



Product Information

MCS 100 E HW/PD/CD
Multi-Component Analysis Systems
for Monitoring Flue Gases



Continuous Flue Gas Monitoring Tailored to Your Needs

For industrial plants to run efficiently, raw gas/exhaust air monitoring and process control require reliable and cost-effective measuring systems.



Applications

- Power plants
- Refuse incineration plants
- Steel production
- Cement industry
- Industrial air extraction systems

The MCS 100 E HW, MCS 100 E PD and MCS 100 E CD measuring systems fulfill these requirements in a very unique way. Based on the flue gas analyzer MCS 100 E, they can be adapted to specific applications to handle a range of continuous flue gas monitoring tasks. SICK-MAIHAK also designs everything from complete flue gas analysis systems to preinstalled, accessible analysis containers.

A solid platform as a basis for tailor-made measuring technology

■ Tried-and-tested extractive measuring technology

The MCS 100 E HW/PD/CD measuring systems work by extracting part of the flue gas and feeding it to the MCS 100 E analyzer. A high sample gas flow rate of >400 l/h ensures fast response times and minimizes memory effects and delays. The sampling device is adapted to the conditions of the sampling point.

■ Reliable, flexible systems

The systems consist of a cabinet, analyzer, measuring gas cooler or permeation dryer, measuring gas pump as well as the complete temperature monitoring system including external components. They are self-monitoring, perform zero balancing (and, if required, calibration) automatically, and output the appropriate status signals. If a fault occurs, the system automatically switches to standby mode and flushes the sample and cell of corrosive flue gas.



Example of an MCS 100 E HW system cabinet

■ Fail-safe interfaces

Measured values and status signals can be picked off on module boxes. These include digital/analog inputs and outputs which are suitable for connecting external analyzers for total carbon, dust and Hg (mercury), for example. Data acquisition equipment, printers or modems can also be connected to the system. Modbus protocol is supported; PROFIBUS and Foundation Fieldbus are available on request.

■ Complete heating and temperature monitoring

The MCS 100 E systems monitor probes, filters, gas ducts and all internally-heated components as standard.

■ Barometric correction

The systems can be expanded to incorporate a pressure sensor that corrects the test result to take account of fluctuations in the atmospheric pressure.

■ Convenient operation and easy maintenance

The operating status is indicated by means of three lamps (operation, fault, maintenance) on the front door which also includes a maintenance switch and the main switch. The maintenance interval approved by TÜV (authorized inspection agency) is three months.

The MCS 100 E Analyzer – Powerful yet Compact

■ Intelligent analyzer

The MCS 100 E analyzer features a photometer, cell, control computer and user interface with keyboard and monitor. An integrated flow meter monitors the sample gas flow rate. An oxygen probe (ZrO_2) can also be installed. All parts in contact with the measuring gas can be heated to prevent cooling below the dew point. The MCS 100 E controls and monitors flue gas measurements. The values determined are displayed on screen, stored on the computer and transmitted to the interfaces integrated in the system cabinet via light guides.

■ Photometer – many components, optional calibration filter

The photometer is a single-beam infrared device which enables bifrequency and gas filter correlation procedures to be used simultaneously. Two important features of the light source (an infrared emitter) are its high energy output and long service life. The light emitted passes through the chopper wheel, the cell, the two filter wheels with the interference and gas filters, and impinges on a pyroelectric detector. An optional calibration unit enables the selected sensitivity to be checked quickly.

■ Cell: Long optical path, low volume, adjustable temperature

The optical path of the cell (3 or 6 m) is permanently set via the mirrors cut into the end faces. The cell has been optimized to minimize volume and maximize gas exchange. It can be set to temperatures of up to 200 °C (optionally up to 225 °C). The gas inlet is fitted with a protective filter.

