Operating Instructions
POWERCEMS100

Endress+Hauser
People for Process Automation

Described Product

Product name: POWERCEMS100

Manufacturer

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Legal notice

Original document

This document is an original document of Endress+Hauser SICK GmbH+Co. KG

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1 About this document

Note

This document:

- Contains Information necessary during the life cycle of the POWERCEMS100.
- Must be made available to all persons working with the system.

Read this document carefully and ensure that the contents are fully understood before working with the POWERCEMS100.

1.1 Limitation of liability

Note

Applicable standards and regulations, the latest state of technological development, and our many years of knowledge and experience have all been taken into account when assembling the data and information contained in these Operating Instructions.
The manufacturer assumes no liability for damage due to:

- Failing to observe this document
- Failing to comply with information and regulations
- Unauthorized fitting and installations
- Technical modifications
- Using spare, wear and accessory parts which are not released
- Unauthorized software modifications, adaptations and/or manipulations
- Failure to carry out regular maintenance work and its documentation

The actual scope of delivery can deviate from the characteristics and information described here for special versions, additional order options or due to the latest technical modifications.

1.2 Purpose of the Document

This document describes:

- Transport/installation
- Commissioning/operation
- Maintenance/troubleshooting
- Disposal

1.3 Target groups

This document is intended for qualified persons who work with the POWERCEMS100.

1.4 Further information

Special local conditions

Follow all local laws, regulations, technical rules and company policies applicable at the installation location.

Keeping documents

This document as well as other applicable Technical System Documentation/information:

- Must be kept available for reference
- Must be passed on to a new operator / new qualified personnel

1.5 Other applicable Technical System Documentation/information

Individualized versions of POWERCEMS100 with adapted internal or peripheral equipment exist. For the relevant information, see the delivered separate documentation:

- Operating Instructions for the gas analyzers.
- Operating Instructions for additional components (optional):
  - Sampling probe
  - Sample gas lines
  - Components for temperature control of external (heated under control) sample gas lines
  - NO_x converter
- Operating Instructions/Data Sheets for system control:
  - BCU (with operator panel)
- Operating Instructions / Data Sheets for components of the control cabinet climate control and lighting (optional):
  - Cabinet cooling unit
  - Cabinet fan
  - Control cabinet light (standard)
- Operating Instructions / Data Sheets for components for sample gas conditioning and test gas feeding (optional):
  - Sample gas pump
  - Sample gas cooler (including condensate pump)
  - Test gas valves (solenoid valves)
  - Humidifier container
  - Sample gas monitoring
  - Water trap (humidity separator)
- Layout of spacial arrangement of system components
- Circuit diagram
- Connection diagram
- Wiring diagram
- Gas flow plan

1.6 Document conventions

▶ Handling instruction

Reference to another document

All units and of measurement in this document are metric units.
Subject to change without notice. Illustrations may differ from the actual design.

2 For your safety

2.1 Intended use

The POWERCEMS100 is a multi-component analysis system designed for continuous flue gas and emission monitoring for industrial combustion plants and processes.

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

Any warranty claim against SICK AG becomes void when the product is used for any other purpose or is modified.

The intended use also includes reading and observing all safety instructions and information in this document.

2.2 General safety information

- ▶ Read this document carefully before working on the POWERCEMS100 and observe all safety instructions and information.
- ▶ Only qualified persons from the respective departments are permitted to work on the POWERCEMS100.
- ▶ Follow operating procedures.
- ▶ Follow local regulations.
- ▶ Follow local regulations regarding working with gas and electric components.
- ▶ Only authorized persons are permitted access to the POWERCEMS100.

System damage/transport damage

Damage to single system components can cause malfunctions of the complete system.

- ▶ Do not ignore system components damaged during transport.
- ▶ In case of damage, contact SICK Service.

2.3 Requirements on the personnel's qualification

Only qualified persons from the relevant specialist areas may carry out work on the system.

- Qualified persons are those who, based on their training, knowledge and experience as well as their knowledge of relevant regulations and standards, are capable of carrying out the tasks given and recognizing and avoiding independently hazards involved.
- Qualified electricians have the technical training, skills and experience as well as knowledge of the relevant standards and regulations to carry out work on electrical systems and to independently identify and avoid possible hazards.

2.4 Sources of danger

Toxic gases

Toxic gases can lead to poisoning when the following is not observed:

- Operate system in adequately ventilated areas or rooms.
- Use gas detection systems.
- Only open and enter Shelter (container) with suitable respiratory protection and gas warning detector (PPE).
- Only enter contaminated rooms with PPE (respiratory equipment, gas warning detector).
- Perform regular leak tightness checks.

Explosive atmospheres

Risk of explosion in explosive atmospheres.

- Do not operate the analysis system for emission monitoring in potentially explosive atmospheres.

Ignitable gases

Avoid risks due to ignitable gases:

- Do not lock or block exhaust air openings in the cabinet top.
- Operate system in adequately ventilated areas or rooms.
- Avoid open ignition sources.
- Observe and adhere to local laws, technical rules and Operating Instructions.
- Drain the measured medium in a safe way.
- Perform regular leak tightness checks.

Note

- The operator is responsible for performing pressure and leak tightness checks.
- Observe the respective approval document, legal specifications as well as the TÜV performance test.

Voltage

Touching live components can lead to death, burning or shock due to electric shock.

- Only qualified personnel may perform electrical work on the system.
- Prior to starting work on electric components, observe the five safety rules:
  - Switch off.
  - Secure against switching on.
  - Determine no voltage is applied.
  - Ground and short-circuit.
  - Cover or barrier off adjacent live parts.

Suspended loads

Suspended loads can lead to injuries if the following is not adhered to:

- Never stand under suspended loads.
- Special attention when lifting the loads.
- Comply with the lifting instructions to prevent injuries and other accidents.
- Use suitable undamaged lifting equipment.
- Wear personal protective equipment (safety helmet, safety gloves).

2.5 System warranty

Any warranty claim becomes void when:

- Safety information and measures in this document are disregarded.
- Parts or components on the POWERCEMS100 are installed, fitted or changed without authorization.
- The POWERCEMS100 is changed or modified.
- Software is changed, adapted and/or manipulated without authorization.

2.6 RoHS Directive

This product was designed for specific applications in large-scale industrial plants according to Article 2 (4) e, RoHS 2011/65/EU and accordingly may be used only in such equipment.

The product is neither suited nor authorized for use outside this equipment. SICK can therefore not accept any warranty or liability whatsoever for such use.

2.7 Safety conventions

The warning notices in these Instructions have the following meaning:

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, can result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, can result in light or moderate injury.

NOTE

Indicates a situation that can lead to material damage if ignored.

2.8 Warning signs

Sign	Significance
	Warning of danger area
	Warning of dangerous electric voltage
	Warning of explosive substances
	Warning of explosive atmosphere
	Warning of inflammable substances
	Warning of oxidizing substances
	Warning of toxic substances
	Warning of acidic substances
	Warning of suspended loads
	Warning of noxious or irritant substances
	Warning of gas cylinders
	Warning of dangers to environment, nature and organic life

Hazard warning on the control cabinet door

2.9 Mandatory signs

Sign	Significance
	Read document
	Wear protective gloves
	Wear respiratory equipment
	Wear head protection
	Wear foot protection
	Switch off prior to maintenance or repair

3 Product description

3.1 Features of the POWERCEMS100

The POWERCEMS100 is a cold dry multi component analysis system for continuous measurement and monitoring of gases.
Performance-tested version (EN 15267-3): GMS800

The POWERCEMS100 operates in extractive mode, i.e. the gas to be measured is withdrawn from the gas duct using a gas sampling probe and fed to the analysis system via a heated (controlled or self-limiting) sample gas line.

Refer to the Technical System Documentation for individual, system-specific equipment and/or project-specific version of the POWERCEMS100 analysis system

3.2 Method of operation

- Test gas feed is performed cyclically and can additionally be started manually.
- “Uncertain operating states” are shown in the status indicator.
  The POWERCEMS100 analysis system remains in Measuring mode
- Should a malfunction occur, the device switches automatically to “Stand-By”.

3.3 Functional principle

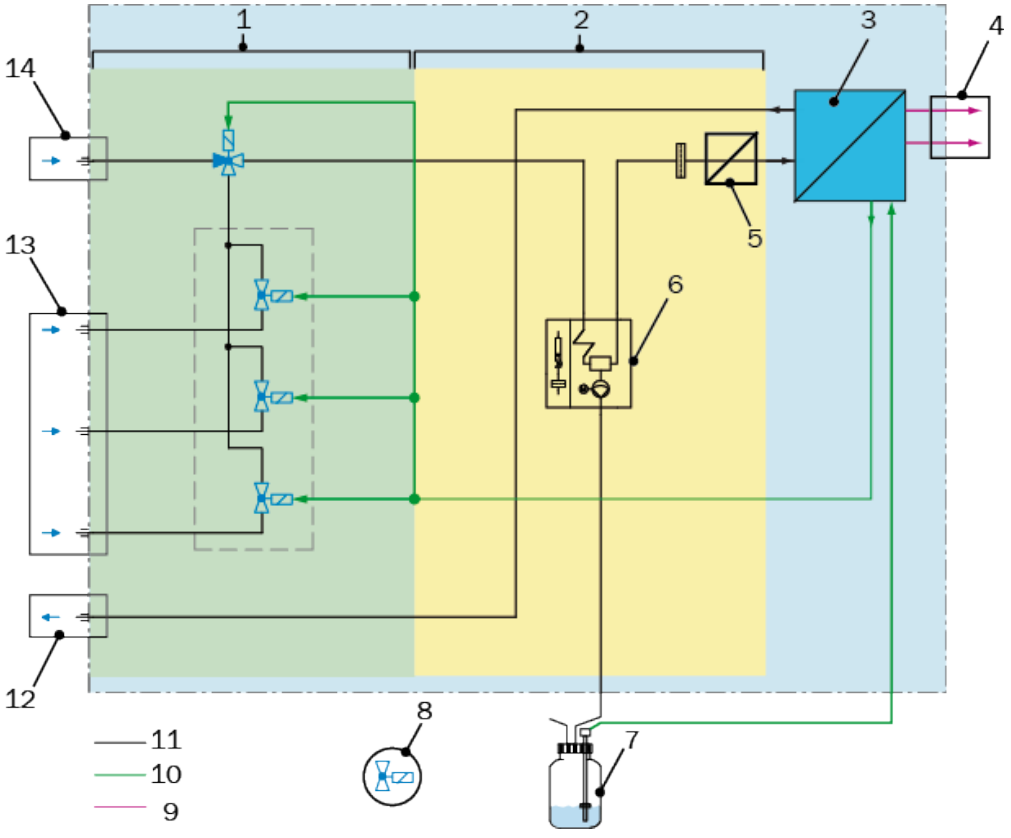


Fig. 1: Functional principle PowerCEMS100 (example)

Legend	
1	Test equipment
2	Gas conditioning
3	Analyzer
4	Analog output
5	NO_x converter
6	Sample gas cooler
7	Condensate container
8	Option (test gas valves)
9	Analog
10	Binary
11	Pneumatic
12	Sample gas outlet
13	Calibration gas inlets
14	Sample gas inlet

3.4 Internal functional units

Refer to the relevant Operating Instructions and Technical Information for further information.

