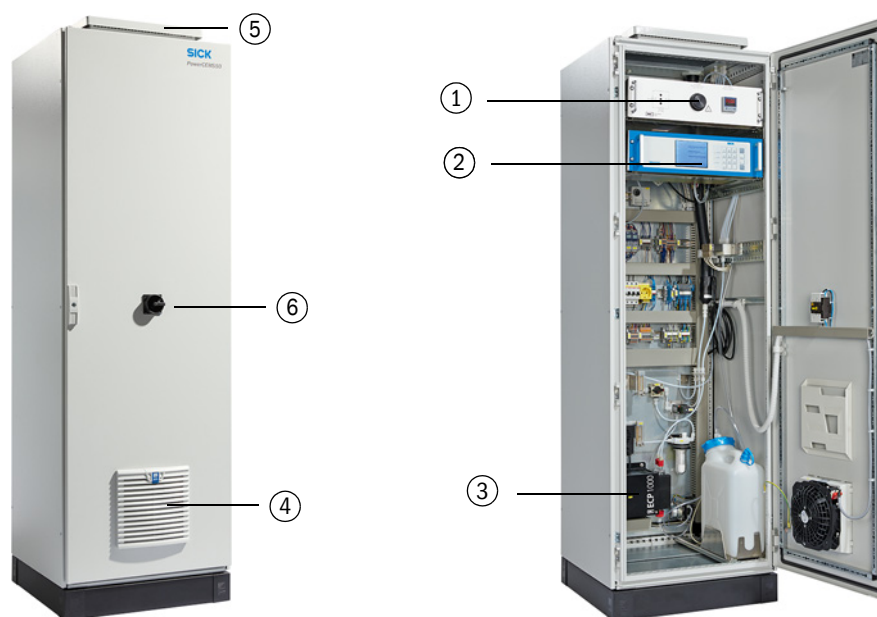
Refer to the wiring diagram, system overview and the delivered system records and documents for individual system-specific equipment or the project-specific version of the overall PowerCEMS analysis system.

2.2

PowerCEMS50

Fig. 1

View PowerCEMS50



1	NOx converter	2	S700 or SIDOR (Analyzer module)	3	Sample gas cooler
4	Fan	5	Air outlet	6	Main switch

PowerCEMS50 contains the analyzers S700 or SIDOR (19" racks).

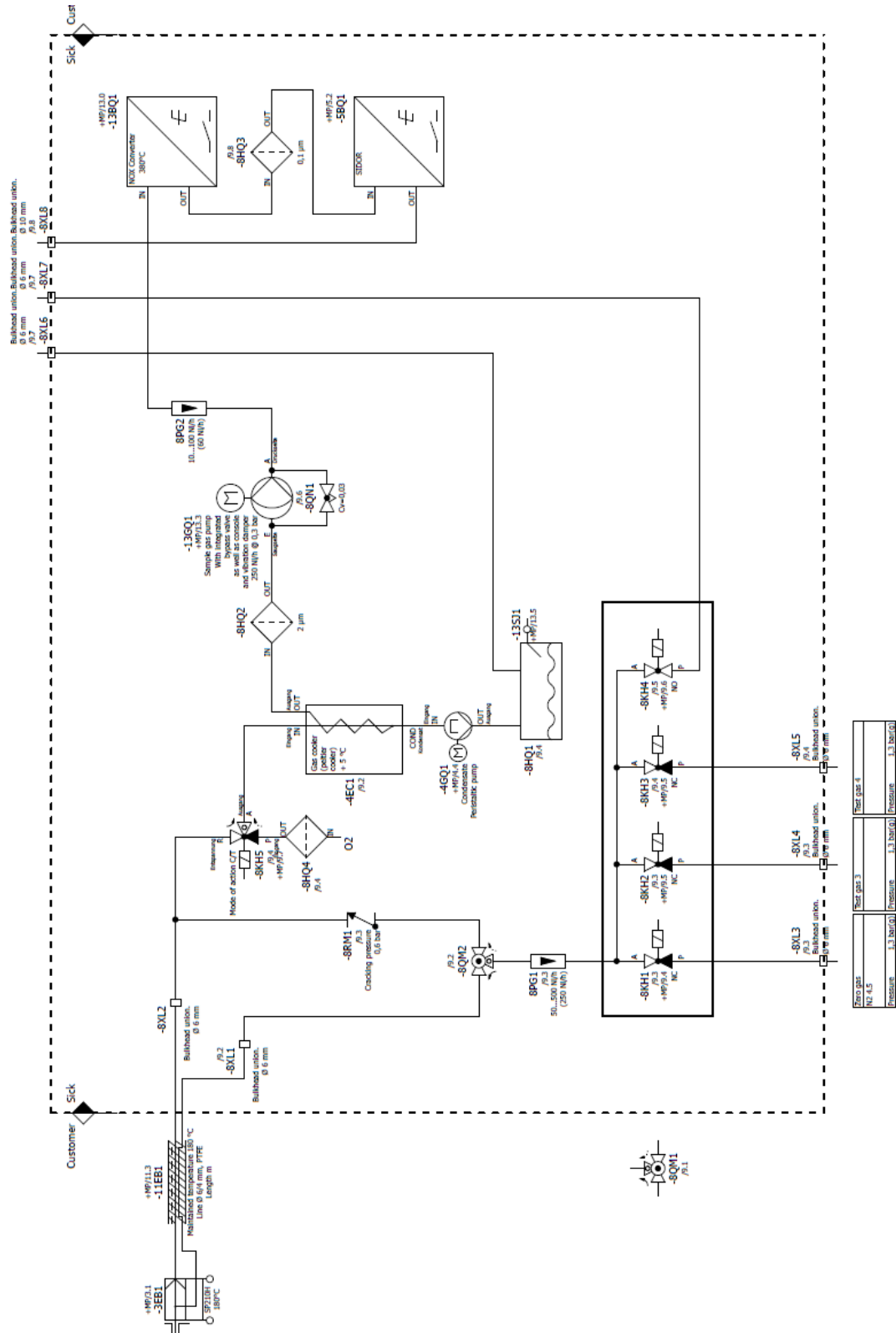
- For measuring CO, O2 and NOx: SIDOR
- For measuring CO, O2, NOx and SO2: S700

The analyzers contain:

- UNOR/MULTOR
- OXOR P, OXOR E
- Gas module with pump, pressure sensor and flow sensor (cable length up to 25 m)
Cable longer than 25 m: External sample gas pump in the system cabinet.

2.2.1 System components

Fig. 2 Gas flow diagram CO, NOx, O2

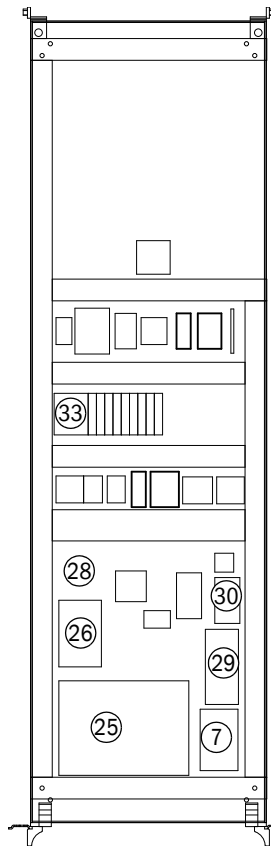


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System elements legend		
Name	Description	
A1	Analyzer	Application-specific
B04	Condensate collection container with level switch	
E01	Gas sampling probe	Application-specific
E02	Sample gas line	Application-specific
E04	Sample gas cooler	Application-specific
E05	NO _x converter	Application-specific
M01	Sample gas pump	Application-specific
M02	External condensate pump	Use = optional
Y03	Test gas feed valve (for test gas feeding to the probe)	Use / Type = optional
Y05..Y09	Test gas valves	Customer-specific
Y10	(Test gas) vent valve	Customer-specific
Y11	Control valve - sample gas pump	
Y12	Overpressure valve	
O7	Sample gas outlet (collector)	
I0	Flow monitoring (for test gas feeding to the probe)	Customer-specific
F13/14	Filter	Customer-specific
W15	Water trap	

2.2.2 Internal functional units

Fig. 4 Functional units



7	Condensate container (on side panel)
25	Sample gas cooler
26	Sample gas pump
28	Control valve
29	Fine filter
30	Flowmeter
33	Fault current circuit breaker
	See drawing "Control Cabinet Legend" in the wiring diagrams for further functional units