■ Integrated flow meter

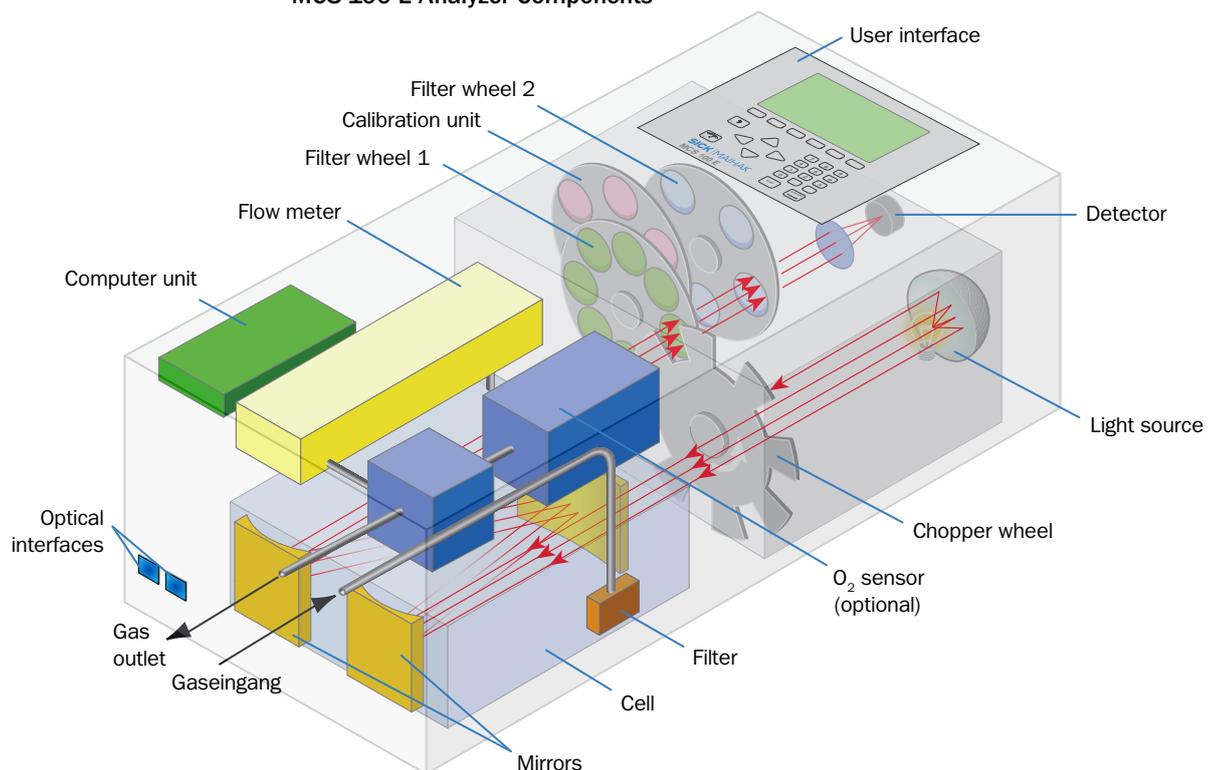
The measuring gas flow is monitored by an integrated flow meter which measures differences in temperature between still and flowing gas. An alarm sounds if a settable limit value is undershot.

■ Integrated O_2 measurement with high stability and long service life

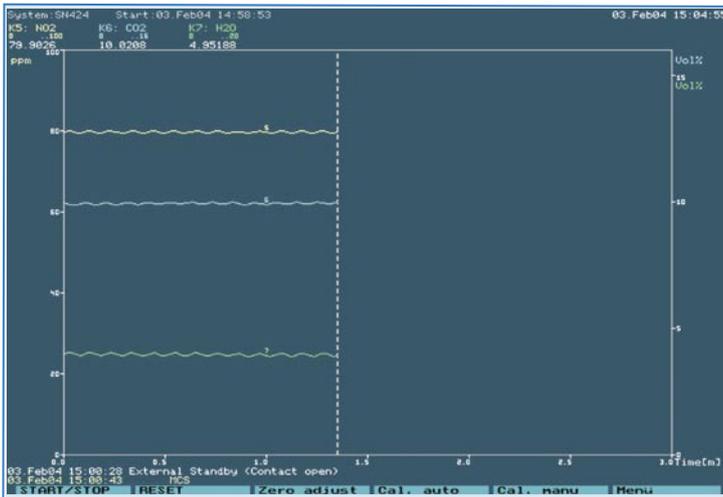
The MCS 100 E also features an optional oxygen measurement. Part of the flue gas is removed at the cell outlet and fed to a zirconium oxide probe (ZrO_2) in the bypass. The ambient air serves as a reference. The electrical signal is analyzed in the computer. The ZrO_2 probe is highly stable and has a long service life.