- GMS811 gas analyzers.
- Control unit BCU (Basic Control Unit).
- Components for supply / regulation of heated (external) sample gas lines and heated gas sampling probes (option).
- Sample gas delivery unit:
  - Pump module GMS800
    - Filter
    - Pressure measurement
    - Humidity measurement
  - External sample gas pump for hose lengths > 25 m
  - Control valves / needle valves (option)
  - Flowmeter (option)
- Sample gas conditioning:
  - Sample gas cooler with optional:
    - Flowmeter
    - Needle valve
    - Condensate pump
    - Filter
    - Humidity sensor
  - Sample gas filter (option)
  - Condensate collection container with level monitor
  - Water trap
  - Sample gas monitoring (flow)
- Span gas / test gas feed unit:
  - Solenoid valves

  - Humidifier container (option)
- (NO_x) Sample gas converter (option)
- Terminal strips for customer analog/digital connection
- Interface modules (options)

3.5 External functional units

The external functional units are project-specific / system-specific. Refer to the Technical System Documentation for details.

- Gas sampling probes
- Sample gas lines
- on the process (stack, slot, duct) (option)
  - Temperature sensors
  - Pressure sensors
  - Gas flow rate measuring devices (e.g. FLOWSIC)
  - Dust measuring devices (e.g. DUSTHUNTER)

3.6 Measuring components

Possible measuring components[1]	CO, NO, SO_2, CO_2, CH_4, O_2[2]

1 According to built-in analyzer and equipment of the PowerCEMS100.
2 Paramagnetic/electrochemical.

Refer to the Information of the analyzer and the System/Project Documentation for system-specific details and information on the measuring components.

3.7 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)
- RS485 - Modbus RTU
- Ethernet
  - Modbus TCP
  - OPC DA
  - SOPAS ET
- Voltage supply (system-specific)
  - 400V, 50Hz
  - 400V, 60Hz
  - 230V, 50Hz
  - 230V, 60Hz
  - 115V, 50Hz
  - 115V, 60Hz
- UPS connection / supply (option)

3.8 Description of system components

3.8.1 Exterior view

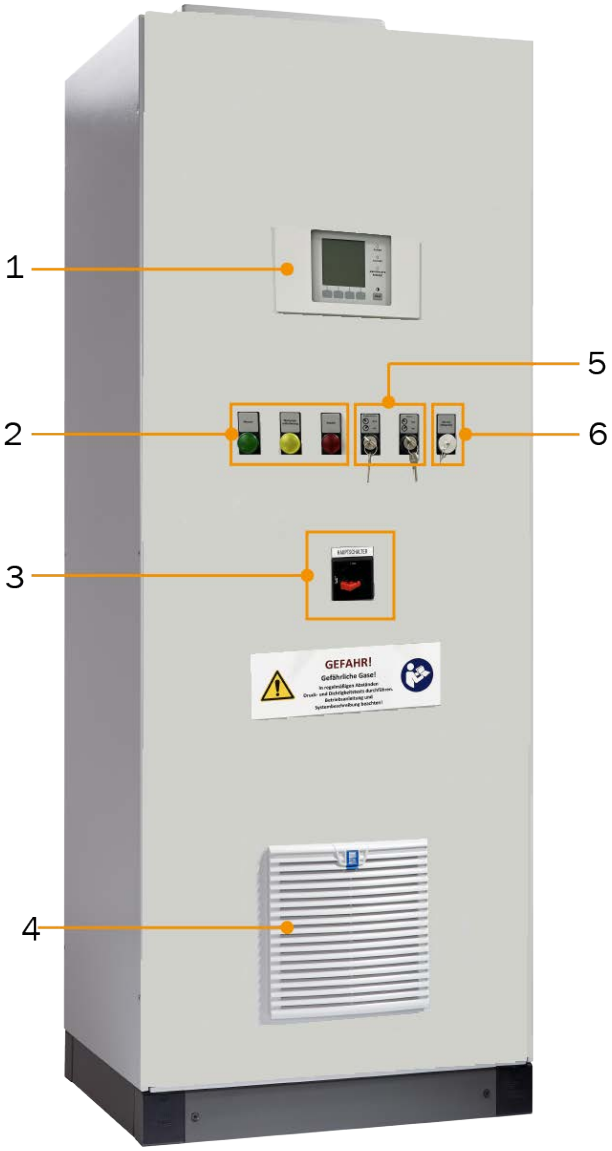


Fig. 2: PowerCEMS100 exterior view of front panel without cooling unit

Legend	
1	BCU operator panel (Basic Control Unit)
2	Status indicators: Measuring / Maintenance / Failure
3	Main switch
4	Air inlet (optionally fitted cooling unit on the side)
5	Key switch - probe calibration / maintenance
6	Optional RJ45 socket - BCU Ethernet connection

Note

The layout can vary specific to the system.

3.8.2 Interior view

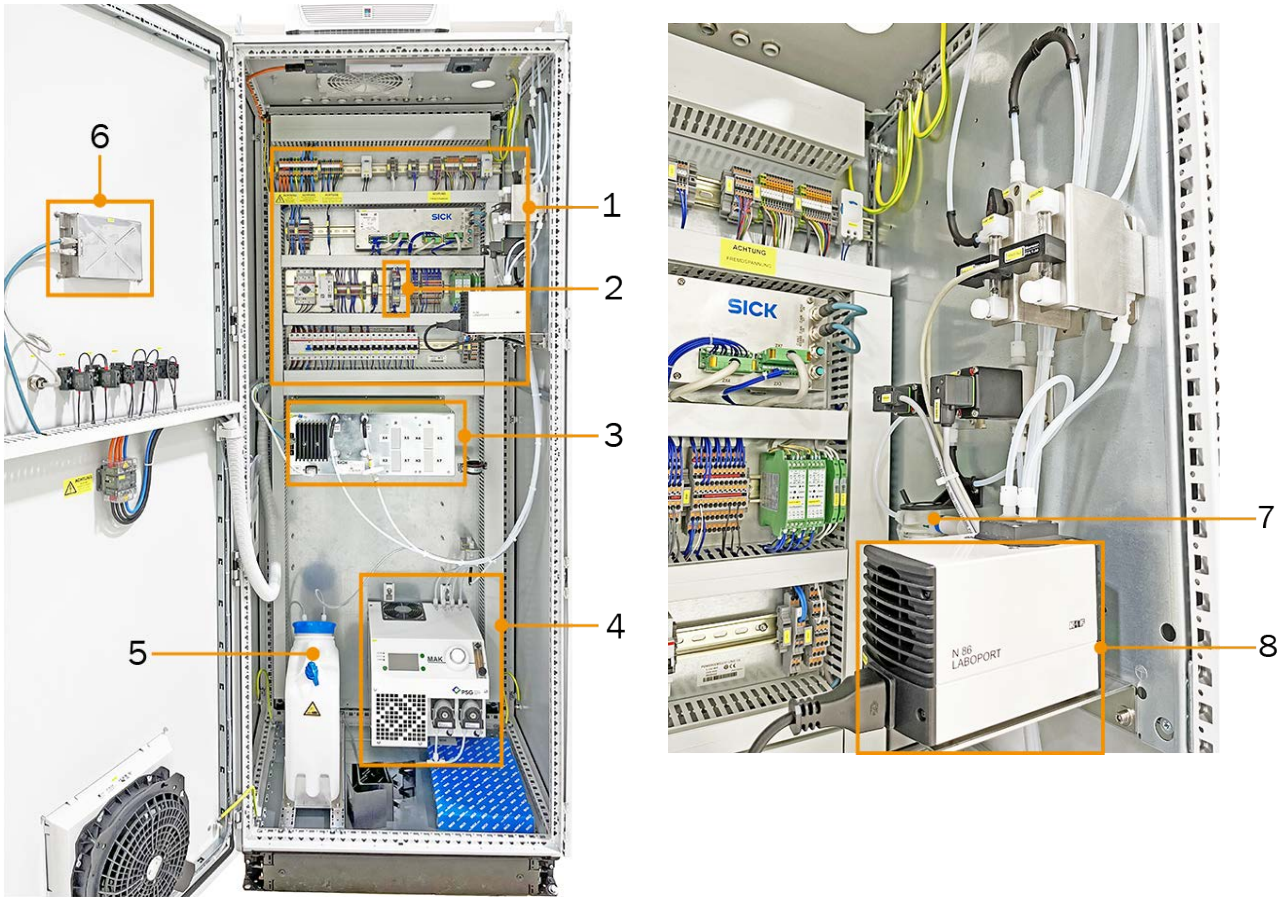


Fig. 3: PowerCEMS100 interior views (examples)

Legend	
1	Terminal strips / fuses / relays
2	Temperature controller for sample gas lines
3	Gas analyzer
4	Sample gas cooler
5	Condensate container
6	BCU operator panel (rear)
7	Zero gas humidifier
8	Sample gas pump

Note

The layout can vary specific to the system.

3.8.3 Parts list

Refer to the Technical System Documentation (EPLAN) for a detailed parts list of the system components.