- Components for supply / regulation of heated (external) sample gas lines and heated gas sampling probes (option)
- Sample gas delivery unit comprising:
 - Sample gas pump(s) in the analyzer or in the system cabinet
 - Control valve(s) / needle valve(s) (option)
 - Flowmeter
- Sample gas conditioning comprising:
 - Sample gas cooler(s) (optionally available with: Flowmeter and needle valve, condensate pump, filter, Peltier cooler (standard), compressor gas cooler (for SO₂))
Sample gas filter
 - Condensate collection container with level monitor (option)
 - Water trap
 - Sample gas monitoring (flow) in the analyzer
- Test gas feed unit:
 - Solenoid valves: customer-specific: Manual or solenoid valves for automatic adjustment
- Analyzer(s)
- (NO_x) Sample gas converter (option)
- Terminal strips for connection/interfaces by customer
- Interface modules RS232 to RS485 (option)

2.2.3 **External functional units**

- Gas sampling probe(s)
- Sample gas line(s)

External components supplementing the system

- Temperature sensors (option, for external temperature measurement)
- Pressure sensors (option, for external pressure measurement)
- Gas speed measuring devices (option)
- Dust measuring devices (option)
- Other project-specific peripherals (option)



The external functional units are project / system-specific. Refer to the wiring diagram as well as the System Documentation for details.

2.2.4 **Measuring components**

Possible measuring components ^[1]	CO, SO ₂ , NO _x , O ₂
--	--

[1] Depending on built-in analyzer and equipment of the PowerCEMS system

Refer to the Electronic Device Passport of the analyzer and the wiring diagram of the PowerCEMS analysis system for system-specific details and information on the measuring components.

2.2.5 **Interfaces**

- Measured value, status and control outputs
 - Measured value outputs (analog), freely selectable (0 / 2 / 4 ... 20 mA linear)
 - Status and control outputs
- Measured value and control inputs
 - Measured value inputs (analog)
(0 / 2 / 4 ... 20 mA or 0 ... 10V)
- Digital interfaces (option)
 - RS232 - RS485
- Voltage supply
 - 400V, 50Hz
 - OR
 - 230V, 50Hz

2.2.5.1 **Parts list**

Refer to the wiring diagram of the PowerCEMS analysis system for the system-specific parts list of the system components.

2.2.5.2 **Gas flow plan**

- ▶ Refer to the wiring diagram of the PowerCEMS analysis system (→ p. 13, §2.2.1) for the system-specific gas flow diagram

A typical layout for a PowerCEMS variant with sample gas line and test gas feed to the sample gas probe is shown in the following. The layout as well as the variant can vary specific to the system.

- The names of the system components can vary specific to the system.

PowerCEMS50

3 Preparation for Initial Start-up

Installation
Assembly

3.1 **Scope of delivery**

Please see the delivery documents for the scope of delivery.

3.2 **Project planning and installation information**

3.2.1 **Preparation of installation location**



NOTICE:

- ▶ Connection to the gas supply may only be performed by skilled persons who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

The operator is responsible for preparing the installation location.

- Pay attention to the ambient conditions (→ “Technical Data”).
(Conditions: Under a roof or protected against direct heat radiation, heavy dust loads and corrosive atmospheres).
- Cabinet dimensions (refer to the view drawings / wiring diagram in the System Documentation).
- Ensure the load carrying capacity of the floor is adequate (refer to Technical Data for weight).
- Install the PowerCEMS measuring system in an environment almost free from vibrations.
Vibrations can influence measurement and therefore, in case of doubt, plan onsite vibration damping.
- Install the PowerCEMS measuring system as close as possible to the sampling point.
 - Short sample gas lines mean short T90 times.
Maximum length of sample gas line: 50 m.
 - ▶ Observe the information in the assembly guidelines for fitting heating hoses.
- Provide a suitable installation location for the test gas cylinders (option).
Note:
 - Observe local provisions governing gas cylinder installation.
 - Provide a suitable installation location for the pressure regulator unit.
- Air outlet of the control cabinet ventilation / climate control
 - ▶ Do not block the air outlet of the control cabinet ventilation nor the cabinet climate control of the PowerCEMS analyzer cabinet.
- Provide (individual) attachments for the system cabinet.
- For installation on gratings: Parts could drop or liquids (e.g. condensate) could drip and cause injuries. Provide a suitable base plate.

3.3 Transport and installation



NOTICE:

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

- ▶ Only use suitable hoisting equipment (e.g. crane) to install the PowerCEMS (refer to technical data for weight).
- ▶ Observe the current applicable PowerCEMS analyzer cabinet transport and load information.
- ▶ Use the lugs / transport strapping points located on the cabinet roof.
- ▶ Secure the PowerCEMS immediately against falling over.

3.4 Removing transport safety devices

- ▶ Check the system for transport safety devices and remove these.



NOTICE:

- ▶ Remove transport safety devices on control cabinet, filters, washing bottles and other parts before start-up.

3.5 Checking attachments and connections

- ▶ Check whether hose connections and screw connections have become loose during transport.

3.6 Inserting filter elements

- ▶ To prevent damage during transport, some components are disassembled and delivered in separate packing in the control cabinet.



NOTICE:

- Insert filter elements before start-up.

3.7

Inserting the NOx converter cartridges (option)

- ▶ Check that the catalyzer cartridge is inserted in the NOx converter. Converters built into PowerCEMS analysis systems are normally delivered ready for operation with the catalyzer cartridge already fitted.

**NOTICE:**

- Observe the NOx converter Operating Instructions when inserting the catalyzer cartridge.
- Insert the catalyzer cartridge of the NOx converter before start-up.

**WARNING: Hot converter or hot catalyzer cartridge**

The surface of the converter or catalyzer cartridge can be hot.

- ▶ Take appropriate protective measures (e.g. wear gloves).
- ▶ Protect parts against unauthorized access.

3.8

Preparing for start-up of gas sampling probes

Observe the Operating Instructions / Assembly Instructions for the gas sampling probes when preparing for installation or start-up.

**WARNING: Overpressure in gas duct**

When opening the gas duct, gas flows out when overpressure exists.

- ▶ Take appropriate protective measures.

3.9

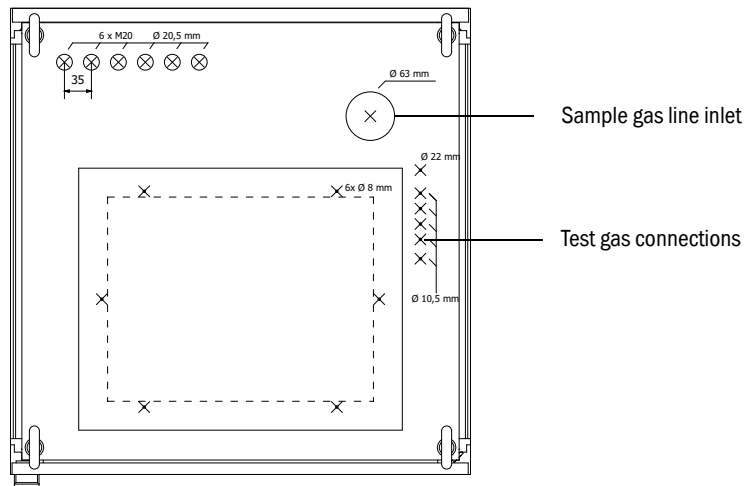
Gas lines

Gas connections for the standard PowerCEMS analysis cabinet are located on the side or top of the control cabinet.

Refer to in the view drawings or wiring diagram for the system-specific version of the PowerCEMS analysis cabinet that can vary.

Fig. 5

Gas connections (serve as examples)



- The layout can vary specific to the system.

**WARNING: Noxious sample gas**

The gases can contain components harmful to health or irritating.

- ▶ Lead the measuring system gas outlets outdoors or into a suitable flue.
- ▶ Protect the sample gas outlet from frost.
- ▶ The sample gas must not penetrate the control cabinet.
- ▶ Observe information from the plant operator.