MCS 100 E Analyzer Components



Analyzer, Computer and User Interface: State-of-the-Art Technology



Measured values displayed as a time characteristic



■ Integrated system control in the MCS 100 E analyzer

The computer integrated in the MCS 100 E analyzer is IBM compatible with a DOS user interface. A silicone disc (with no moving parts) serves as a bulk memory. The computer controls the measurement procedure, processes measured values, monitors limit values and outputs the results, warnings and alarms to the monitor and the interfaces. The illuminated LC monitor and touch-sensitive keyboard are splash-proof and located on the front of the device. Connecting an external keyboard is very convenient thanks to a socket on the front of the unit.

■ User-friendly software: two levels with password protection

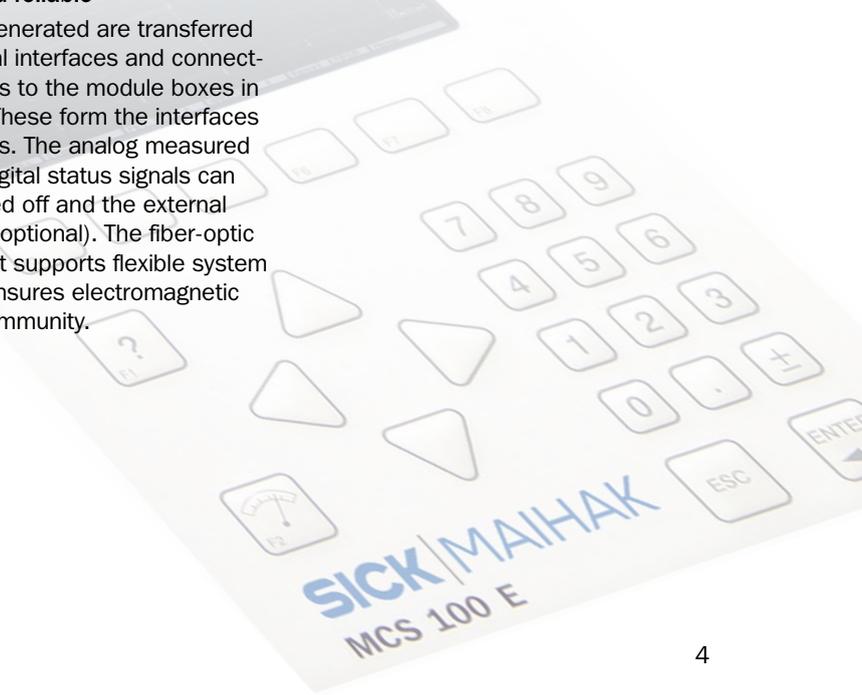
The software for operating the MCS 100 E is menu driven and features two levels: one for the measuring mode and another for password-protected configuration changes.

■ Measured value display/ data backup

All measured values are displayed together with status messages either numerically or graphically on the monitor as a concentration characteristic. The graphic display can be tracked and the status messages called up via the bulk memory.

■ Via light guides to the system: flexible and reliable

The signals generated are transferred via two optical interfaces and connected light guides to the module boxes in the cabinet. These form the interfaces to the process. The analog measured values and digital status signals can then be picked off and the external signals read (optional). The fiber-optic cable concept supports flexible system design and ensures electromagnetic interference immunity.



Custom-Made Solutions for a Wide Range of Measuring Tasks



MCS 100 E system variants

- **MCS 100 E HW with high-temperature measuring technology** – standard application in refuse incineration plants
- **MCS 100 E PD with permeation dryer** – for extremely small measurement ranges for SO₂ and HCl in power plants and refuse incineration plants
- **MCS 100 E CD with gas cooler** – the specialized solution for applications in power plants



| Features |
|---------------------------------------------------------------------------|
| ■ Continuous monitoring of up to eight gas components plus O ₂ |
| ■ Easy to use, reliable and robust |
| ■ Automatic zero monitoring |
| ■ Automatic test gas function (optional in certain cases) |
| ■ Internal calibration standard (optional) |
| ■ Low maintenance |