3.9 Gas flow plan

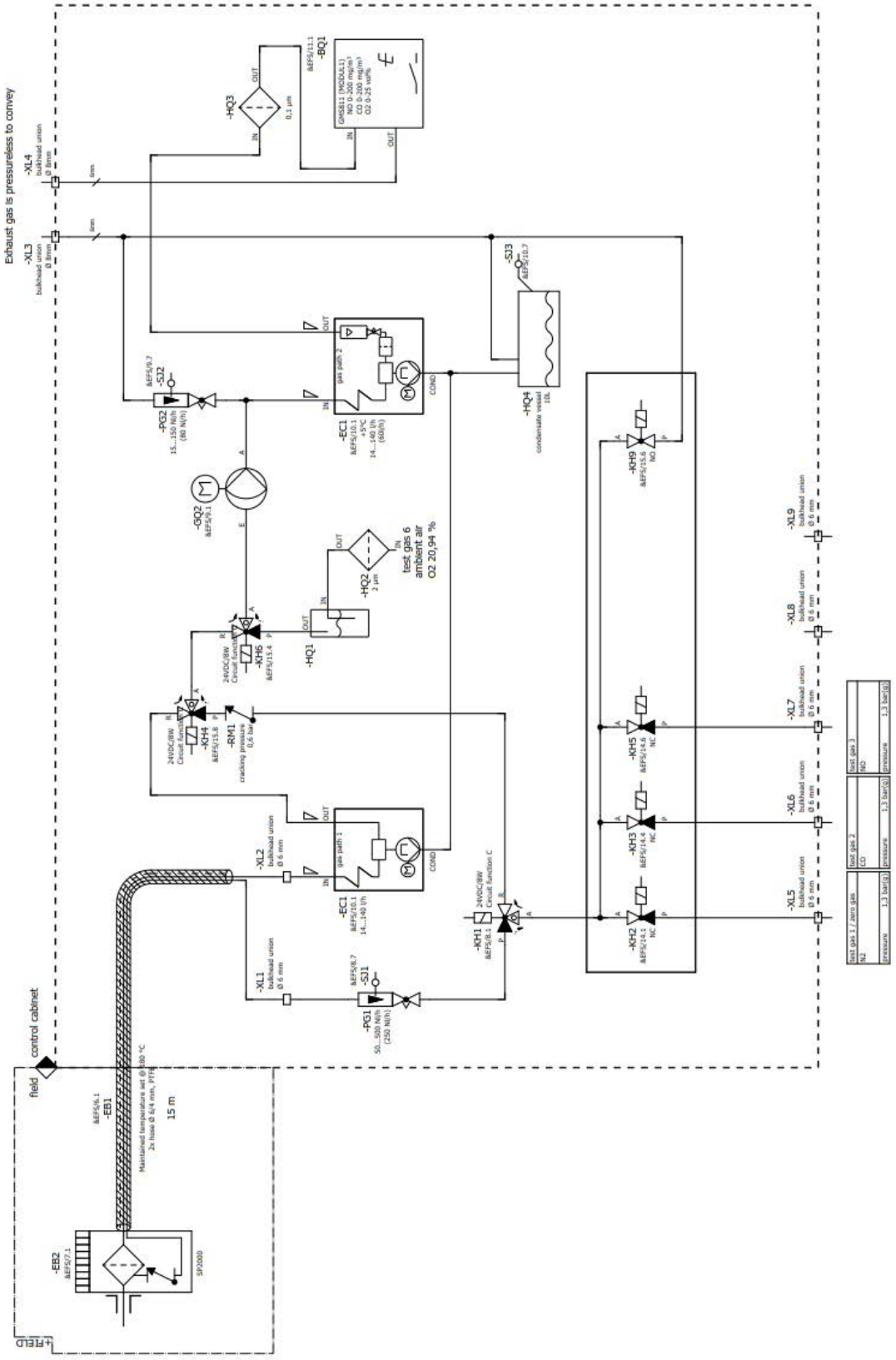


Fig. 4: PowerCEMS100 gas flow plan

4 Transport

Note

The system may only be transported and installed by qualified persons.

⚠ **DANGER**
SUSPENDED LOADS

Danger through suspended loads. Serious injuries or death.

- Never stand under suspended loads.
- Special attention when lifting the loads.
- Comply with the lifting instructions to prevent head injuries and other accidents.
- Use suitable lifting equipment.
- Wear safety helmet and safety shoes (PPE).

- Use eye bolts / transport lugs on the cabinet roof.
- Only install the system using suitable lifting equipment (e.g. crane, sling chains, lifting straps).
- Immediately after installation, secure the cabinet against falling over.

4.1 Removing the transport safety devices

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

Note

- Remove the transport safety devices from the control cabinet, filter and other parts prior to commissioning.

4.2 Checking attachments and connections

- Check hose connections and screw fittings for tight seat.

4.3 Insert filter elements and bubbling frits

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

Note

- Filter elements and bubbling frits must be installed and/or filled before commissioning.

4 TRANSPORT

5 Installation

5.1 Preparing the installation location

Note

The system may only be installed by qualified persons.
The operator is responsible for preparing the installation location.

- ▶ Observe ambient conditions
  - – Under a roof
  - – Protection against direct sun/heat radiation
  - – Heavy dust load
  - – Corrosive atmosphere
- ▶ System cabinet dimensions (see Technical Data / Technical System Documentation).
- ▶ Ensure floor carrying capacity.
- ▶ Set up the system cabinet in a low-vibration environment.
  Vibrations can influence measurement, plan vibration damping.
- ▶ Set up the system cabinet as close as possible to the sampling point.
  - – Short sample gas lines mean short T-90 times.
  - – Maximum length of sample gas line: 70 m.
  - – Observe the assembly guidelines for fitting heating hoses.
- ▶ Provide a suitable installation location for test gas cylinders (only when used).
- ▶ Observe local regulations on installing gas cylinders.
- ▶ Provide a suitable installation location for the pressure control unit.
- ▶ Air outlet of the system control cabinet ventilation / climate control
  - – Do not block air outlet of the system control cabinet ventilation and climate control.
- ▶ Provide (individual) attachments for the system cabinet.
- ▶ For installation on gratings, provide a base plate under the system cabinet as protection against falling parts or liquids (condensate).

⚠ **WARNING**
Acidic or alkaline condensate
Serious injuries to the skin and serious environmental damage.
- ▶ Wear gloves and protective clothes.
- ▶ Collect dripping condensate.
- ▶ Dispose of condensate according to valid local environment protection guidelines.

5.2 Inserting the NO_x converter cartridges (option)

⚠ **WARNING**
Hazard through hot surfaces on the converter and catalyzer cartridge.
Serious injuries through burns.
- ▶ Wear protective gloves.
- ▶ Secure components against unauthorized access.

- ▶ Check that the catalyzer cartridge is inserted in the NO_x converter.
  Normally, the converter fitted in the POWERCEMS100 analysis system is delivered with the catalyzer cartridge already fitted and ready for operation.

5.3 Preparing the gas sampling probe

Observe the Operating Instructions / Assembly Instructions for the gas sampling probes when preparing for installation or commissioning.

WARNING
Hazard through overpressure in the gas duct
Serious injuries
▶ Set the pressure via the pressure control valve.

5.4 Gas lines

The gas connections for the standard POWERCEMS100 system cabinet are located on the top of the system cabinet.

Note
The system-specific version of the POWERCEMS100 system cabinet may vary, refer to the view drawings in the Technical System Documentation.

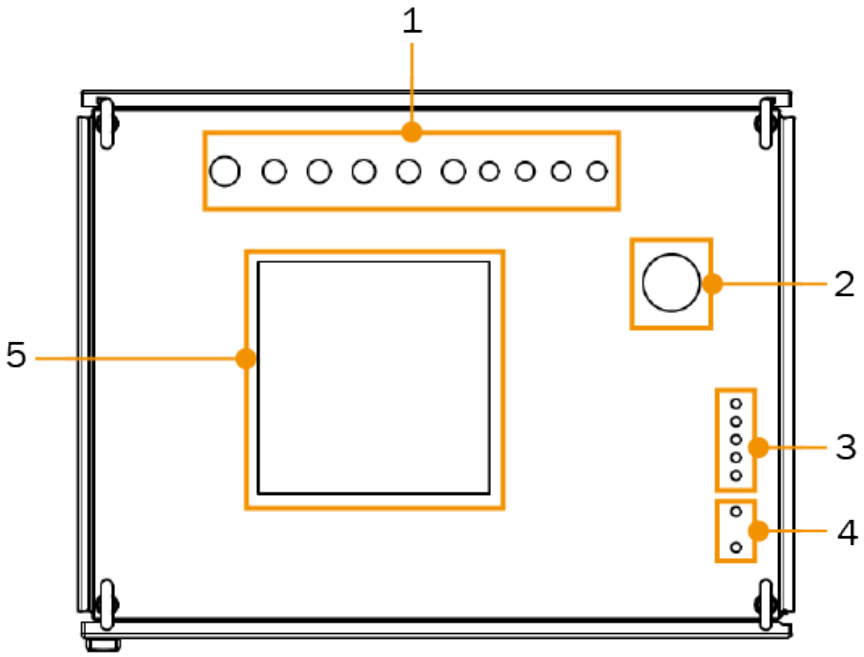


Fig. 5: Gas and electric lines connections (system cabinet top view)

Legend	
1	Ducts for electric lines
2	Sample gas line inlet
3	Zero gas/span gas
4	Gas outlet
5	Roof vent opening

WARNING
Hazard through irritating components in the sample gases
Serious injuries of the respiratory system.
- Lead the measuring system gas outlets outdoors or into a suitable flue.
- Protect sample gas outlet against frost.
- Sample gas must not penetrate the inside of the system cabinet.
- Observe the information of the plant operator.

WARNING
Hazard through acidic condensate
Serious injuries of the skin and respiratory system.
- Dispose of the contents of the condensate container according to the applicable safety measures and valid environment regulations.
- Wear suitable protective gloves and respiratory equipment.

Note
- Ensure only the media for which the measuring system has been designed are fed. If necessary, have this checked by SICK Customer Service.
- The gas lines to the POWERCEMS100 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 and avoid hazards.
- Gas lines / sample gas lines may only be connected to the POWERCEMS100 analysis system by skilled personnel.
- Risk of damage to the POWERCEMS100 and adjacent equipment if the sample gas is corrosive or could generate 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 the gas path is leaky (dilution effect).
- At the sample gas outlet, no significant counter-pressure may built-up, and no strong pressure fluctuations may occur.
- Make sure sample gas can flow out »freely« (without pressure).
  The pressure at the sample gas outlet should not be increased significantly.

5.5 Preparing the electrical installation

Note

Electrical connection may only be carried out by electricians.

DANGER
Hazard through voltage
Serious injuries or death.
- Ensure that the measuring system is always grounded.
- Never disconnect or remove the protective conductors in the measuring system or in the power supply line.

Refer to the terminal diagram in the Technical System Documentation (circuit diagram) for a description of the terminal strips.

5.5.1 Cable inlet on the system cabinet

The cable ducts on the POWERCEMS100 system cabinet are located on the top of the control cabinet.

The system-specific version of the POWERCEMS100 system cabinet can vary, refer to the view drawings and/or the Technical System Documentation.

5.5.2 Preparing the main power supply

- Lead the main power supply to the system cabinet.
- The wiring system to the power voltage supply of the system must be installed and fused according to the relevant power voltage regulations.
- Provision of UPS (option).
- Before commissioning, check the main power supply properties for rated current/rated voltage/rated capacity for system supply (auxiliary power) match the system-specific specifications of the POWERCEMS100 analysis system

5.6 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 corresponding Data Sheets or Operating Instructions of the respective external components for details on the main power supply connection or connection to the POWERCEMS100 analysis system as well as specifications on auxiliary power required (rated current/rated voltage/rated capacity).

5.7 Connecting to the customer plant

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

6 Commissioning

Note

The POWERCEMS100 analysis system may only be put into operation by skilled persons

CAUTION

Set up the POWERCEMS100 analysis system in vertical operating position **24 hours** before first commissioning.
This ensures the cooling liquid in the sample gas cooler sinks.

6.1 Commissioning of the humidifier containers (option)

- ▶ Remove possibly present transport safety devices. Insert bubbling frits in the humidifier containers.
- ▶ Fill the humidifier containers with solution and/or distilled water. Recommended filling level approx. 50%. The bubbling frit must be completely immersed.

6.2 Before switching on

Note

Before commissioning, 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 the following prerequisites:

- ▶ Observe the ambient temperature for operating the POWERCEMS100 analyzer and/or system components.
- ▶ Dry and clean interior of the POWERCEMS100 analysis system.
- ▶ All filters, filter elements and inserts fitted and ready for operation.
- ▶ Hose connections checked for tight seat.
- ▶ All project-specific external components and signal generators to be integrated such as:
  - Sample gas probes
  - Sample gas lines
  - Temperature sensors
  - Pressure sensor

  or other external signal generators and transmitters connected and ready for operation.
- ▶ Catalyzer cartridge inserted in NO_x converter.

6.3 Switching on the POWERCEMS100 analysis system

CAUTION

Set up the POWERCEMS100 analysis system in vertical operating position **24 hours** before first commissioning.
This ensures the cooling liquid in the sample gas cooler sinks.