**NOTICE:**

- ▶ Make sure only the media for which the measuring system is designed are fed.
If necessary, have this checked by SICK Customer Service.
- ▶ The gas lines to the PowerCEMS may only be laid 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.
- ▶ Gas lines / sample gas lines may only be connected on the PowerCEMS analysis system by SICK Customer Service or skilled personnel.
- ▶ Risk of damage to the PowerCEMS and adjacent equipment if the sample gas is corrosive or could create corrosive liquids in combination with water (e.g. humidity).
- ▶ Measured values could possibly be erroneous when the gas path is leaky (dilution effect).
- ▶ Measured values could possibly be erroneous when a partial vacuum exists in the gas duct and when the gas path is leaky (dilution effect).
- ▶ No strong pressure fluctuations may occur at the sample gas outlet.
- ▶ Make sure sample gas can flow out »freely« (without pressure).
- ▶ No significant counterpressure may occur at the sample gas outlet.

3.10

Condensate outlet (for option without condensate container)

If the system does not have a condensate container: Connect a suitable condensate drain-off on the condensate outlet to the side.

**WARNING: Caustic condensate**

- Condensate created at the gas outlet and its deposits can be caustic.
- ▶ Channel condensate off safely.
 - ▶ Observe suitable safety measures when disposing of condensate.

3.11 Preparing the electrical installation



WARNING: Health risk by voltage

- ▶ Electrical connection of the PowerCEMS may only be carried out by electricians 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.
- ▶ For operation, the measuring system must always be grounded.
- ▶ Never disconnect or remove the protective conductors in the measuring system or in the supply line.

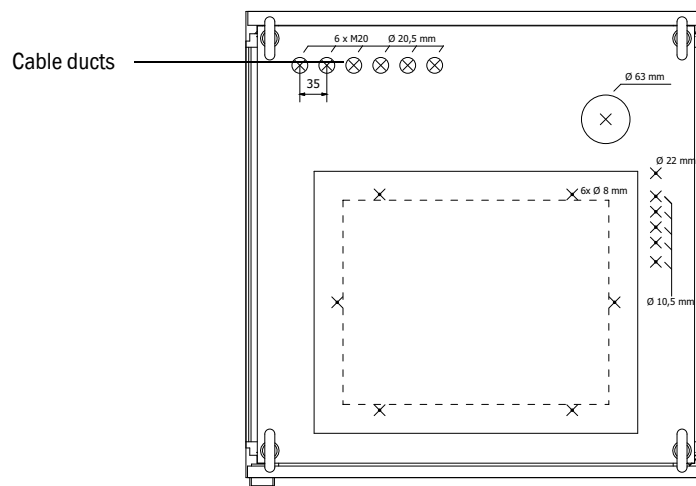
- ▶ Refer to the terminal diagram in the wiring diagram for a description of the terminal strips.

3.11.1 Cable inlet view

The cable ducts on the PowerCEMS analyzer cabinet are located on the top of the control cabinet.

Refer to in the view drawings or wiring diagram for the system-specific version of the PowerCEMS analysis cabinet that can vary.

Fig. 6 Cable ducts (serve as examples)



- The layout can vary specific to the system.

3.11.2 Preparation of mains supply

- Lead the mains supply to the analysis cabinet
- The wiring system to the mains supply voltage of the system must be installed and fused according to the relevant regulations.
- Before start-up, check the mains properties for rated current/rated voltage/rated capacity for system supply (auxiliary power) match the system-specific specifications of the PowerCEMS analysis system.
- ▶ Refer to the system-specific wiring diagram or the System Documentation for details on the mains supply connection as well as specifications on nominal power/voltage/rating.

3.11.3 **External components and signal generators**

Carry out electrical and mechanical connection of project-related external components and signal generators and other project-specific peripherals to be integrated and then put these into operation.

- ▶ Refer to the system-specific wiring diagram and the corresponding Data Sheets or Operating Instructions of the respective components for details on the mains supply connection or connection to the PowerCEMS analysis system as well as specifications on auxiliary power required (nominal power/voltage/rating).

3.12 **Connection to the operator's plant**

3.12.1 **Integration of the PowerCEMS into the operator's plant**

- Lay all necessary connections according to the System Documentation:
 - Voltage supply
 - Signal lines
 - Integration of all external components (option)

3.12.2 **Data evaluation (external interfaces)**

- Connect customer-specific data transfer / evaluation.

PowerCEMS50

4 Start-up

Switching on
Start-up of system components

4.1 **Persons authorized to carry out start-up**



NOTICE:

- ▶ The PowerCEMS may only be put into operation by skilled persons who, based on their device-specific training and knowledge, can assess the tasks given and recognize the dangers involved.

4.2 **Start-up of washing bottles / humidifier containers (option)**

- Insert the bubbling frits in the washing bottles / humidifier containers (option) (remove any transport safety devices still fitted (option))
- Fill the washing bottles / humidifier containers with solution or distilled water. Recommended filling level approx. 50%. The bubbling frit must be constantly immersed.
- Due to application conditions (option), washing bottles / gas washers with the option of automatic media exchange are used. Refer to the wiring diagram of the PowerCEMS analysis system for the corresponding specifications.

4.3 **Before switching on ...**



NOTICE:

Before start-up, the system must have been installed for at least 24 hours in its intended operating position at the installation location to achieve optimum operating conditions and prevent damage to system components.

- ▶ Check: Have all transport safety devices been removed (option)?
- ▶ Observe the ambient temperature for PowerCEMS sample gas system or system components operation (→ "Technical Data").
- ▶ Check: Is the inside of the PowerCEMS analysis system dry and clean?
- ▶ Check: Are all filters and filter elements and inserts fitted and ready for operation?
- ▶ Check: Did hose connections become loose during transport?
- ▶ Check: Are all project-specific external components and signal generators to be integrated, e.g. sample gas probes and lines, temperature and pressure sensors or other external signal and measured value sensors, connected and ready for operation?
- ▶ Check that the catalyzer cartridge is inserted in the NO_x converter.
- ▶ Check for condensate outlet option: Is the condensate outlet free from any blockages?

4.4 **Switching on the PowerCEMS**

- ▶ Switch the PowerCEMS analysis system on using the main switch (“ON” position). Refer to the wiring diagram for the applicable name.
- ▶ Switch on the residual-current device (RCD). Refer to the system-specific wiring diagram for the relevant names (see System Documentation).
- ▶ Switch on all circuit breakers (MCB). Refer to the system-specific wiring diagram for the relevant names (see System Documentation).
- ▶ The PowerCEMS analysis system is in the warming-up phase. Depending on the components to be measured and the measuring ranges, and the drift, the warming-up phase takes up to 24 hours. However, the typical case is that certain system components can cause a measurement at an earlier timepoint after, for example, reaching the required operating temperature even under consideration of possible drift and compliance with switch-on conditions (→ p. 59, §9.4).

4.4.1 **Start-up for the sample gas cooler (option)**

- ▶ For start-up, observe the sample gas cooler Operating Instructions.
- ▶ Wait for the cooler warm-up phase to end (duration: approx. 30 minutes). A green LED indicates when the operating temperature has been reached.

4.5 **Ready-for-measurement status**

PowerCEMS50 is ready for measurement, when no status message (e.g. temperature error/cooler alarm) is displayed and all subassemblies are in operation.

4.6

Start-up for the analyzer (S700/SIDOR)

- ▶ For start-up, observe the analyzer Operating Instructions.
- ▶ Wait for the analyzer start-up phase to end (duration: approx. 15 minutes).
- ▶ Switch on the analyzer using the mains switch at the rear of the device.
- ▶ Query the device status via the analyzer main menu.
Proceed according to the Operating Instructions.
- ▶ Set or control the required gas throughput according to the analyzer Operating Instructions.



This is, at the same time, start-up monitoring of the complete analysis system to determine any possible malfunctions.

Refer to the details on clearing malfunctions in this System description as well as in the analyzer Operating Instructions.

4.7

Start-up for the NO_x converter (option)

- ▶ For start-up, observe the NO_x converter Operating Instructions.
- ▶ Check that the cartridge has been inserted.
- ▶ Wait for the converter start-up phase to end (duration: approx. 15 to 30 minutes).
- ▶ The converter is ready for operation after the preset operating temperature is reached.

**WARNING: Hot converter or hot catalyzer cartridge**

The surface of the converter or catalyzer cartridge can be hot.

- ▶ Take appropriate protective measures (e.g. wear gloves).
- ▶ Protect parts against unauthorized access.

Start-up for the cabinet climate control (option)



NOTICE:

- ▶ Avoid frequent, short starts of the control cabinet cooling unit or opening the control cabinet door frequently for short periods.
- ▶ Observe the minimum switch-off times when switching the control cabinet cooling unit or the complete PowerCEMS analysis system on or off. Non-observance can damage the control cabinet cooling unit.
- ▶ Refer to the specific Operating Instructions of the control cabinet climate control device for the recommended minimum switch-off time.