| MCS 100 E System | HW (high-temp. meas. tech.) | PD (permeation dryer) | CD (gas cooler) |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applications | <ul style="list-style-type: none"> ■ Power plants ■ Refuse incineration plants ■ Steel production ■ Cement production ■ Industrial air extract. systems <p>Federal German Pollution Control Act (13th/17th Impl. Ordinances) and raw gas applications</p> | <ul style="list-style-type: none"> ■ Power plants ■ Refuse incineration plants ■ Steel production ■ Crematoriums ■ Industrial air extract. systems <p>Also for requirements beyond the Federal German Pollution Control Act (13th/17th Impl. Ord.)</p> | <ul style="list-style-type: none"> ■ Power plants ■ Steel production ■ Cement production ■ Crematoriums ■ Industrial air extraction systems <p>Emissions monitoring</p> |
| Features | <ul style="list-style-type: none"> ■ Standard system for raw and clean gas monitoring ■ Temperature monitoring of all heated components ■ Minimum adsorption and desorption effects ■ Meas. point switchover (optional) ■ Corrosion-protected measuring gas cell due to high temperatures (185 to 220 °C) | <ul style="list-style-type: none"> ■ Extremely small measurement ranges ■ Guarantee value monitoring ■ Minimum adsorption and desorption effects ■ Corrosion-protected measuring gas cell due to high temperatures (185 to 220 °C) | <ul style="list-style-type: none"> ■ Standard measuring technology ■ Extremely small/diverse measurement ranges ■ NO₂ measurement without catalyst ■ Corrosion-protected measuring gas cell due to high temperatures (185 to 220 °C) |
| Components | HCl, SO ₂ , CO, NO, NH ₃ , H ₂ O, CO ₂ , O ₂ and other IR-active gases | HCl, SO ₂ , CO, NO, NO ₂ , CO ₂ , O ₂ and other IR-active gases | SO ₂ , CO, NO, NO ₂ , CO ₂ , O ₂ , N ₂ O, CH ₄ and other IR-active gases |
| Approvals | TA air, 13 th /17 th BImSchV ^{*)} , EPA, GOST, MCert ^{**)} | TA-Luft, 13 th /17 th BImSchV ^{*)} , MCert ^{**)} | GOST |

^{*)} Federal German Pollution Control Act (13th/17th Implementing Ordinances

^{**)} Being prepared



The MCS 100 E HW System with High-Temperature Measuring Technology

The MCS 100 E HW with high-temperature measuring technology is the standard solution for

- flue gas monitoring in refuse incineration plants according to the Federal German Pollution Control Act (17th Implementing Ordinance)
- use in refuse incineration plants and power plants with high acid dew points

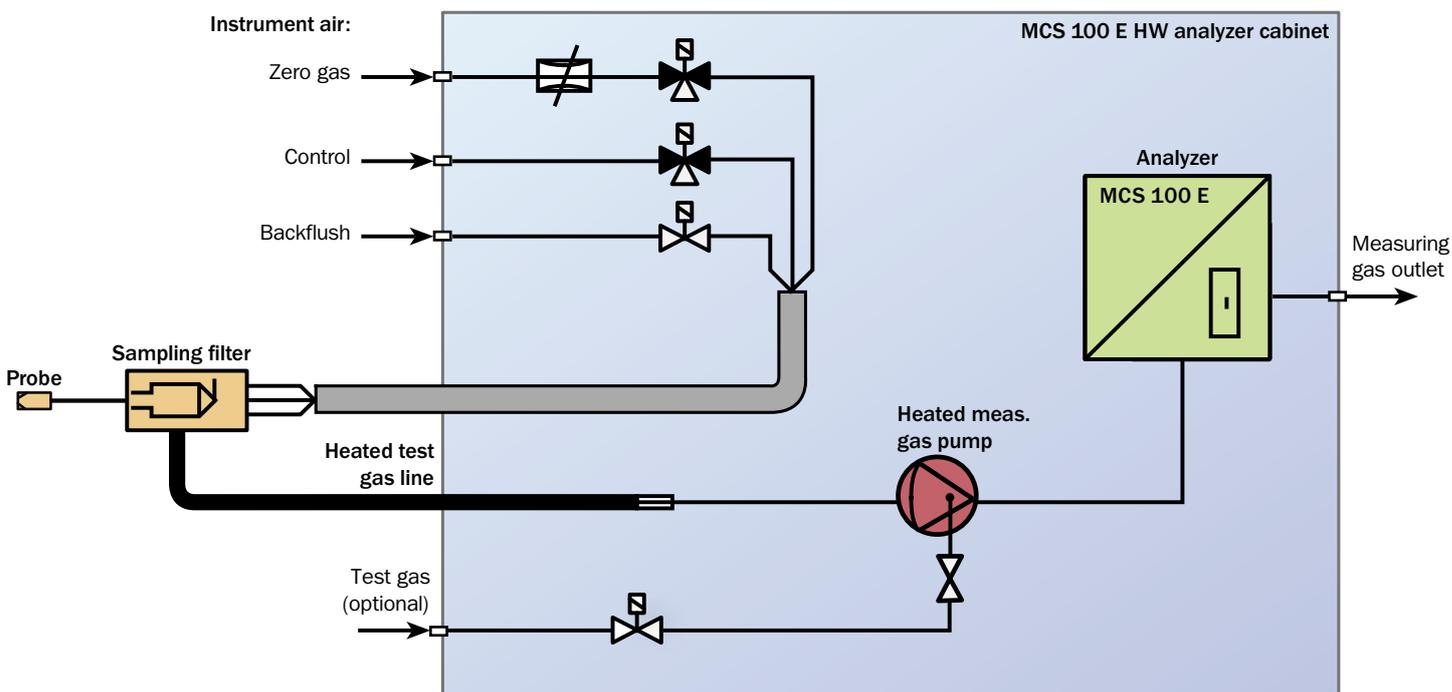
It is deployed not only on the raw gas side for process monitoring, but also on the clean gas side for emissions monitoring.