- ▶ Switch the POWERCEMS100 analysis system on using the main switch (position “ON”). Refer to the wiring diagram for the applicable designation.
- ▶ Switch on the residual-current device (RCD).
  Refer to the system-specific wiring diagram for the relevant designations (see Technical System Documentation).
- ▶ Switch on all circuit breakers (MCB).
  Refer to the system-specific wiring diagram for the relevant designations (see Technical System Documentation).
- ▶ The POWERCEMS100 analysis system starts 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 provide 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.

6.4 Commissioning of sample gas cooler

For commissioning, observe the sample gas cooler Operating Instructions.

- ▶ Wait for the cooler warm-up phase to end (duration: approx. 30 minutes).
  A green LED on the display signals when the operating temperature (3 ° C) is reached.
- ▶ Switch on the sample gas cooler at the front of the device.

6.5 Commissioning of analyzers

Also see the Operating Instructions of the analyzer.

- ▶ Wait for the analyzer warm-up phase to end (duration: approx. 15 minutes).
- ▶ Inquire the device status using the BCU operator panel.
- ▶ Set or control the required gas throughputs according to the analyzer Operating Instructions.

Note

This is, at the same time, commissioning 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.

6.6 Commissioning of NO_x converter (option)

Also see the Operating Instructions of the NO_x converter.

- ▶ Check that the cartridge is inserted.
- ▶ Wait for the converter warm-up phase to end (duration: approx. 15 to 30 minutes).
- ▶ The converter is ready for operation after the preset operating temperature is reached.

6.7 Commissioning of cabinet climate control

Note

- ▶ Avoid frequent, short starts of the system cabinet cooling unit or opening the system cabinet door frequently for short periods.
- ▶ Observe the minimum switch-off times when switching on the system cabinet cooling unit and/or the complete POWERCEMS100 analysis system.
  Non-observance of the minimum switch-off times may damage the system cabinet cooling unit.
- ▶ Refer to the relevant Operating Instructions of the system cabinet cooling unit for recommended minimum switch-off time.

- ▶ Observe the relevant Operating Instructions and Data Sheets in the system documentation for commissioning the climate components.
- ▶ Adapt the settings for operating parameters / temperatures to local conditions. Otherwise POWERCEMS100 analysis system components could fail or be damaged.
- ▶ Wait for a certain time (**24 hours**) after installation or initial commissioning 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 wait time.

Installation location

The corresponding climate components are fitted on the POWERCEMS100 analysis system depending on the planned installation location (local conditions).
The following can be used, for example:

- Control cabinet fan (option)
- Control cabinet cooling unit (option)
- Control cabinet heating (option)
- The climate components are pre-set to the following operating parameters/temperature values:
  - Control cabinet fan / cabinet thermostat: 25 °C
  - Control cabinet cooling unit: 25 °C
  - Heating (optional): approx. 15 °C to 20 °C

Refer to the relevant Operating Instructions for details on commissioning and operation of the individual climate components or the wait time for the system cabinet cooling unit.

Note

These settings must be adapted to local conditions.
Internal system components of the POWERCEMS100 analysis system can fail or be damaged when operating / ambient temperatures are too low or high.

Information on operation / function of the system cabinet cooling unit

An additional door limit switch is normally fitted to avoid higher condensate levels when the system cabinet door is open.
Opening and closing the system cabinet door prevents a possible cyclic operation. Switching the cooling function off and on is automatically delayed. Refer to the Operating Instructions of the cooling unit for duration and further details on the switching delay.
Avoid frequent, short starts of the cooling unit or opening the system cabinet door frequently for short periods.

6.8 Commissioning of heated gas sampling probe

Observe the relevant Operating / Assembly Instructions for the gas sampling probe during commissioning.

DANGER
Hot surfaces on probe and filters
Serious burns.
- ▶ Wear protective gloves.
- ▶ Protect parts against unauthorized access.

DANGER
Escaping gas due to overpressure in the gas duct
Serious injuries of the eyes and respiratory system.
- ▶ Regularly check the gas duct for leak tightness.
- ▶ Wear suitable respiratory equipment.
- ▶ Ensure adequate ventilation.

DANGER
Explosive sample gas.
Serious injuries or death.
- ▶ Check the gas duct for leak tightness.
- ▶ Prevent ignitions parks (light switch, open fire).
- ▶ Ensure adequate ventilation.

DANGER
Sample gases detrimental to health
Serious injuries of the respiratory system or death.
- ▶ Wear suitable respiratory equipment.
- ▶ Ensure adequate ventilation.

- The sample gas probe is a system-specific / project-specific external functional unit (option).
- Wait for the heating up time for the gas sampling probe to end (duration: approx. 2 hours.
- Check the set-point setting on the built-in thermostat or on the external controller (optional controlled heater).
- See the Technical System Documentation for set-point values.
- Make sure the built-in ball valve is closed on gas sampling probes with ball valve (option).

6.9 Restarting after longer shutdown

- Contact SICK Customer Service to clarify 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, see following Table.

System component to be checked	Check for:
Lines/hoses	– Condensate residues – Blockage – Contamination – Cracks – Porous or brittle material – Tight and correct seat
Filter[1]	– Condensate residues – Contamination – Ready for operation
Humidifier container[2]	– Ready for operation
Sample gas pump	– Ready for operation
Water trap[3]	– Condensate residues
Analyzers	– Ready for operation
NO_x converter (option)	– Ready for operation – Cartridge
Gas cooler	– Ready for operation
Span gases	– Use-by date – Remaining reserves – Pressures
System cabinet climate control	– Ready for operation
Gas monitor / Gas measurement computer	– Ready for operation
Condensate collector (with level switch)	– Ready for operation – Fill level
Sample gas outlet, sample gas recirculation	– Blockages
Sampling probe	– Ready for operation
External components and signal generators	– Ready for operation

1 Possibly replace filter elements/inserts
2 Fill, if necessary
3 Replace the water trap when condensate is present

In addition to this list, also observe the information and conditions for particular system components in Sections “Commissioning” and “Maintenance” in these Operating Instructions.

Refer to the Operating Instructions for the individual system components for further details and information.

7 Operation

7.1 System components

Further information on:

- Operation
- Layout and function
- Setting system parameters

of system components can be found in the relevant Operating Instructions as well as in the Technical System Documentation.

7.2 Operating elements on the BCU operator panel

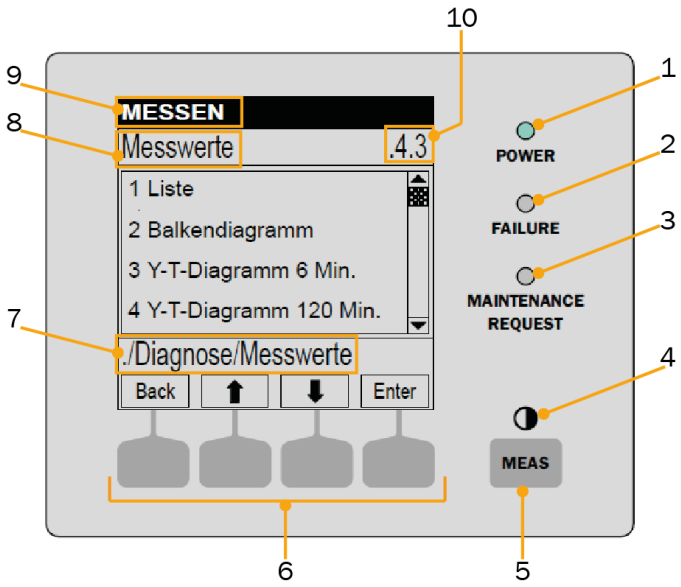


Fig. 6: Operating and display elements of the BCU (with menu example)

Legend

1	Signal LED - POWER
2	Signal LED - FAILURE/error message
3	Signal LED - MAINTENANCE REQUEST
4	Contrast symbol
5	MEAS - Measuring screen
6	Function buttons F1, F2, F3, F4
7	Current menu branch
8	Current menu
9	Status bar
10	Menu number

7.3 Switching on

- ▶ Switch on the main switch on the system cabinet front door.
  - Signal LED “POWER” lights red.
- ▶ Measuring screen appears on the display.
- ▶ Wait for the heating up phase to complete.
  - Signal LED “POWER” lights red.
  - The measured values blink on the display.
  - Status bar shows “see logbook”.
    During the heating up phase, the start process is saved in the logbook.
    “Measure” is displayed in the status bar at the end of the heating up phase.
- ▶ Check safe operating state.
  - Signal LED “POWER” lights red.
  - Signal LED “FAILURE” does not light.
  - Measuring screen active for constantly displayed measured values (not blinking).

Note

The display lighting switches off automatically after some time.
Reactivation: Press the F1 or F4 function key.

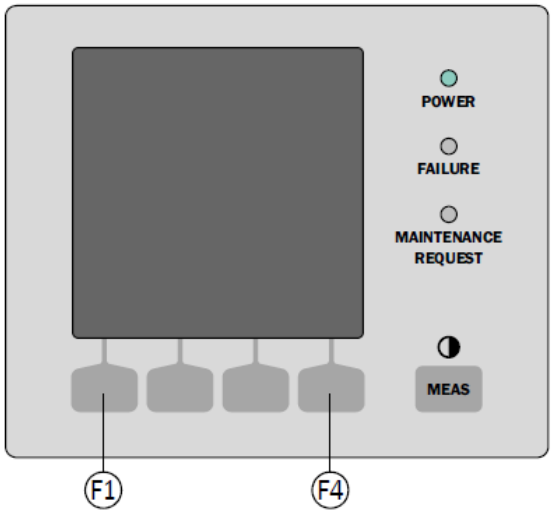


Fig. 7: BCU operator panel, function buttons F1 - F4

Refer to “Supplementary Operating Instructions BCU” for further, detailed information on operation via the BCU operator panel.