- ▶ Observe the respective Operating Instructions and Data Sheets in the System Documentation when starting-up the climate control components.
- ▶ Adapt the settings for operating parameters / temperatures to local conditions. Otherwise components of the PowerCEMS analysis system could fail or be damaged.
- ▶ Wait for a certain time after installation or initial start-up to ensure optimum lubrication and cooling of the control cabinet cooling unit. Refer to the specific Operating Instructions of the control cabinet cooling unit for details on this waiting time.

The corresponding cabinet climate control components are fitted on the PowerCEMS analysis system depending on the planned usage location (local conditions). The following will be used, for example:

- Control cabinet fan
- Control cabinet cooling unit (option)
- ▶ Refer to the relevant Operating Instructions for details on start-up and operation of the individual components or the wait time for the control cabinet cooling unit.
- ▶ The climate control components are set at the factory to the following operating parameters / temperatures:
 - Control cabinet fan / cabinet thermostat: 25 °C
 - Control cabinet cooling unit: 25 °C
- ▶ These settings must be adapted to local conditions. Internal system components of the PowerCEMS analysis system can fail or be damaged when operating / ambient temperatures are too low or high.

Information on operation / function of the control cabinet cooling unit

An additional door limit switch is normally fitted to avoid higher condensate levels when the control cabinet door is open.

Switching the cooling function off and on is delayed automatically to avoid a possible cyclic operation when the door is opened and closed. Refer to the Operating instructions of the control cabinet cooling unit for duration and further details on the switching delay.

Whenever possible, avoid frequent, short starts of the control cabinet cooling unit or opening the control cabinet door frequently for short periods.

4.9

Start-up for the heated gas sampling probe

- ▶ The sample gas probe is a system / project-specific external functional unit (option). Observe the Operating Instructions / Assembly Instructions for the gas sampling probe during start-up.
- ▶ Wait for the heating up time for the gas sampling probe to end (duration: Approx. 2 hours).
- ▶ Check the nominal value setting on the built-in thermostat or on the external controller (option regulated heating) (refer to the wiring diagram for the nominal values).

**WARNING: Hot probe and hot filter**

The surfaces of the probe or filter can be hot.

- ▶ Take appropriate protective measures (e.g. wear gloves).
- ▶ Protect parts against unauthorized access.

**WARNING: Hazard through overpressure in the gas duct**

When opening the gas duct, gas flows out when overpressure exists.

- ▶ When necessary: Take suitable protective measures.

**WARNING: Risk of explosions when explosive sample gas is used**

Risk of explosions when the gas path is not gas-tight.

**WARNING: Hazard through noxious sample gases**

The sample gases can contain components harmful to health or irritating.

- ▶ When necessary: Take suitable protective measures.

4.10

Restarting after longer shutdown

Restarting after a longer shutdown (several weeks) requires cooperation between Service technicians and the planning engineers responsible for the plant environment.

- ▶ Please contact SICK Customer Service to clarify the individual precautionary measures required for a restart after a longer shutdown (several weeks).
- ▶ Ensure the following as preparatory work for clarification:
Check the system and system components are ready for operation according to the instructions on start-up (→ p. 27, §4) as well as maintenance (→ p. 47, §8) as described in these PowerCEMS Operating Instructions and the Operating Instructions for the system components.

System component(s) (What to check)	Technical Checks
Lines / hoses	Free of condensate, blocked, soiled, cracks, porous, brittle, tight and correct seat.
filter	Free of condensate, not soiled, ready for operation. Note: Replace the filter elements / inserts / wool when discolored.
Washing bottles, gas washers, humidifier containers	Ready for operation (fill when necessary).
Sample gas pump	Ready for operation.
Water trap	Free from condensate (replace the water trap when necessary.) Note: If condensate is present, the water traps block and must be replaced.
Analyzer	Ready for operation.
NOx converter (option)	Ready for operation (including cartridge).
Gas cooler	Ready for operation.
Test gases	Use-by date, remaining reserves, pressures.
Cabinet climate control	Ready for operation.
Condensate collection container with level switch (option)	Ready for operation (empty when necessary).
Sample gas outlet, sample gas recirculation	Free from blockages.
Sampling probe	Ready for operation.
External components and signal generators	Ready for operation.

- ▶ In addition to this list, also observe the information and conditions for particular system components in Sections “Start-up” (→ p. 27, §4) and “Maintenance” (→ p. 47, §8) in these PowerCEMS Operating Instructions.
- ▶ Refer to the Operating Instructions for the individual system components for further details and information.

PowerCEMS50

5 Operation

Operation

5.1 Operation

5.1.1 Operation

PowerCEMS50 is operated via the fitted analyzer S700 or SIDOR.



Operation of PowerCEMS50 → Operating Instructions S700 or SIDOR

5.1.2 Operating the system components

The PowerCEMS analysis system is a user-friendly and low-maintenance measuring system that functions with self-monitoring.

For details, refer to the Operating Instructions of the individual system components, sample gas probe, sample gas line, sample gas cooler, sample gas pump and S700 or SIDOR analyzer used.

5.2 Layout and functions of system components

Refer to the wiring diagram for the layout and function of the individual system components in the PowerCEMS analysis system.

5.3 System Parameters

Refer to the System Documentation as well as the wiring diagram for details concerning setting the system parameters of the PowerCEMS analysis system.

PowerCEMS50

6 Adjusting

Adjustment

6.1 **When is adjustment necessary?**

The PowerCEMS measuring system or the analyzer should be adjusted:

- After start-up
- In regular intervals during operation (about weekly to monthly is recommended)
- For emission measurement required by law according to the Certification or legal specifications.
- The specific adjustment cycles depend on the application and are not the responsibility of SICK AG.

6.2 **Basic variants of the adjustment procedure**

Two basic test gas feed options exist:

- External test gas feed directly to the gas sampling probe (option)
- Internal test gas feed in the PowerCEMS analysis system before the sample gas cooler
- ▶ Refer to the wiring diagram in the project documentation of the PowerCEMS analysis system for the system-specific variants.

Adjustment can be performed either with automatic or manual control:

- Manual calibration with manual feeding of test gases (standard)
- Automatic calibration (option)
- Manual calibration with automatic feeding of test gases (option)
- ▶ Depending on the analyzer, adjustment can be performed with external test gases, with internal calibration cuvette and / or ambient air.
- ▶ Refer to the Operating Instructions of the corresponding analyzer for further details describing the adjustment variants.

6.3

Performing the adjustment procedure

Adjustment of the PowerCEMS50 is controlled by the analyzer (S700 or SIDOR).

- When automatic test gas feeding is used, the analyzer switches the test gas valve automatically.
- For manual test gas feed (with ball valve): Connect the test gas to the components to be adjusted.
Exception: Component O2. This is done automatically, because the adjustment is performed with ambient air.

It is recommended to refer to the Operating Instructions of the respective analyzer for settings.

For carrying out a probe adjustment (option), a ball valve is installed in the analyzer cabinet which has to be switched for the relevant gas path.

As an option, the test gas can be fed directly to the analyzer or via the probe for adjustment (refer to flow plan of the relevant system design).

Monitoring of the flow during adjustment is carried out manually via visual inspection of the flowmeter and should not be less than 250 NI/h.

If there is no adequate flow of the test gases during probe adjustment, the adjustment must be canceled and the read-in adjustment values deleted (refer to analyzer manual).

Possible causes:

- Test gas bottle is empty or not connected
- Test gas path is clogged or interrupted
- Test gas pressure too low, return valve on probe does not open
- Return valve defective

6.3.1

Switching test gas valves and test gas pressures

For adjustment/probe adjustment, the same pressure of approx. 1.3 bar (depending on the probe valve - refer to next Section) has to be set for all test gases.

The flow to the analyzer should be 60 NI/h during adjustment and measuring mode.

When an external pump is used, the flow can be set at the bypass needle valve, when an internal analyzer pump is used, the flow can be set directly via the analyzer menu.

The sample gas probe contains a return valve for loading the gas path to the analyzer with test gas, which opens when a pressure of approx. 0.7 ... 1.0 bar overpressure is applied and releases the test gas (refer to sampling probe manual).