High-temperature technology for all components

All components of the MCS 100 E HW that come into contact with the measuring gas are heatable and, therefore, protected from cooling below the dew point and the corrosion associated with it. Although the flue gas is cleaned

of dust at the sampling point, its composition is, on the whole, not changed. Components such as HCl, SO₂, CO, NO, NH₃, H₂O and CO₂ can, therefore, be measured. Further IR-active components can also be applied. The heated measuring gas pump is located in the MCS 100 E HW system cabinet. The pump draws the flue gas via the sampling device and the heated flue gas line into the system cabinet and forces

it through the analyzer. In order to minimize the adsorption and desorption effects of HCl and NH₃, the analysis system is designed to handle a high flow rate of approximately 600 l/h. The outlet line for the measuring gas is usually not heated. A precipitation collector with automatic fill-level monitoring is recommended depending on the installation location.



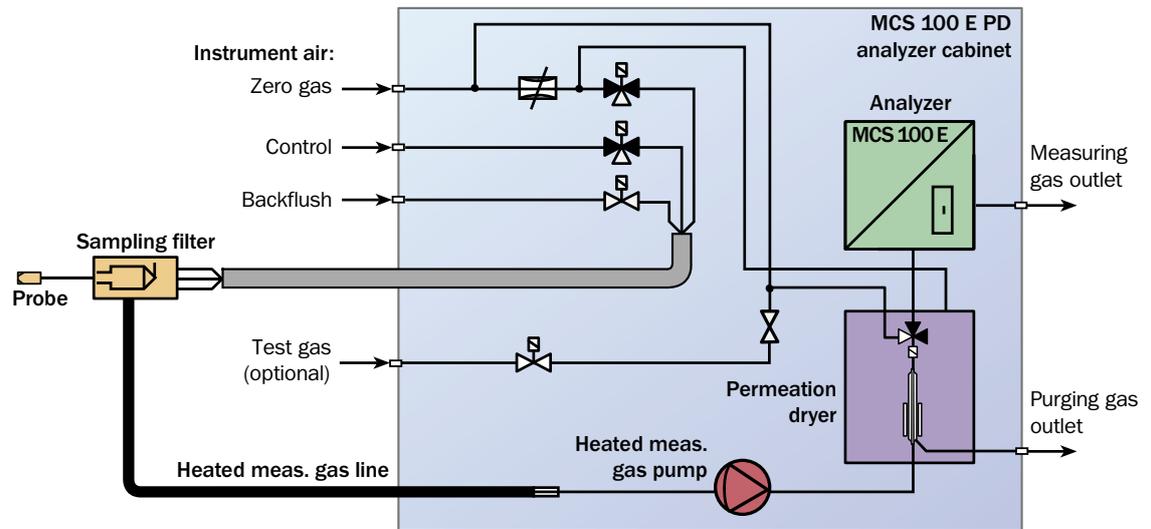
The MSC 100 E PD System with Permeation Dryer

The MCS 100 E PD system (with permeation dryer for drying gases) is designed for recording extremely small measurement ranges in power plants and refuse incineration plants, for example for very low limit values or for monitoring guarantee values for flue gas cleaning. The legal measurement ranges are, in certain cases, significantly lower than required by the Federal German Pollution Control Act (17th Implementing Ordinance).