7.4 BCU operating functions overview – Menu structure in SOPAS

User level:	O Operator (standard)	A Authorized operator
Access rights:	o view	● set/ start

Path			Menu contents	O	A
BCU					
	Measuring Screen				
		Measuring Screen 1	*Programmed layout*	o	o
		Measuring screen 2 ... 8			
	Diagnosis				
		Logbook	*System messages list*	o	o
		Status	*"LED" status indicator*	o	o
		System overview	*Measured values | Source (sensor)*	-	o
		I/O module	*I/O modules installed*	o	o
	Configuration				
		Measuring Screen			
			Measuring Screen 1	*Layout selection*	-	●
				Programming		
			Measuring screen 2 ... 8			
		I/O				
			Digital Inputs (DIi)	Name | Inverted	o	●
			Digital outputs (DOi)	Source | Inverted	o	●
			Analog inputs (AIi)	Name | Zero | Measuring range	o	●
			Analog outputs (AOi)	Source | Zero | *Ranges*	o	●
			Modbus inputs (MBIi)	Signal		
			Modbus output (MBOi)	Source	o	●
		Formulas				
			Formulas	*Programming | Activating*	o	●
			Function button	Name | Function	o	o
		Timer				
			Cyclic trigger (CTi)	Name | Start time | Cycle time	o	●
			Countdown (SCCDi)	Name | Time	o	●
		Variables				
			Real values (RVi)	Name | Function	o	●
			Integer values (IVi)	Name | Function	o	●
			Boolean values (BVIi) – input signal	*Source*	o	●
			Boolean values (BVOi) – output signal	Monitor	o	o
			Boolean values (BVi)	Name | Function	o	●
			Help values (SjHVk)	Source | Sensor | Help value	o	●
		Sequence control programs				
			Number		o	●
			Sequence control programs			
				Sequence control 1 (SC1)	Overview | Program	o	●
				Sequence control program 2 ...4 [1]			
		Measured values (MVi)		Limit values | Measured value mask	o	●
		Measuring point automatic		*Measuring points | Measuring times*	o	●
		Test Gas Table		*Setpoint value- Use*	o	●
		Adjustment/validation		*Programming*	o	●
		Pump control		*On/off | Capacity*	o	●
		Modbus		*Status*	o	o
		Device		Device number	o	o
				Location	o	●
				IP address	o	o
				CAN baud rate	o	o
				Time | Temperature	o	o
		System		Serial number | Tag No.	o	

Path			Menu contents	O	A
Maintenance					
	Tests			-	
		Digital inputs	*Assignment | State*	-	o
		Digital outputs	*Function test*	-	●
		Analog inputs	*Use | Current signal*	-	o
		Analog outputs	*Function test*	-	●
	System functions		Warm start	o	●
			Parameter upload		
			Firmware update		
	Maintenance mode		*Activate status (flag)*	o	●
			Status display	o	o
	Function buttons		*Start a function*	o	o
	Operator commands		*Start/abort an adjustment validation function*	-	●
	Manual adjust		Components | Function | Start	●	●
	Data backup				
		User settings	Backup | Restore	-	●
		Factory settings	Restore	-	●

[1] When a corresponding number is set

Refer to the Technical Information of the Basic Control Unit (BCU) for GMS800 series and “Supplementary Operating Instructions BCU” for detailed information on the BCU operating functions.

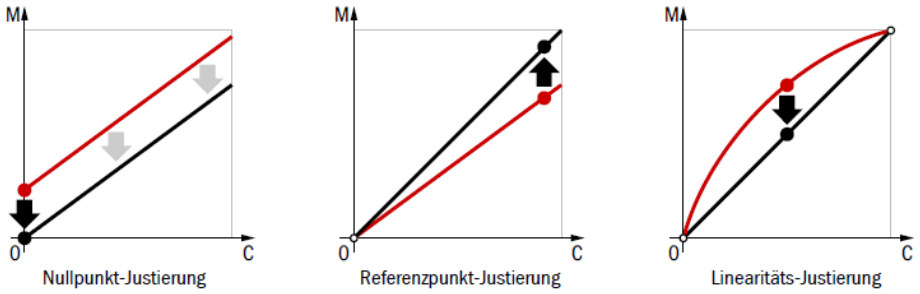
8 Adjusting

8.1 Adjustment purpose

It is unavoidable that some of the properties of Analyzer modules will change during the operating time. This changes measurement results even when external conditions remain identical.

This gradual change in measured results is known as drift. Zero point drift and reference point drift exist. These drifts are measured during adjustment and the relation between real concentration and measured value (characteristic curve) is corrected accordingly (see Fig. 8:).

The linearity of the characteristic curve (proportional relation between real value and measured value) can also be corrected afterwards .



Zero point adjustment | Reference point adjustment | Linearity adjustment

Fig. 8: Adjustment functions (schematic)

8.2 Principle adjustment procedure

- A test gas is fed in.
- A measured value (actual value) is determined with this test gas.
- This actual value is then compared against the programmed setpoint value.
- The internal adjustment parameters are then corrected mathematically so that the actual value then corresponds to the setpoint value.

To attain complete adjustment, this procedure must be performed twice for each measuring component – once for the zero point and once for the reference point. Relevant sequence control programs control these procedures.

When is adjustment necessary

The POWERCEMS100 analysis system and/or the analyzers have to be adjusted:

- approx. 12 - 24 h after commissioning
- at regular intervals during operation

Note

Choose larger adjustment intervals when possible (e.g. 3 or 6 months) when permitted by the application or when expressly allowed (see TÜV performance test report).

- For emission measurement required by law according to the Certification or legal specifications (according to TÜV performance test report).

Note

The specific adjustment cycles depend on the application and are not the responsibility of SICK AG

8.3 Adjustment procedure

There are two procedures for adjusting the POWERCEMS100:

- Analyzer adjustment (automatic test gas feed)
- Probe adjustment

Different test gas paths are used for the procedures.

▶ Analyzer adjustment - the test gas is fed directly to the analyzer.
▶ Probe adjustment - the test gas is fed into the analyzer via the probe.

Select the respective procedure via the key switch on the system cabinet door.
During adjustment, the analyzer independently switches to the suitable test gas valve. The available test gases have to be entered in the analyzer first (see Operating Instructions BCU).

Refer to the relevant Technical System Documentation for assignment of the test gases to the test gas valves.

8.4 Test gas pressure

The test gas pressure for both adjustment procedures is set to:

▶ 1.3 bar for all test gases.

Setting is done via the pressure control valve.

8.5 Flow rate values

The flow rate values for both procedures differ as follows:

▶ Analyzer adjustment: 60 Nl/h
Automatic monitoring by the analyzer.
▶ Probe adjustment: ≥ 250 Nl/h
Visual monitoring on the flowmeter.

Setting the flow rate value for external pump via:

- Bypass needle valve
- Bypass valve

Setting the flow rate value for internal analyzer pump via:

- Needle valve on the flowmeter of the sample gas cooler

8.6 Adjustment abort

An adjustment abort is either performed:

▶ automatically

or

▶ manually on the analyzer

Note

When the adjustment procedure is aborted, it has to be acknowledged by pressing the key switch. Only then can a new adjustment procedure be started.

8.6.1 Clearing malfunctions

Malfunction	Possible cause	Action
Adjustment abort	Test gas container empty	Replace test gas container
	Test gas container not connected	Connect test gas container
	Test gas path clogged	Clean test gas path
	Test gas path interrupted	Connect test gas path
	Test gas pressure too low	Set test gas pressure to 1.3 bar
	Non-return valve on the probe does not open	Check non-return valve, replace if necessary

8.6.2 Resetting the maintenance request after automatic adjustment abort

- In case of an adjustment abort, the adjustment values are discarded.
- A maintenance request is activated.
- Turn key switch to analyzer adjustment and back again (acknowledgment).
- The maintenance request is reset.

8.6.3 Manual adjustment abort on the analyzer

- After a manual adjustment abort, the adjustment values are discarded.
- Maintenance request is not activated.

9 Decommissioning

9.1 Safety measures before decommissioning

9.1.1 Protection of external components

- Consider and protect connected external components.
- Check if any automatic emergency measures could be triggered when decommissioning the analyzer. Observe the switching logic of the POWERCEMS100 analysis system as well as the gas analyzers.

Refer to the relevant Operating Instructions for further information on the switching logic of the gas analyzers.

- Prepare connected software systems for decommissioning.
  This helps to prevent possible malfunction messages.
- Observe electrical safety rules.

9.1.2 Completely remove toxic/humid sample gases

DANGER
Sample gases detrimental to health or toxic
Serious injuries of the respiratory system or death.

- Wear suitable respiratory protection for all work on the gas lines.
- Prior to decommissioning, adequately purge the measuring system with neutral gas (e.g. nitrogen N_2).

- Stop sample gas feed.
- Switch off sample gas pumps.
- Activate status output “Maintenance” on the gas analyzer. The sample gas pumps are switched off.
- Prior to decommissioning, all sample gas components have to be thoroughly purged with a dry, neutral gas.
- Consider the maximum allowable sample gas pressure of the analyzer when purging with a neutral gas.

Refer to the Operating Instructions/Technical Data Sheet of the relevant analyzer for information on the maximum allowable sample gas pressure.

- Purging with ambient air can also be performed after considering and checking the application and ambient conditions.
  For purging, suction in the ambient air via the sample gas probe for several minutes.
- Stop the purge gas feed and close off all gas connections of the POWERCEMS100 analysis system or close off the relevant valves in the purged gas path.

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

9.1.3 Switching off

- ▶ Observe the minimum switch-off times for the control cabinet cooling unit.
- ▶ Failure to observe the minimum switch-off times can damage the control cabinet cooling unit.

Refer to the relevant Operating Instructions for information on the minimum switch-off times of the control cabinet cooling unit.

- ▶ Switch off the control cabinet cooling unit.
- ▶ Switch off the POWERCEMS100 analysis system at the main switch (on the outside of the door) (position “OFF”) and secure against switching on.

9.1.4 Decommissioning

- ▶ Disconnect the POWERCEMS100 analysis system completely from the power supply.
- ▶ Disconnect the sample gas lines from probe and system cabinet.

DANGER
Sample gas detrimental to health or toxic
Serious injury of the respiratory system or death.
- ▶ Wear suitable respiratory protection for all work on the gas lines.
- ▶ Prior to decommissioning, adequately purge the measuring system with neutral gas (e.g. nitrogen N_2).

- ▶ Dispose of the condensate.

WARNING
Acidic condensate
Serious injuries and/or serious damage to environment and nature.
- ▶ Wear personal protective equipment (gloves, respiratory protection).
- ▶ Disposal according to local and legal environment regulations and guidelines.

- ▶ Empty the humidifier containers.
- ▶ Close off the gas inlet/outlet on the analyzer.
- ▶ Close off the end of the sample gas line on the probe.
- ▶ Dismantle the sample gas probes and close off the connections with blind flanges.

9.1.5 Storage

Conditions

- In dry, vented rooms.
- Ambient temperatures: -20 ... +55 °C
- Relative humidity: ≤ 75% without condensate.

CAUTION

To avoid condensation, purge the sample gas paths of the POWERCEMS100 analysis system with a dry, neutral gas before storage.

10 Maintenance

10.1 Important safety information on maintenance

Note

The system may only be maintained by qualified personnel.

- ▶ Do not remove, add or modify any components on the system.
- ▶ Unless such changes are described and specified in the official information by the manufacturer. Otherwise:
  - – the manufacturer's warranty becomes void
  - – the approval becomes void.

⚠ **DANGER**
System switched on during opening
Serious injuries or death.
- ▶ Prior to opening, disconnect the system cabinet from the power supply.
- ▶ During all maintenance work as well as replacing system components, switch off the system and secure against switching on.
- ▶ Do not interrupt protective conductor connections.

⚠ **DANGER**
Leaky or opened sample gas lines
Serious injuries or death.
- ▶ Prior to working on the gas lines with combustible or explosive sample gas, interrupt the gas feed and purge the gas lines with neutral gas.
- ▶ Wear personal protective clothing.

⚠ **DANGER**
Sample gas detrimental to health or toxic
Serious injuries or death.
- ▶ Wear personal protective equipment (gloves, respiratory protection).

⚠ **DANGER**
Hot surfaces
Serious skin burns.
- ▶ Wear protective gloves.