As this opening pressure has to be applied additionally, the pressures for the test gases have to be set to approx. 1.3 bar overpressure.

The opening pressure of the probe valve can vary slightly from probe to probe. Set the test gas pressure to a value that ensures that the flow through the flowmeter is always above 250 NI/h. This ensures that a sufficient amount of test gas always flows out via the probe tube and that it does not mix with sample gas from the exhaust gas duct when suctioned to the system.

Be aware that the test gas pressure values have to be set anew if adjustment is not carried out via the probe and the test gas is fed directly to the measuring system (refer to flow plan).

6.4

Adjustment of external components and signal generators

External components and signal generators connected to the PowerCEMS measuring system or fed by the PowerCEMS measuring system must be adjusted or calibrated according to the individual component characteristics and applications, independent from the PowerCEMS measuring system.

PowerCEMS50

7 Shutdown

- Standby operation
- Switch-off procedure / switching off
- Shutdown
- Storage
- Disposal

7.1 General information

**NOTICE:**

- ▶ Comply with the safety information, applicable health and safety measures and the instruction sequence during shutdown.

7.2 Standby operation (Maintenance mode)

The PowerCEMS analysis system can be set to Standby operation (Maintenance mode) for a short time to allow, for example, maintenance work and / or to avoid long restart times after a targeted measurement operation interruption.

This Standby state is achieved by putting the sample gas pump out of operation to stop sample gas feed. To do this, the »Maintenance« status output must be activated per menu function on the analyzer.

Refer to the Operating Instructions of the analyzer for details on operation and the relevant menu functions.

Activating the »Maintenance« menu function with the analyzer automatically switches off the sample gas pump and a maintenance signal informs a possible external location that the PowerCEMS analysis system is not in regular operation and pending measurement values are therefore implausible.



An optional maintenance switch is fitted on the PowerCEMS analysis system depending on the system. If operating mode »Maintenance« is activated using this maintenance switch, the sample gas pump function is not put out of operation and only the maintenance signal is sent to a possible external location.

7.3 Switch-off procedure / switching off

7.3.1 Safety measure: Secure connected locations

- 1 Shutting down the PowerCEMS analysis system can affect external locations. Inform external locations as required.
- 2 Make sure automatic contingency measures are not triggered when shutting down. It may be necessary to take into consideration with which switching logic the switching outputs of the PowerCEMS analysis system function.
 - ▶ Observe the Operating Instructions for the analysis system.
- 3 If a data processing system is connected, it may be required to manually indicate a planned shutdown, so that the system will not interpret the shutdown as a PowerCEMS analysis system malfunction.

7.3.2

Safety measure: Completely remove the sample gas**WARNING: Hazard through noxious sample gases**

If the PowerCEMS analysis system was used to measure toxic or dangerous gases:

- ▶ When necessary: Take suitable protective measures.
- ▶ Purge the measuring system sufficiently long with a neutral gas (e.g. with nitrogen)

**NOTICE:**

- ▶ Consider the maximum allowable (sample) gas pressure of the analyzer when purging with a neutral gas.
- ▶ Refer to the Operating Instructions or the Data Sheet of the analyzer for the applicable maximum sample gas pressure.

7.3.2.1

When measuring toxic, dangerous or wet gases

If the PowerCEMS analysis system was used to measure toxic, dangerous or wet gases, gas paths as well as components carrying sample gas must be purged thoroughly with a neutral gas before shutting down.

- 1 Purge all the gas paths of the PowerCEMS analysis system, including external sample gas lines, for several minutes with a »dry« neutral gas - e.g. with nitrogen (techn.).
 - ▶ Consider the maximum allowable sample gas pressure of the analyzer when purging with a neutral gas. Refer to the Operating Instructions or the Data Sheet of the analyzer for the applicable maximum sample gas pressure.
 - Purging with ambient air could also be considered depending on the application and ambient conditions.
In this case, it suffices when the system suctions in ambient air for several minutes on the sample gas probe side.
(It may be necessary to pull the sample gas probe out of the duct here.-> Attention! Application conditions and safety information must be observed.)
- 2 Now stop sample gas feed, close off all gas connections of the PowerCEMS analysis system, or close the relevant valves in the purged gas path.
Sample gas feed (or sample gas suctioning in) can be interrupted by switching the sample gas pumps / analyzers off or via a corresponding manual analyzer menu function. Refer to the Operating Instructions of the relevant analyzer for details on operation and menu functions.



It is recommended to activate the »Maintenance« status output per menu function on the analyzer. This switches the sample gas pump off and sends a maintenance signal to a possible external location to signal that the PowerCEMS analysis system is no longer in regular measuring operation.

7.3.2.2

When measuring harmless gases**WARNING:**

In case of doubt please contact the plant operator or SICK Customer Service to clarify or classify the sample gas as a harmless medium.

- 1 Stop sample gas feed to the PowerCEMS analysis system by switching off the sample gas pumps / analyzers or via a corresponding manual analyzer menu function as well as by closing off any shutoff fittings installed.
 - ▶ Refer to the Operating Instructions of the relevant analyzer for details on operation.



It is recommended to activate the »Maintenance« status output per menu function on the analyzer. This switches the sample gas pump off and sends a maintenance signal to a possible external location to signal that the PowerCEMS analysis system is no longer in regular measuring operation and pending measurement signals are therefore implausible.

- 2 Separate the PowerCEMS analysis system from the external sample gas paths so that no sample gas and test gas can flow into the PowerCEMS analysis system. (E.g. with overpressure in the measuring channel.)
- 3 Now close off all gas connections, lines and valves on the PowerCEMS analysis system.

7.3.3

Switch off

- ▶ Switch the PowerCEMS analysis system off using the main switch ("OFF" position). Refer to the wiring diagram for the corresponding designation and location / position of the main switch → p. 12, Fig. 1.

**NOTICE:**

With control cabinet climate control devices (option):

- ▶ Observe the minimum switch-off times for the control cabinet cooling unit when switching the PowerCEMS analysis system on or off.

Non-observance can damage the control cabinet cooling unit.

- ▶ Refer to the specific Operating Instructions of the control cabinet cooling unit for the recommended minimum switch-off time.

7.4

Shutdown

- ▶ Disconnect the PowerCEMS measuring system completely from the mains.
- ▶ Separate the sample gas line from the probe and cabinet.



WARNING: Hazard through noxious sample gases

If the PowerCEMS analysis system was used to measure toxic or dangerous gases:

- ▶ When necessary: Take suitable protective measures.
- ▶ Purge the measuring system sufficiently long with a neutral gas (e.g. with nitrogen)

- ▶ Dispose of the condensate.



WARNING: Caustic condensate

- ▶ Observe suitable safety measures when disposing of condensate.
- ▶ Dispose of condensate according to local regulations.

- ▶ Empty washing bottles / humidifier containers (option).
- ▶ Close off the gas inlet / outlet on the analyzer.
- ▶ Close off the end of the sample gas line on the probe side.
- ▶ Dismantle the sample gas probes and close off the connections with blind flanges.
- ▶ Disconnect or close off any other optional connections (e.g. instrument air, water connections, connections for condensate outlet).

7.5

Storage

Storage conditions:

- Indoors.
- Ambient temperature: -20 - + 55 °C.
- Relative humidity max. 80%, without condensation.
- Recommendation: Store the PowerCEMS as dry as possible.



To prevent condensate occurring, purge the internal sample gas path thoroughly with a »dry« neutral gas before shutting down.

7.6

Disposal

Observe the relevant local conditions for the disposal of industrial waste.



The liquid in the dismantled storage container is acidic and contains inorganic or organic substances that are toxic or harmful to the environment. This waste must be disposed off according to the legal regulations and as hazardous waste when necessary.

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

- *Electronics*: Condensers, rechargeable batteries, batteries.
- *Display*: Liquid of LC display.
- *Sample gas filters*: Sample gas filters could be contaminated by pollutants.
- *Sample gas paths*: Toxic materials in the sample gas could have been absorbed or trapped in »soft« gas path materials (e.g. hoses, sealing rings). Please check whether such effects have to be considered during disposal.
- *Analyzer Modules*
 - Observe the information on disposal in the Operating Instructions of the relevant analyzer.
- *Cabinet cooling unit (option)*:
 - Correct disposal of refrigerants of the cabinet climate unit.
 - Observe the information on disposal in the Operating Instructions of the relevant cabinet cooling unit.