⚠ **WARNING**
Toxic condensate
Serious damage to environment, nature and health.
- ▶ The liquid contained in the condensate container is acidic, alkaline and contains inorganic or organic substances toxic or harmful to the environment.
  This waste must be disposed off according to legal regulations and as hazardous waste when necessary.
- ▶ Wear personal protective equipment (gloves, respiratory protection)

Refer to the relevant Operating Instructions of the relevant system components for details on maintenance and safety information.

10.2 Operating state - Maintenance

Either activate the Maintenance mode:

- Via the key switch “Maintenance” on the outside of the system cabinet door.
  The sample gas pump remains active and a maintenance signal is set.

or

- Activate Maintenance mode on the BCU.
  LED “MAINTENANCE REQUEST” lights. Menu function “Maintenance signal” activates status “C”.
  When this status controls a digital output of the GMS800, an external source receives a signal that the GMS800 is not in Measuring mode (e.g. during maintenance work). The sample gas pump is switched off and the sample gas signals are not processed.

10.3 Visual inspection / functional check

- Perform outer visual check daily/weekly.
  Pay attention to the signal lamps on the system cabinet door.
- Check the following components of the complete analysis system regularly (monthly):
  - Screw connections
  - Hose connections
  - Gas lines
  - Connections of the POWERCEMS100
  - Connections of the probe

10.4 Maintenance intervals

System components	Description	Intervals		
		1x/ week	1x/ month	1x/ year
Gas sampling probe (option)	▶ Check filters and seals. Replace filters regularly depending on wear. **Note:** See the Operating Instructions of the gas sampling probe.		X	
Sample gas line (option)	▶ Check heating function. Clean. **Note:** Observe the operating instructions/assembly guidelines for fitting heating hoses.		X	
Filter (option)	▶ Check condition. Degree of contamination different depending on the application. ▶ Check for condensate in filter housing bottom. Drain off condensate when necessary. **Note:** Observe Operating Instructions/Data Sheets.	X		
Glass wool filter (option)	▶ Check condition. Wear different depending on the application. **Note:** When replacing brass or glass wool, make sure no particles can penetrate the control cabinet.	For 2/3 dark coloring and/or heavy degradation, replace filter		
Gas washer (option)	▶ Function check of the gas washer with automatic media replacement. Inlet/outlet must be free.	X		
Humidifier container (option)	▶ Check function. ▶ Check liquid reserves (solution and/or distilled water) of humidifier container and top up if necessary. Filling quantity approx. 50% of container volume. ▶ Check for contamination / blockage of the containers, bubbling frits and Raschig rings. Clean as required. **Note:** Bubbling frits / Raschig rings are fragile.	X		
Sample gas pump (option)	▶ Check function. **Note:** Observe relevant Operating Instructions.		X	
Water trap	▶ Replace. **Note:** Condensate in the water trap blocks it. Thus, the gas flow is interrupted and a “System error” is signaled.			X
Cabinet vent Filter fan (option)	▶ Functional check ▶ Clean heavily contaminated filter pads and replace as necessary. **Note:** Replace/clean filters in good time. Clean filter pads by flushing or blowing. **Note:** Observe the filter fan Operating Instructions.		X	
Cabinet thermostat (option)	▶ Check function in connection with the filter fan.		X	
Condensate collector (with level switch) 	▶ Check container state. Empty when necessary. Observe the safety instructions. **Note:** Sample gas condensate is hazardous waste. Observe regulations on condensate disposal according to the Water Resources Law (WHG). **Caution**: Serious damage to environment, nature and health by toxic condensate.		X	

System components	Description	Intervals		
		1x/ week	1x/ month	1x/ year
Adsorption pads (universal filter) (option)  	The adsorption pad is used to adsorb water vapor in certain applications. The adsorbent becomes colorless as it absorbs more and more moisture (e.g. silica gel / M&C “90F5110” with color indicator orange). Replace the adsorbent when it is completely colorless. The state can be seen from the outside without having to unscrew the filter. **Note:** Observe the relevant Product Information and/or the Data Sheet of the universal filter (“FT-AP” filter fitting) for filling the filter cartridges. **Caution:** Depending on the sample gas or application, the adsorbent can be contaminated with noxious and / or highly flammable substances. Dispose of used adsorbent as hazardous waste according to the applicable disposal regulations. **Caution:** Observe applicable health and safety regulations. **Note:** Regeneration of the adsorbent is not allowed when it is contaminated with dangerous substances.	As required		
Sample gas cooler (including condensate pump)	▶ Check enclosure and condensate pump for damage.		X	
	▶ Replace the optionally fitted Teflon filter cartridge depending on wear and degree of contamination.		X	
	▶ Regulate the refrigerant condenser depending on the degree of contamination.		X	
	▶ Replace the hoses of the condensate pump depending on the wear. ▶ Check screw connections / connections. **Note**: Observe the Operating Instructions of the sample gas cooler and the condensate pump. **Caution**: The condensate can be acidic.	At least 1 per year. Recommendation: every 3 months		
Analyzer	**Note:** Observe the Operating Instructions of the respective analyzer.			
NO_x converter (option) 	**Note:** Make sure the correct cartridge type is used when replacing catalyzer cartridges (differing temperature ranges). **Note:** Refer to Operating Instructions of converter for details on exchanging catalyzer cartridges. **Warning:** Risk of burns by extremely hot surface of the catalyzer cartridge. Wear protective gloves.	As required		
Gas monitor / Gas measurement computer (option) (Gas warning system)	Have it tested with test gas by skilled Service personnel. **Note:** Observe Operating Instructions of gas monitor. **Caution:** The operator must check the limit or threshold values (alarm thresholds) set at the factory locally and adapt these to local conditions. The settings must observe the relevant regulations and safety regulations as well as laws on monitoring toxic gases and / or LEL monitoring. **Recommendation:** Conclude a maintenance contract with the Service department of the device manufacturer. **Note:** In case of an alarm, sample and test gas feed are interrupted and a visual as well as acoustic warning message triggered			X
Lines/hoses	Check for: ▶ possible blockages, contamination, cracks. ▶ possible porous or brittle condition. ▶ tight, correct seat. ▶ Clean or replace lines / hoses as necessary.			X

System components	Description	Intervals		
		1x/ week	1x/ month	1x/ year
Control cabinet cooler (option)	**Note:** Observe relevant Operating Instructions.			
Span gases (option)	Check state and availability of span gases: ▶ Feed pressure from the central gas supply. Option: Monitor cylinder pressure with contact pressure gauge. ▶ Remaining reserves in pressure cylinders. ▶ Use-by date.		X	

10.5 Cleaning information

- ▶ Clean the outside and inside of the system cabinet with a soft cloth.
- ▶ Do not use any mechanically or chemically aggressive cleaning agents.
- ▶ Do not allow any liquids to penetrate the system cabinet or housings of system components.

10.6 Wear parts (WP) / Spare parts (SP)

Sample gas filter / SICK filter					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
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.
Brass wool, approx. 12 g	2 028 844	Corrosion inhibitor filter (2028305)	X		2 pcs. / 1 Y.
Coupling GL18 - DN4/6 - PVDF	5 312 119	Corrosion inhibitor filter (2028305)		X	2 pcs. / 2 Y.
Filter tube DURAN L=200 mm D=18 mm 2xGL18	4 039 113	Corrosion inhibitor filter (2028305)		X	1 pc. / 2 Y.
Corrosion inhibitor filter complete, incl. filling (brass wool) incl. 2 connections DN4/6 PVDF (l=230 mm, D =16, glass)	2 028 305			X	1 pc. / 2 Y.
Filterwool,glassNo.703 11µm Sales unit=500 g	5 311 940	Glass wool filter	X		1 pc. / 1 Y.
Coupling GL32 - DN4/6 - PVDF	5 312 284	Glass wool filter		X	2 pcs. / 2 Y.
Filter tube DURAN L=250 mm D=40 mm 2xGL32	4 039 232	Glass wool filter		X	1 pc. / 2 Y.
Water trap WT20.5K	5 313 317	Water trap		X	1 pc. / 2 Y.
Filter element (front panel)	5 317 730	(2 028 590) Fi56NK3 Front fitted filter Diaphragm fine filter (visible contamination)	X		1 pc. / 1 Y.

Sample gas filter / filter M&C					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Filter element F-0,1GF50 (glass fiber) 0.1 µm	2 038 474	Front fitted filter FPF-0,1GF (5311705)	X		1 pc. / 1 Y.
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 element for filter CLF-5	5 312 349/ 5 311 437	Aerosolfilter CLF-5 (5311101)	X		1 pc. / 1 Y.
Spare parts set I for filter CLF-5/W (filter frit, diaphragm filter, flat ring disc, O-ring)	5 312 359	Aerosolfilter CLF-5/W (5311436)	X		1 pc. / 1 Y.
Spare parts set II for filter CLF-5/w (diaphragm filter, flat ring disc)	5 312 360	Aerosolfilter CLF-5/W (5311436)	X		1 pc. / 1 Y.
Adsorption pad / filter FT-AP 03F5200 (M&C)	5 322 648			X	1 pc. / 2 Y.
Adsorption material for adsorption pad Dry beads with moisture indicator. (silica gel) Color: orange, quantity: 1000 ml	5 603 168	Adsorption pad FT-AP 03F5200 (M&C)	X		As required

Sample gas filter / filter Bühler					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Filterelement S2 (glassfiber) 2 µm Sales unit=5 pcs.	5 312 243	Fine filter AGF-PV-30-S2 (5312425)	X		1 pc. / 1 Y.
Filterelement F2L (PTFE) 2 µm Sales unit=1 pc.	5 317 771	Fine filter AGF-PV-30-F2L (0730459)	X		1 pc. / 1 Y.
Filterelement F25 (PTFE) 25 µm Sales unit=5 pc.	5 311 943	Fine filter AGF-PV-30-F25 (5312424)	X		1 pc. / 1 Y.
Filterelement F25L (PTFE) 25 µm Sales unit=1 pc.	0 026 797	Fine filter AGF-PV-30-F25L (0026796)	X		1 pc. / 1 Y.
Filterelement F2 (PTFE) 2 µm Sales unit=5 pc.	5 322 649	Fine filter AGF-T-30-F2 (5312703)	X		1 pc. / 1 Y.
Filterelement DRG25VA-V (1.4301) 25 µm Sales unit=1 pc.	5 312 687	Fine filter AGF-VA-23V (5312686)	X		1 pc. / 1 Y.
Filterelement 12-57-C (borosilicatefiber) Sales unit=1 pc.	5 312 319	Coalescence filter K-AGF-PV-30-A (5317088)	X		1 pc. / 1 Y.