PowerCEMS50

8 Maintenance

Maintenance, information

Maintenance signal

Maintenance recommendation

Spare and wearing parts

8.1

Important maintenance information**WARNING:**

- Whenever possible, only replace components with the equipment switched off.
(Maintenance work could also be carried out conditionally in “Maintenance mode” under consideration of all safety regulations and information).
- If you have to open the device for adjustment or maintenance work, repair or replacement of parts, disconnect it first from all voltage sources.
- If the open device must be live for adjustment or maintenance, this work has to be performed by skilled persons who are familiar with potential hazards.
- Never interrupt the protective conductor connections inside or outside the device. The interruption can cause the device to become dangerous.
- If you have reason to suspect that safe operation of the device is no longer possible, put the device out of operation and secure it against unauthorized start-up.
- No components may be removed, added or changed on the device unless described and specified in the official manufacturer information.
Otherwise:
 - Any warranty by the manufacturer becomes void
 - The approval could become void
- If you feed combustible or explosive sample gas through the analyzer:
There is risk of explosions when the gas path is leaky or when the closed gas paths or lines are opened.
- Do not put the detonation flame arrester function integrated in the system in the sample gas supply line as well as the sample gas outlet out of operation when using the PowerCEMS analysis system to measure explosive gases.
- Depending on the measuring medium, toxic deposits could be contained in the feeders with media contact.
- Acidic solutions (condensate) can occur.
- Attention: Depending on the sample gas or application, the adsorbent can be contaminated with noxious and / or highly flammable substances.
- Surfaces of system components can be hot.
(E.g.: converter enclosure, converter cartridge, gas sampling probe, sample gas line, and others.)



- The liquid in the dismantled storage container is acidic and contains inorganic or organic substances that are toxic or harmful to the environment.
- Used adsorbent is hazardous waste.
- ▶ This waste must be disposed off according the legal regulations and as hazardous waste when necessary.



Refer to the Operating Instructions of the respective system components for further details on maintenance and warning / safety information.

8.2 **Maintenance signal (Maintenance mode)**

The »Maintenance« status output can be activated manually to signal to external locations that the PowerCEMS analysis system is no longer in regular measuring operation, for example because maintenance work is being carried out.

Activation is done per analyzer menu function or separate maintenance switch depending on the project planning and version of the PowerCEMS analysis system.

- ▶ Refer to the Operating Instructions of the relevant analyzer or the wiring diagram for version and details.

Activating »Maintenance« mode per analyzer menu function automatically switches off the sample gas pump and a maintenance signal informs a possible external location that pending measurement signals are therefore implausible.

If operating mode »Maintenance« is activated per optional maintenance switch (system-specific equipment), the sample gas pump function is not put out of operation and only the maintenance signal is sent to a possible external location.

- ▶ Remember to switch the maintenance signal off again when it is no longer needed.

8.3 **Visual inspection / function control**

Check the operating state of the devices by visual inspection.

- ▶ It is recommended to carry out this visual check weekly.
- ▶ For the complete analysis system
Regular checks of screw connections, hose connections, gas lines and other connections to the PowerCEMS, the probe and further system components.
- ▶ Check enclosure and condensate pump for possible damage by acids.

8.4 Description of maintenance work

8.4.1 Maintenance recommendations / maintenance intervals

- Maintenance intervals depend on the application.
- In principle, the maintenance recommendations in the respective Operating Instructions of the system components are applicable. All the recommendations depend on the process and are not within SICK's area of responsibility.
 - Refer also to the Operating Instructions of the respective system components.
- SICK recommends the following checks. (Based on average operation.)

System components	Recommended inspection / Description of maintenance	Recommended maintenance intervals		
		Weekly	Monthly	Yearly
Gas sampling probe (option)	Check filters and seals. Replace filters regularly depending on wear. Remark: Observe the Operating Instructions of the gas sampling probe.		X	
Sample gas line (option)	Check heating function. Clean regularly. Remark: Observe respective Operating Instructions or Assembly Guidelines on fitting heating hoses.		X	
Filter (option) – Sample gas probe – Sample gas cooler or filter after Peltier cooler	Check filter condition / degree of contamination. (Filter wear can vary depending on the application.) Check for condensate in filter housing bottom. Drain off condensate when necessary. Remark: Observe relevant Operating Instructions / Data Sheets.	X		
Sample gas pump (option)	Check pump function. Remark: Observe relevant Operating Instructions.		X	
Water trap	Replace water trap at least once a year. Note: Water trap blocks when condensate occurs and must be replaced. In this case, the system reports "System error" because the gas flow is interrupted.			X
Filter fan of cabinet vent	Check filter fan function. Clean heavily soiled filter pads and replace as necessary. Set filter pad replacement interval individually depending on dust volume and operating time. Attention: Replace filters in good time. Dirty filter pads lead to temperature increases in control cabinets. Filter pads can be cleaned by flushing or blowing out. Remark: Observe Operating Instructions of filter fan.		X	
Cabinet thermostat (option)	Check function in connection with the filter fan.		X	
Condensate container with level switch (option)	Check container condition. Empty when necessary. Note: Sample gas condensate is hazardous waste. Observe regulations on condensate disposal according to the Water Resources Law (WHG). Attention: The liquid contains acid. Observe applicable health and safety regulations.		X	

System components	Recommended inspection / Description of maintenance
Sample gas cooler (compressor) including condensate pump	<p>Check enclosure and condensate pump for any possible damage. Replace the Teflon filter cartridge, when fitted as an option, regularly depending on wear and contamination. Regulate refrigerant condensers regularly depending on contamination. Replace condensate pump hoses regularly depending on wear but at least once a year. It is recommended to replace hoses every three months as precautionary measure. Attention: The condensate can be acidic. Check screw connections / connections. Remark: Observe Operating Instructions of compressor sample gas cooler</p>
Sample gas pump (Peltier) including separate condensate pump	<p>Check enclosure and condensate pump for any possible damage. Replace the separate Teflon filter cartridge regularly depending on wear and contamination. Replace condensate pump hoses regularly depending on wear but at least once a year. It is recommended to replace hoses every three months as precautionary measure. Attention: The condensate can be acidic. Check screw connections / connections. Remark: Observe Operating Instructions of Peltier sample gas cooler</p>
Condensate pump (refer to compressor or Peltier cooler)	<p>Check enclosure and condensate pump for any possible damage. Replace condensate pump hoses regularly depending on wear but at least once a year. It is recommended to replace hoses every three months as precautionary measure. Attention: The condensate can be acidic. Check screw connections / connections. Remark: Observe Operating Instructions of Peltier sample gas cooler</p>
Analyzer	Refer to Operating Instructions of relevant analyzer.
NOx converter (option)	<p>Note: Make sure the correct cartridge type is used when replacing / exchanging catalyzer cartridges (differing temperature ranges). Refer to Operating Instructions of converter for details on exchanging catalyzer cartridges. Warning: Very hot catalyzer cartridge. Risk of burns when exchanging.</p>
Lines / hoses	<p>Check for possible blockages, spoiling, cracks. Check for possible porous or brittle condition. Check for tight, correct seat. Clean or replace lines / hoses as necessary.</p>
Control cabinet cooler (option)	Refer to Operating Instructions of respective system components.
Test gases (option)	Check condition and availability of test gases regularly (e.g.: Feed pressure from central gas supply, remaining reserves in pressure cylinders, use-by date).

8.5 **Cleaning information**

- ▶ Use a soft cloth to clean the cabinet on the outside and inside.
- !▶ Do not use any mechanically or chemically aggressive cleaning agents.
- !▶ Do not allow any liquids to penetrate the control cabinet or enclosures of system components.

8.6 **Recommended spare parts (SP) / wearing parts (WP)**8.6.1 **SP/WP for internal components**

- Wearing and spare parts depend on the analyzer and application.
- Service life of wearing parts depends on the application.
- ▶ Store parts in a dry, ventilated area protected against dust.
- ▶ Avoid long storage times.

Sample gas filter / SICK filter					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Filter-diaphragm made of glass fiber 55 mm diameter Sales unit=25 pcs.	5 312 005	Front fitted filter FI56NK3(2028590) Ext. filter	X		1 pc./ 1 y.
Safety filter FI64 glass, 2 µm, for hose diameter=4 mm	2 027 973	S700 / SIDOR		X	1 pc./ 2 y.
Water trap WT20.5K	5 313 317	Water trap		X	1 pc./ 2 y.