Filter pad for cabinet fan					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Replacement filter pad for outlet filter and filter fan (WxHxD) 289 x 289 x 17mm	5 312 422	Outlet filter SK3243.xxx (5 314 520)	X		As required
Fine filter pad for filter fan (ventilator, filter) (WxHxD) 289 x 289 x 12mm	5 312 422	Filter fan SK3243.xxx (6 029 938)	X		As required

Washing bottles (option) / humidifier containers					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Humidifier container, complete FP-BF (G1/4) (03F5700)	5 320 642			X	As required
Washing bottle, complete (option) FP-W (G1/4) (03F5300)	5 311 644			X	As required
Washing bottle, complete (option) FP-W (GL18) (03F5500)	5 314 373			X	As required
Gas washer, complete Gaswasherbottle DURAN D=50,L=280.3xGL14 incl. Raschig rings approx. 5x5mm, approx. 120 ml incl. screw cap and O-ring ID=48, S=4	2 038 449			X	As required

Sample gas cooler M&C (Peltier)	6 023 455				
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Glass heat exchanger, 1-stage	5 309 822	Peltier cooler M&C/ECP100		X	1 pc. / 3 Y.
Glass heat exchanger, 2-stage	5 309 759	Peltier cooler M&C/ECP101		X	1 pc. / 3 Y.
Heat-conductive paste for glass heat exchanger	5 310 689	Peltier cooler M&C/ECP102		X	1 pc. / 3 Y.

Sample gas cooler M&C with CAN bus					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Hose pump SR25, complete	6 039 473	Sample gas cooler ECM		X	1 pc. / 2 Y.
Heat exchanger ECM-2PV (glass)	6 027 144	Sample gas cooler ECM	X		1 pc. / 2 Y.
Hose pump, type SR25.2, 115/230V, 50/60Hz (01P9125)	6 033 592	Sample gas cooler ECM			1 pc. / 3 Y.
Heat exchanger (PVDF)	5 313 016	Sample gas cooler ECM	X		1 pc. / 2 Y.
Filter element, glass fiber, 0.1 µm	5 325 515	Sample gas cooler ECM	X		1 pc. / 2 Y.
O-ring for filter	5 325 516	Sample gas cooler ECM	X		1 pc. / 2 Y.
Spare filter glass	5 325 517	Sample gas cooler ECM		X	
Spare parts set hose pump, type SR25: Pump hose 3.6x1.3 / 5 pcs. Novoprene Wrapping tape roll 1 pc.	2 050 587	Sample gas cooler ECM	X		2 pcs. / 1 Y.
Heat-conductive paste 5 g	5 601 326	Sample gas cooler ECM	X		1 pc. / 1 Y.
Heat-conductive paste 50 g	5 310 689	Sample gas cooler ECM	X		1 pc. / 1 Y.

Sample gas cooler AGT (MAK10)	6 029 673				
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Spare filter cartridge, Teflon	5 320 090	Sample gas cooler MAK10	X		1 pc. / 3 Y.
Hose pump SR25, complete 115/230V 50/60Hz IP00, 5 rpm, incl. hose Novoprene and 2 hose connections	6 027 131	Sample gas cooler MAK10		X	1 pc. / 2 Y.
Spare parts set hose pump SR25 comprising: 5 pcs. Pump hose 4.8x1.6 Novopreme, 1 pc. tape	2 050 587	Sample gas cooler MAK10	X		1 pc. / 1 Y.

Condensate pump SR25					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Hose pump SR25, complete 115/230V, 50/60Hz, IP00, 5 rpm. 1 duct, 2 rolls on assembly bracket Novoprene hose 4.8x1.6 - 0.4 l/h with 2 hose connections 5mm	6 027 131			X	1 pc. / 3 Y.
Spare parts set hose pump SR25 comprising: 5 pcs. Pump hose 4.8x1.6 Novopreme, 1 pc. tape	2 027 976	Hose / condensate pump SR25	X		2 pcs. / 1 Y.
Hose pump, type SR25 5 rpm 5 rpm / N4.8x1.6 239/115 V, 50-60 Hz	6 026 412			X	1 pc. / 3 Y.
Hose pump, type SR25.1 230 V / 50 Hz; 115 V / 60 Hz (01P1000)	6 021 783			X	1 pc. / 3 Y.

Sample gas pump KNF					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Spare parts set for pump N86-KT.18 comprising: 1 pc. structure diaphragm, 2 pcs. valve plate, 2 pcs. sealing ring	5 312 317	Sample gas pump N86-KT	X		1 pc. / 1 Y.
Sample gas pump, complete N86-KT. 19231 VAC in housing, flow rate approx. 250 l/h	6 027 252	Sample gas pump		X	1 pc. / 3 Y.

Sample gas pump Bühler 2.3					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Bellows complete with grub screw for sample gas pump P1.1, P2.3SP, PTFE (4200059)	5 312 043	Sample gas pump P2. 3SP / -V (6032166 / 6026333)		X	1 pc. / 3 Y.
Set of inlet/outlet valves for sample gas pump, max.80°C (4201002)	5 311 455	Sample gas pump P2 3SP / -V (6032166 / 6026333)		X	1 pc. / 3 Y.
Set of inlet/outlet valves for sample gas pump P2.x, max.140°C (4202002) 0 743 493 ET	5 312 793	Sample gas pump P2. 3SP / -V (6032166 / 6026333)		X	1 pc. / 3 Y.
Spare parts set: Plunger; extenter, screw and ball bearing (4200075	2 027 980	Sample gas pump P2.3SP (6032166)		X	1 pc. / 3 Y.
Sample gas pump complete, Bühler P2.3SP	6 032 166			X	1 pc. / 3 Y.
Sample gas pump complete, Bühler P2.3SP-V	6 026 333			X	1 pc. / 3 Y.

Sample gas pump Bühler P1.1					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Bellows complete with grub screw for sample gas pump P1.1, PTFE (4228066)	5 332 406	Sample gas pump P1.1 (6055271)		X	1 pc. / 2 Y.
Set of inlet/outlet valves for 1sample gas pump P1.1, max.80 °C (4228066)	5 332 408	Sample gas pump P1.1 (6055271)		X	1 pc. / 2 Y.
O-ring for pump P1.1 (9009398)	5 332 407	Sample gas pump P1.1 (6055271)		X	1 pc. / 2 Y.

NOx converter M&C					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Heater CG-2 (95A9057), 230V 50/60Hz	6 027 894	NOx converter CG2		X	1 pc. / 3 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.
Converter cartridge CG-2-SS (95A9004) Stainless steel wool filling, T=660 °C, with spare O-ring set.	5 315 396	NOx converter CG	X		1 pc. / 1 Y.

10.7 External components - Wear parts (WP) / Spare parts (SP)

Sample gas probe SP210-H/W					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
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 [94], Viton (5312366) 2 pcs. cover seal (5312367	2 031 994	Gas sampling probe SP210-H	X		1 pc. / 1 Y.
Flange seal DN65 PN6B [67]	5 313 427	Gas sampling probe SP210-H		X	1 pc. / 1 Y.
Thermostatic switch	6 027 810	Gas sampling probe SP210-H		X	1 pc. / 1 Y.
Heating cartridge HLPSR	6 027 80945	Gas sampling probe SP210-H		X	2 pcs. / 1 Y.
Heat-conductive paste for heating cartridge insertion	5 601 324	Gas sampling probe SP210-H		X	1 pc. / 1 Y.

Sample gas probe SP2000 SP2000-H/R					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Parts set SP2000, comprising: 2 pcs. Viton flat seal [30] (5 306 634) 2 pcs. filter element SP-2K 150 (6 012 411) 2 pcs. O-ring [55], Viton (5 306 625) 2 pcs. O-ring [39], Viton (5 306 624)	2 030 462	Gas sampling probe SP2X00	X		1 pc./ 1 y.
Flange seal DN65 PN6B [67]	5 313 427	Gas sampling probe SP2000		X	1 pc. / 1 Y.
Heating cartridge HLP	6 012 408	Gas sampling probe SP2000		X	2 pcs. / 1 Y.
Heat-conductive paste for heating cartridge insertion	5 601 324	Gas sampling probe SP2000		X	1 pc. / 1 Y.

Sample gas probe SP180-H					
Description	**Part No.**	**used in:**	**WP**	**SP**	**Requirement per x years**
Filter element SP-2K	5 308 926	Gas sampling probe SP180-H	X		2 pcs. / 1 Y.
O-ring Viton 39	5 306 624	Gas sampling probe SP180-H		X	2 pcs. / 1 Y.
O-ring Viton 55	5 306 625	Gas sampling probe SP180-H		X	2 pcs. / 1 Y.

11 Troubleshooting

11.1 Important Information

Personnel responsible for troubleshooting must have knowledge and experience with:

- Gas analysis technology.
- Handling compressed gas cylinders.
- Gas lines (PTFE lines) and their screw fittings (establishing gas leak tightness).
- Only electrical specialists are permitted to work on the electrical system or electrical assemblies.
- Hazards by test gases detrimental to health. The personnel must recognize and avoid them.

⚠ **WARNING**
Toxic condensate
Serious injuries and/or serious damage to environment and nature.
- ▶ Wear personal protective equipment (gloves, respiratory protection).
- ▶ Disposal according to local and legal environment regulations and guidelines.

11.2 Clearing malfunctions (BCU error messages)

Malfunction	Possible cause	Action
Cabinet temperature too high	Fan failure.	Check fan.
	Cooling unit failure.	Check cooling unit.
	Thermostat defective.	Replace thermostat.
Test gas flow too low	Test gas bottle empty or not connected.	Replace container and connect correctly.
	Test gas path clogged or interrupted.	Clean gas path and establish connection.
	Test gas pressure too low.	Set pressure to 1.3 bar.
	Non-return valve on the probe does not open.	Check valve.
	Return valve defective.	Replace valve.
	Flow volume of 250 Nl/h is underflown.	Set flow volume to ≥ 250 Nl/h.
Bypass flow too low	Pump defective.	Replace pump.
	Gas path clogged.	Clean gas path.
Probe temperature too high / too low	Heater defective.	Check heater.
	Contact jams.	Check and loosen contact.
	Probe connected incorrectly.	Check and correct connection.
Sample gas line (HK1)[1] temperature too high / too low	Heating element defective.	Replace heating element.
	Temperature sensor PT100 defective.	Replace temperature sensor.
Sample gas line (HK2) temperature too high / too low	Heating element defective.	Replace heating element.
Cabinet temperature too high	Fan failure.	Check fan.
	Cooling unit failure.	Check cooling unit.
	Thermostat defective.	Replace thermostat.
Test gas flow too low	Test gas bottle empty or not connected.	Replace container and connect correctly.
	Test gas path clogged or interrupted.	Clean gas path and establish connection.
	Test gas pressure too low.	Set pressure to 1.3 bar.
	Non-return valve on the probe does not open.	Check valve.
	Return valve defective.	Replace valve.
	Flow volume of 250 Nl/h is underflown.	Set flow volume to ≥ 250 Nl/h.
Bypass flow too low	Pump defective.	Replace pump.
	Gas path clogged.	Clean gas path.
Probe temperature too high / too low	Heater defective.	Check heater.
	Contact jams.	Check and loosen contact.
	Probe connected incorrectly.	Check and correct connection.
Sample gas line (HK1) temperature too high / too low	Heating element defective.	Replace heating element.
	Temperature sensor PT100 defective.	Replace temperature sensor.

Malfunction	Possible cause	Action
Sample gas line (HK2) temperature too high / too low	Heating element defective.	Replace heating element.
	Temperature sensor PT100 defective.	
Sample gas cooler temperature too high / too low	Controller defective.	Replace temperature sensor.
Condensate container	Condensate container full.	Empty condensate container.