Sample gas filter / Filter M&C					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Filter element F-2T (PTFE) 2 µm	5 312 341	Universal filter FP, FT, FS	X		1 pc./ 1 y.
Filter glass F-120G	5 312 766	Universal filter FP, FT, FS		X	1 pc./ 2 y.
Filter glass F-240G	5 312 707	Universal filter FP, FT, FS		X	1 pc./ 2 y.
Spare Viton ring 26	5 312 775	Universal filter FP, FT, FS	X		1 pc./ 1 y.

Filter pad for cabinet fan					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Spare filter pad for outlet filter and filter fan W 173 x H 173 x D 17	5 306 678	Outlet filter SK3323.xxx (5 315 501)	X		As required
Spare filter pad for outlet filter and filter fan W 289 x H 289 x D 17	5 308 584	Outlet filter SK3326.xxx (5 314 520)	X		As required

Sample gas pump KNF					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Spare parts set for pump N86KT.18 comprising: 1 pc. structure diaphragm, 2 pcs. valve plate, 2 pcs. sealing ring	5 312 317	Sample gas pump	X		1 pc./ 1 y.
Sample gas pump, complete, N86 KT.19 231 VAC, in enclosure, flow rate approx. 250 l/h	7 027 252	Sample gas pump		X	1 pc./ 3 y.

NOx converter M&C					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Heater CG-2 (95A9057), 230V/50/60Hz	6 027 894	NOx converter CG2		X	1 pc./ 2 y.
Converter cartridge CG-2-C (95A9003) carbon filling, T=350°C with spare O-ring-set	5 320 289	NOx converter CG	X		1 pc./ 1 y.

Sample gas cooler AGT (compressor cooler MAK10)					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Spare filter cartridge, Teflon	5 320 090	Sample gas cooler MAK10	X		1 pc./ 2 y.
Hose pump SR25, complete 230V 50Hz IP00, 5 rpm, incl. Novoprene hose and 2 pcs. hose sockets	6 039473	Sample gas cooler MAK10		X	1 pc./ 2 y.
Hose pump spare parts set SR25 consisting of 5 pump hoses 4.8x1.6 Novoprene, 1 pc. wrapping tape roll	2 050 587	Sample gas cooler MAK10	X		3 pcs./ 2 y.

Condensate pump SR25					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Hose pump SR25, complete 115/230V, 50/60Hz, IP00, 5 rpm. 1 duct, 2 rollers on assembly bracket Hose 4.8 x 1.6 Novoprene - 0.4 l/h with 2 hose sockets 5 mm	6027 131			X	1 pc./ 2 y.
Hose pump spare parts set SR25 comprising: 5 pcs. pump hose 4.8 x 1.6 Novoprene 1 pc. bearing surface	2 027 976	Hose/condensate pump SR25	X		3 pcs./ 2 y.

Cooler M&C (Peltier)					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Hose pump spare parts set SR25 comprising: 5 pcs. pump hose 3.2 x 6 Novoprene 1 pc. bearing surface	2050587	Gas cooler	X		3 pcs./ 2 y.
Hose pump type SR25, complete 230 V / 50 Hz; 115 V / 60 Hz IP00, 5 rpm. Incl. Novoprene hose and 2 pcs. hose connection	6039473	Gas cooler		X	1 pc./ 2 y.
Filter element, glass fiber, 0.1 µm	5 325 515	Gas cooler	X		1 pc./ 2 y.
O-ring for filter element	5 325 516	Gas cooler	X		1 pc./ 2 y.
Filter glass	5 325 517	Gas cooler		X	1 pc./ 2 y.

8.6.2 SP/WP for external components

Sample gas probe SP210-H; SP210-H/W						
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)	
Parts set SP210, comprising: 4 pcs. Viton flat seal [30] (5306634) 2 pcs. filter element SP-2K (5308926) 2 pcs. O-ring set (5308928) 2 pcs. O-ring set [94], Viton (5312366) 2 pcs. lid seal (5312367)	2 031 994	Gas sampling probe SP210-H	X		1 pc./ 1 y.	
Flange seal DN65 PN6B [67]	5 313 427				X	1 pc./ 1 y.
Thermostatic switch	6 027 810				X	1 pc./ 1 y.
Heating cartridge HLPSR	6 027 809				X	2 pcs./ 1 y.
Heat-conductive paste for heating cartridge insertion	5 602 693				X	1 pc./ 1 y.

Sample gas probe SP180					
Description	Part No.	Fitted in	WP	SP	Requirement per x year(s)
Filter element SP-2K	5 308 926	Gas sampling probe SP180-H		X	2 pcs./ 1 y.
O-ring Viton 39	5 306 624			X	2 pcs./ 1 y.
O-ring Viton 55	5 306 625			X	2 pcs./ 1 y.

8.7 Further and supplementary spare/wearing parts



Refer to Data Sheets / Operating Instructions of the respective system components for further information on spare/wearing parts as required.

PowerCEMS50

9 Clearing Malfunctions

Fuses

Status messages / group alarms

Implausible measuring results

9.1 Fuses

Fuse overview: Refer to fuse plan in the system cabinet.

- ▶ Check correct condition of fuses according to the wiring diagrams
- ▶ Refer to the Operating Instructions / Data Sheets of the system components for details

9.2 Status indicators / group alarms

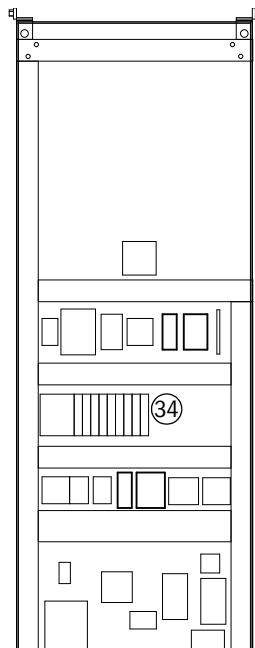
9.2.1 Group malfunction

The following messages are displayed and/or output:

- Creation of a group alarm on the analysis system (refer to wiring diagram PowerCEMS analysis system for details)
- Status indicators on the analyzer display (display messages, significance, cause / information and service information, refer to Operating Instructions of analyzer)

9.2.2 Malfunction indication

Fig. 7 Malfunction indication



34	<p>Malfunction indication</p> <p>Error message relay 1-7. Trouble-free operation of the individual components is displayed by a GREEN LED. <i>The LED goes off in case of a malfunction.</i> Depending on the configuration of your PowerCEMS50, not all components are installed, but all seven relays are always installed. <i>Independent from configuration, all 7 LEDs are on during correct operation</i> Assignment (from the left, refer to numbering on the indicators):</p> <ol style="list-style-type: none"> 1 Cabinet climate control device 2 Sample gas sampling probe 3 Sample gas cooler 4 Temperature controller sample gas line 5 Second temperature controller sample gas line 6 NOX converter 7 Level of condensate container
----	--

9.3 Implausible measuring results

First check the following for implausible measuring results:

- ▶ Whether the specified and elementary process conditions are complied with
- ▶ Whether the sample gas path shows signs of leaks

Refer to the Operating Instructions of the analyzer for further possible causes and information on implausible measuring results or on measured values that are obviously incorrect or fluctuate for no apparent reason.

Switch-on conditions / additions to clearing malfunctions

Note:

Switch-on conditions are set for the PowerCEMS analysis system at the factory. These serve the safety or function monitoring of particular analysis system components and are realized using signal status queries for these components.

Depending on the version of the PowerCEMS analysis system, status signal queries run either via:

- A signal series connection
- The analyzer
- ▶ Refer to the wiring diagram of the PowerCEMS analysis system for the specific parameter settings and version or determination of switch-on conditions.



NOTICE:

- The switch-on conditions configured at the factory must not be deactivated.
- Non-observance or deactivation of the switch-on conditions can cause severe damage.