1 Heating circuit

11.3 Clearing malfunctions (other malfunctions)

Malfunction	Possible causes	Action
Sample gas flow too low	Sampling tube clogged or filter element in sampling probe contaminated.	Check, clean and replace sampling probe, tube and filter element if necessary.
	Sample gas line clogged.	Check and clean.
	Wrong flow setting.	Check flow setting on flow-meter. Set-point: approx. 60 l/h.
	Water trap or glass wool filter clogged.	Check and replace.
Test gas setting or Measuring Screen implausible	Warm-up phase of analysis system not yet finished.	Wait for warm-up phase to finish. Depending on components to be measured, measuring ranges and drift, the warming-up phase takes up to 24 hours.
	Test gas and set test gas concentration do not match.	Check test gas concentration via the BCU.
	Test gas unreliable, low flow.	Check set-point value, service life, pressure and lines.
	Gas path leaky or clogged	Check gas path.
	Damaged sub-assemblies.	Check enclosure, water trap and glass wool filter.
	Fluctuating power voltage.	Check power voltage.
Zero point drifting or sensitivity drifting	Gas path leaky or clogged.	Check gas path for clogs and leak tightness.
	Cooler unstable.	Check cooler.
	Test gas unreliable.	Check set-point value, service life, pressure and lines.
	Flow too low.	Check the set-point value.
Errors on signal lines	Connections loose or corroded.	Check or replace.
	Electromagnetic interference.	Check main power supply for missing protective conductor. Check voltage peaks in the network. Strong radio transmitter in the vicinity, close enclosure door. Replace faulty or corroded grounding.
	Inadequate power supply.	Check.
	Faulty interfaces	Check.

11.4 Switch-on conditions / additions to clearing malfunctions

Remark

Switch-on conditions have been determined for the POWERCEMS100 analysis system which serve to ensure safety and function monitoring of certain analysis components. These are realized by using signal status queries.

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

- A signal series connection

or

- I/O interface modules of the BCU

Queried status parameters to fulfill the switch-on conditions

Note

- ▶ Configured switch-on conditions must not be deactivated or ignored.
- ▶ Deactivation or failure to observe the switch-on conditions leads to serious damage on the analysis system.
- ▶ Refer to the Technical System Documentation for information on the system-specific switch-on conditions.

A status signal is enabled confirming fulfillment of the switch-on conditions when set-point values are maintained.

- Gas sampling probe (option) - temperature set-point value monitoring.
  - Set-point value monitoring through integrated low temperature alarm contact.
- Heated sample gas line (option) - heating function monitoring
  - Monitoring via temperature controller.
- NO_x converter (option) - function monitoring
  - Query of set-point value operating temperature.
- Sample gas cooler - function monitoring
  - Query of set-point value operating temperature.
- Level sensor in condensate collection container - filling level monitor
  - Query of maximum filling level. In case of maximum filling level, the switch-on condition is not enabled.
- Gas analyzers - failure monitoring, monitoring / query of self-diagnostic functions
  - For internal monitoring parameters such as:
    - › Temperature
    - › Flow rate
    - › Humidity

    appropriate messages are sent via CAN bus to the BCU.
- Sample gas pump - monitoring the pump function
  - Monitoring the pump function is controlled via the gas analyzer.

1 Leak Test

Note

Only qualified personnel from the respective field are permitted to work on the system.

Perform leak test at regular intervals.

Note on leak testing of hot extractive systems

Allow system to cool down to ambient temperature before testing.

Recommended device: Testo 324 - leakage rates measuring instrument.
Not included in SICK scope of delivery.

Fig. 9 Testo 324

For further information about the Testo 324 - leakage rates measuring instrument, refer to the respective Testo instruction manual.

1.21 Prepare Test

The sample gas path generally consist of:

Sample gas inlet - Sample gas valve - Cooler - Pump - Analyzer - Sample gas outlet.

- ▶ Close peristaltic pump of the cooler.
- ▶ Close the sample gas supply (pump) of the cooler.
- ▶ Connect the Testo 324 leakage rates measuring instrument to the sample gas inlet.
- ▶ All tests must be documented.
- ▶ To protect the Testo 324, all lines must be free of oil, dust and moisture.

1.32 Leak Test

During the pressure test, all pipes and hoses up to the gas appliances must be tested for leaks at an overpressure of must be tested for leaks at an overpressure of 150 mbar with air or helium. The pipelines are considered to be tight if, after temperature equalization, the test pressure does not drop more than Δp <25 mbar during the subsequent test period of 10 min.

NOTICE

If a leak is detected in gas-carrying lines with a gas detector or with foam-forming agents in accordance with DIN EN 14291, the location must be sealed by suitable measures.

Type	Value
Stabilization time	1 minute
Measuring time [T_{target}]	10 minutes
Test pressure	150 mbar
Permissible pressure drop / time [Δp/T]	< 25 mbar / 10 minutes

1.43 Perform Leak Test

1. Start measurement:
   - The pressure (target) is built up automatically by the device Testo 324.
   - Zeroing starts (5 sec.)
2. Evaluate measurement result:
   - Measurement result is displayed.
3. Document and save the measurement result in the test log.

12 Disposal

Note

Only qualified persons from the relevant specialist areas may carry out work on the system. Only specially trained personnel may switch off, decommission, transport and dispose of the system.

DANGER

Toxic condensate

Serious injuries, death and environmental pollution.

- ▶ Exercise extreme caution when handling corrosive, toxic condensate liquid.
- ▶ Wear personal protective equipment (respiratory protection, gloves).
- ▶ Dispose of the condensate according to valid local and statutory environmental regulations and directives.

Note

Observe the relevant valid local and statutory environmental regulations and directives for the disposal of industrial and electronic waste.

Disposal of batteries, electrical and electronic devices

In accordance with international directives and regulations, batteries, rechargeable batteries as well as electrical and electronic devices may not be disposed off as household waste.

The owner is obliged to dispose of the appliances at the end of their service life via the relevant public collection points.

This symbol on the product, the packaging or in this document indicates that a product is subject to these regulations.

The following sub-assemblies could contain substances that have to be disposed of separately:

- **Electronics:** Capacitors, rechargeable batteries, batteries
- **Displays:** Liquid in the LC displays
- **Sample gas lines:**
  Toxic materials in the sample gas could have penetrated or been absorbed in the “soft” gas path material (e.g. hoses, sealing rings). Such effects must be taken into account during disposal.
- **Gas analyzer:**

Refer to the relevant SICK Operating Instructions for detailed information on the switching logic of the gas analyzers.

- **Air conditioning:**
  Refrigerant in the air conditioner

12 DISPOSAL

13 Specifications

13.1 EU Declaration of Conformity

This is to confirm that the product complies with the regulations of the following EU Directive(s) (including all applicable modifications) and is based on the relevant harmonized standards and/or specifications.

Applied harmonized EU standards and directives

Designation	Document No.
EMC Directive According to Article 19 of the EMC Directive, conformity is presumed on the basis of an EMC assessment.	2014/30/EU
EU Low Voltage Directive	2014/35/EU
Low-voltage switchgear and control gear assemblies	EN 61439-2:2011
EU RoHS Directive	2011/65/EU
Technical documentation for the assessment of electrical and electronic products with regard to the restriction of hazardous substances	EN IEC 63000: 2018-12

13.2 Dimensions

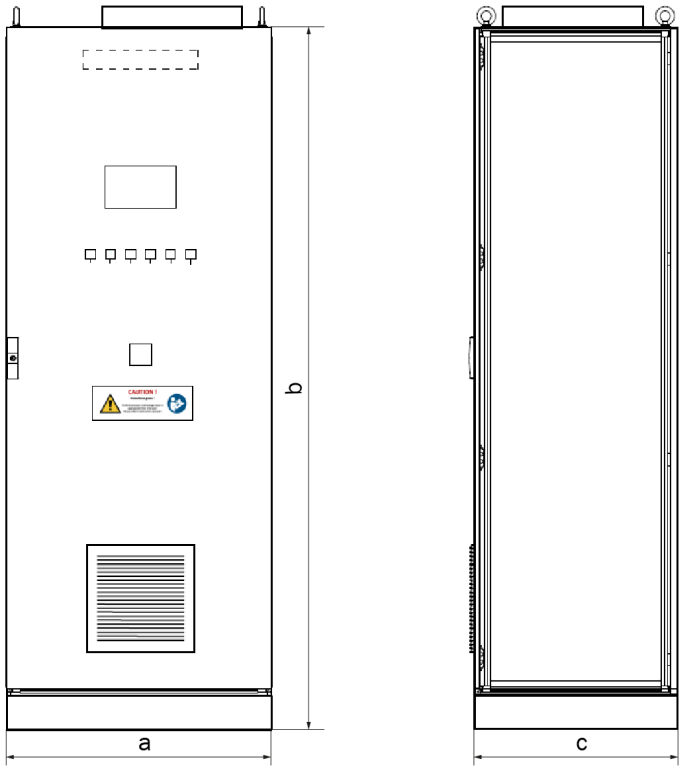


Fig. 10: PowerCEMS100 outer dimensions

Legend	
a	800 mm
b	2100 mm
c	600 mm

13.3 Technical data

Note

The exact device specifications and performance data of the product can deviate and depend on the respective application and customer specification.

Measured variables	CH_4, CO, CO_2, NO, N_2O, O_2, SO_2, further components on request
Measuring method	Extractive
Gas flow	60 l/h With bypass pump: ≤ 250 l/h For short response times
Process temperature	≤ +1000 °C Depending on sampling probe
Sample gas temperature	≤ +200 °C Temperature at system cabinet inlet
Process gas humidity	Non-condensing
Ambient temperature	+5 °C ... +40 °C With cooling unit: +5 °C ... +50 °C
Storage temperature	–20 °C ... +55 °C
Ambient humidity	≤ 75 % Relative humidity, non-condensing
Compliance	Approved for plants requiring approval 2001/80/EC (13th BimSchV) 2000/76/EC (17th BimSchV) 2006/95/EC Low Voltage Directive 2008/108/EC Electromagnetic Compatibility DIN EN 61439-1 and DIN EN 61439-2 Low voltage switchgear assemblies DIN EN 15267-3 Certification of automated measuring systems DIN EN 14181 Stationary source emissions
Electrical safety	CE
IP classification	IP 54 With cooling unit: IP 44
Analog outputs	4 outputs: 0/2/4 ... 20 mA, 500 Ω Electrically isolated
Analog inputs	2 inputs: 0/4 ... 20 mA, 100 Ω Not electrically isolated
Digital outputs	8 potential-free outputs (changeover contacts): 34 V AC, 500 mA /48 V DC, 500 mA Maximum quantity of outputs depends on the application
Digital inputs	8 inputs: 42 V Maximum quantity of inputs depends on the application
Interfaces	RS-422 (option) RS-485 (option) Ethernet TCP/IP
Bus protocol	Modbus TCP OPC CAN

Type	Sheet steel cabinet Versions with NO_x converter (option) Versions with cooling unit or heating (option)
Weight	250 kg - 350 kg Depending on version. Observe load capability of roofs/floors.
Installation	In buildings with protection against corrosive atmospheres
Energy supply	Depending on version
Correction functions	Manual adjustment Automatic check and adjustment with test gases
Options	NO_x converter Cooling unit Heating Bypass pump

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