The following status parameters are queried, for example, to fulfill the switch-on conditions:

- Gas sampling probe (option)
 - Nominal temperature monitoring for heated gas sampling probes (option)
 - Monitoring runs via a low temperature alarm contact integrated in the sample gas probe.
 - A status signal is released confirming fulfillment of the switch-on conditions when the nominal value setting is maintained.
 - Refer to the wiring diagram of the PowerCEMS analysis system or the Operating Instructions of the sample gas probe for the nominal values set or to be set depending on the probe type and system version.
- Sample gas line (option)
 - Heating function monitoring for regulated, heated sample gas lines (option)
 - A status signal is released by the temperature controller confirming fulfillment of the switch-on conditions when the nominal value setting is maintained. Refer to the wiring diagram of the PowerCEMS analysis system for the Operating Instructions for the nominal values set depending on the system.
- NOx converter (option)
 - Function monitoring of converter
 - When no operating malfunction of the converter is present, a status signal to confirm fulfillment of the switch-on condition is released when the operating temperature (nominal temperature) is reached.
- Sample gas cooler
 - Function monitoring of cooler (status query)
 - When no operating malfunction of the cooler is present, a status signal to confirm fulfillment of the switch-on condition is released when the operating temperature (cooling temperature) is reached.
- Level sensor (option)
 - Monitoring of filling level in condensate collection container.
 - A status signal to confirm fulfillment of the switch-on condition is released as long as the specified maximum filling level of the condensate collection container has not been reached.

- Analyzer
To monitor analyzer failure or to monitor / query its self-diagnosis function (for internal monitoring parameters such as temperature, flow rate), a status signal is passed to a potential-free reporting terminal.
- Pump function
The pump function of the sample gas pump is controlled by the analyzer. A status signal confirming fulfillment of the switch-on condition is released when the sample gas pump is activated (operation).

PowerCEMS50

10 Specifications

Declaration of conformity

Approvals

Parameter lists

Technical data

10.1

Compliances

The technical version of this device complies with the following EU directives and EN standards:

- EU Directive: LVD (Low Voltage Directive)
- EU Directive: EMC (Electromagnetic Compatibility)



Applied EN standards:

- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement technology, control technology and laboratory use - EMC requirements

10.1.1

Electrical protection

- Insulation: Class of protection 1 according to EN 61010-1.
- Insulation coordination: Measuring category II according to EN61010-1.
- Contamination: The device operates safely in an environment up to contamination level 2 according to EN 61010-1 (usual, non-conductive contamination and temporary conductivity by occasional moisture condensation).
- Electrical power: The wiring system to the mains supply voltage of the system must be installed and fused according to the relevant regulations.

10.2

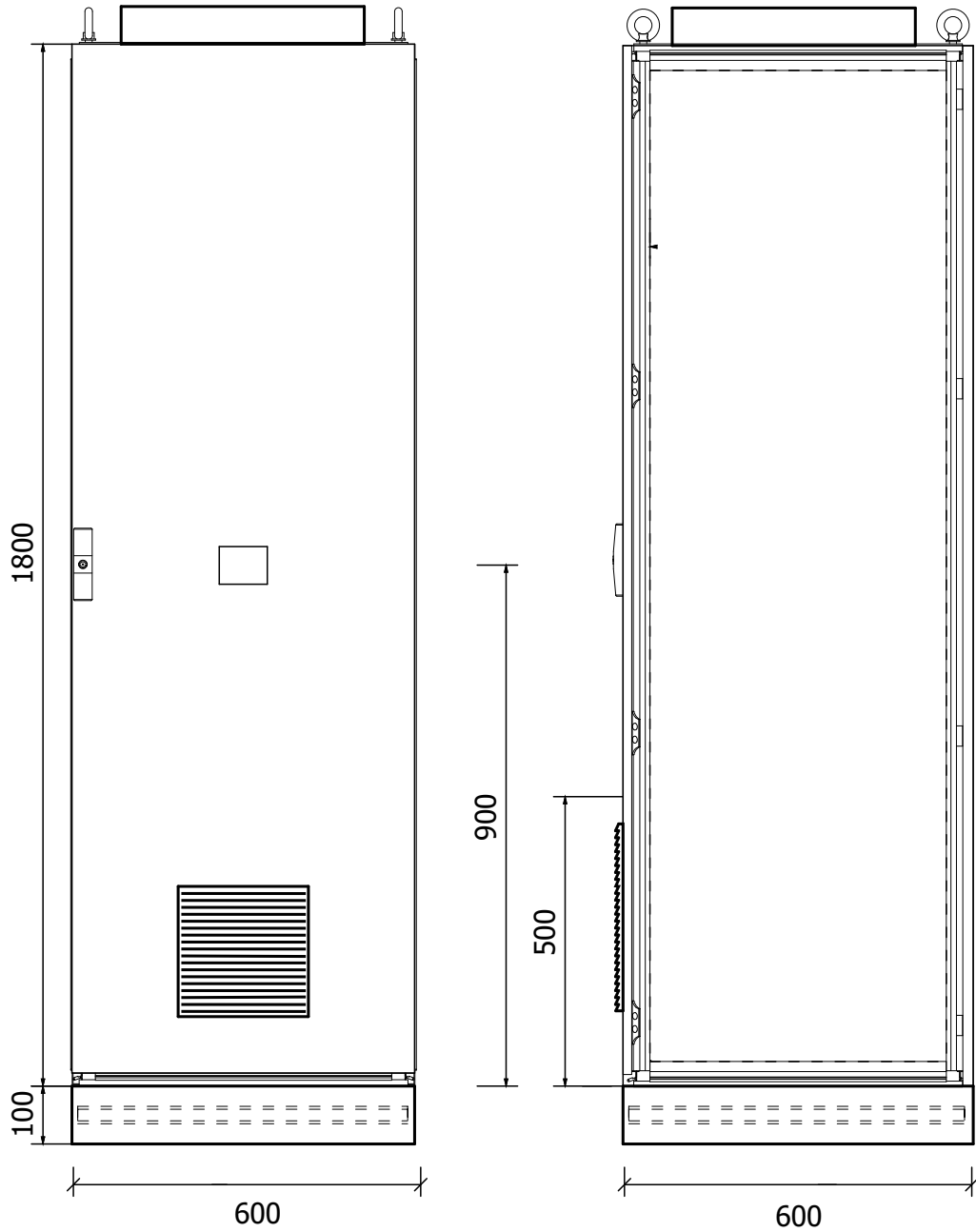
Dimensions



Refer to the view drawings or wiring diagram in the System Documentation for further dimensions.

Fig. 8

Dimensions



10.3 **Technical Data**

Technical data	PowerCEMS50
Versions	<ul style="list-style-type: none"> • Standard version • Version with NO/ NOx converter (option) • Cabinet climate unit (option)
Analyzer	<ul style="list-style-type: none"> • Modular gas analyzer(s) S710 (see product information) • Gas analyzer(s) SIDOR (see product information)
Measuring components (possible)	CO, NO, SO ₂ , O ₂ (application-dependent, refer to System Documentation)
Output and status signals	Typically 4 ... 20 mA (according to the analyzer, see System Documentation)
Sample Requirements	
Sample gas throughput	Approx. 30 ... 100 l/h (larger sample throughput possible depending on the system)
Sample gas temperature	Max. 200 °C at cabinet inlet
Dew point H ₂ O	65 °C maximum.
General Data	
Conditions at installation location	<ul style="list-style-type: none"> • Under a roof with protection against direct heat radiation, heavy dust load and corrosive atmosphere. • Not suitable for potentially explosive atmospheres
Auxiliary power supply	Refer to the system-specific wiring diagram or System Documentation for specifications on nominal power/voltage/rating. Possible variants are e.g.: <ul style="list-style-type: none"> • 400V, 50Hz • 230V, 50Hz • UPS (optional)
Ambient temperature in operation	+5 ... +35 °C ^[1] , +5 ... 50 °C with built-in cooling unit
Transport and storage temperature	-20 ... +55 °C
Relative humidity	Class F (DIN 40040), 75 % yearly average, 95 % short-term, non-condensing
Sample gas pump	<ul style="list-style-type: none"> • Pump (internal) in analyzer conditionally adequate up to 25 m sample gas line • Pump (external) in PowerCEMS analysis system cabinet (option) conditionally adequate for up to 50 m sample gas line (optional, longer lengths with more powerful pumps).
Protection class	• IP 54 • IP 34 with cooling unit
Weight	Approx. 200 ... 230 kg
Material	• Steel sheet enclosure (see System Documentation)
Color	• RAL 7035 (standard) • (other colors optional)
Calibration	<ul style="list-style-type: none"> • Manual, test gas feed manual or automatic • Automatic (according to the analyzer, see System Documentation)
Signals	1 analog output / component
Interfaces	• RS232 (optional) • RS422 (optional) • RS485 (optional)
Bus interfaces	• Modbus (optional)

[1] No direct sunlight

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