Small measurement ranges due to dry flue gas

The MCS 100 E PD is also equipped with a measuring gas pump that feeds the flue gas via a heated sampling point and heated extraction line to the measurement system. A permeation dryer is located downstream of the measuring gas pump where the flue gas is dried. This enables extremely small measurement ranges of SO₂ and

HCl concentrations as well as further components such as NO₂ to be recorded. H₂O and NH₃ are not measured here. The MCS 100 E PD requires relatively clean flue gas. In order to minimize the adsorption and desorption effects, the entire sampling system is designed to handle a high flow rate. A dew point measurement corrects the cross sensitivity resulting from residual moisture and does away with the need for a moisture sensor.



The MSC 100 E CD System with Gas Cooler

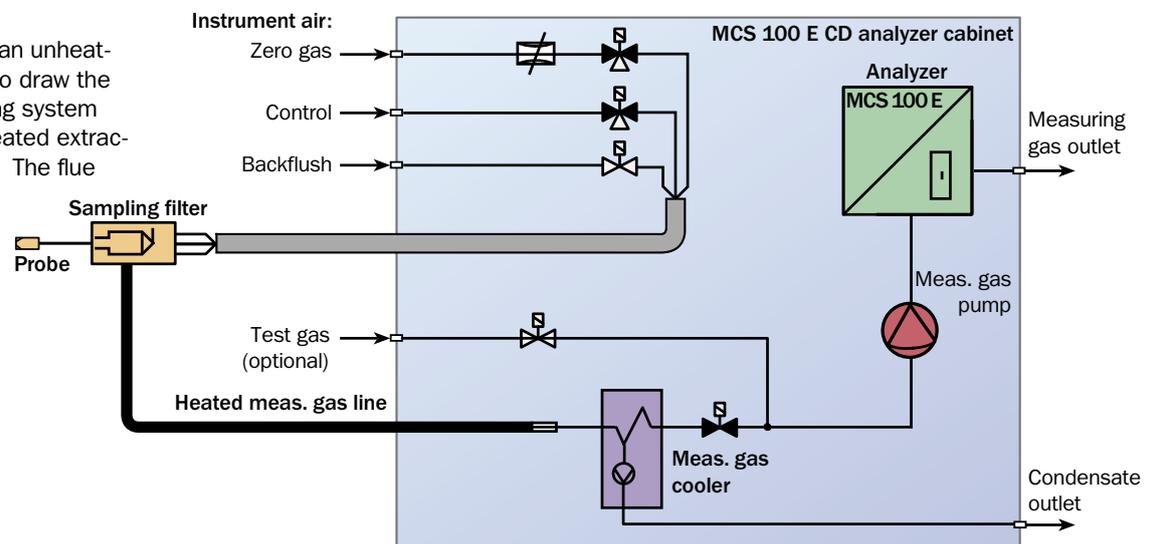
The MCD 100 E CD with integrated measuring gas cooler is ideal for performing operational measurements in power plants. It conforms to the Federal German Pollution Control Act (13th Implementing Ordinance) and can record further components such as NO₂ without the need for a converter.

Small measurement ranges downstream of the gas cooler

The MCS 100 E CD uses an unheated measuring gas pump to draw the flue gas into the measuring system via a heated sample, a heated extraction line and a gas cooler. The flue

gas is dried in the gas cooler and the condensation that accumulates is discharged. Smaller measurement ranges can, in certain cases, also be achieved with this measuring technology in comparison with high-temperature measuring technology, allowing additional components such as NO₂ to be measured. H₂O and water-soluble compo-

nents such as HCl and NH₃ are not measured here. In order to minimize dead time, the entire sampling system is designed to handle a flow rate of >400 l/h. A dew point measurement corrects the cross sensitivity resulting from residual moisture and does away with the need for a moisture sensor for monitoring the cooler.



Accessories, Options and System Technology

Measurements at multiple measuring points

The measuring systems can be configured relatively easily to allow measurements to be performed at additional measuring points. The MCS 100 E controls measuring point switchover via pneumatic valves in the heated sampling probe.

Additional analyzers

Further analyzers such as an FID can be integrated in the system cabinet. A paramagnetic O₂ analyzer can be built into the systems instead of the integrated ZrO₂ oxygen sensor.

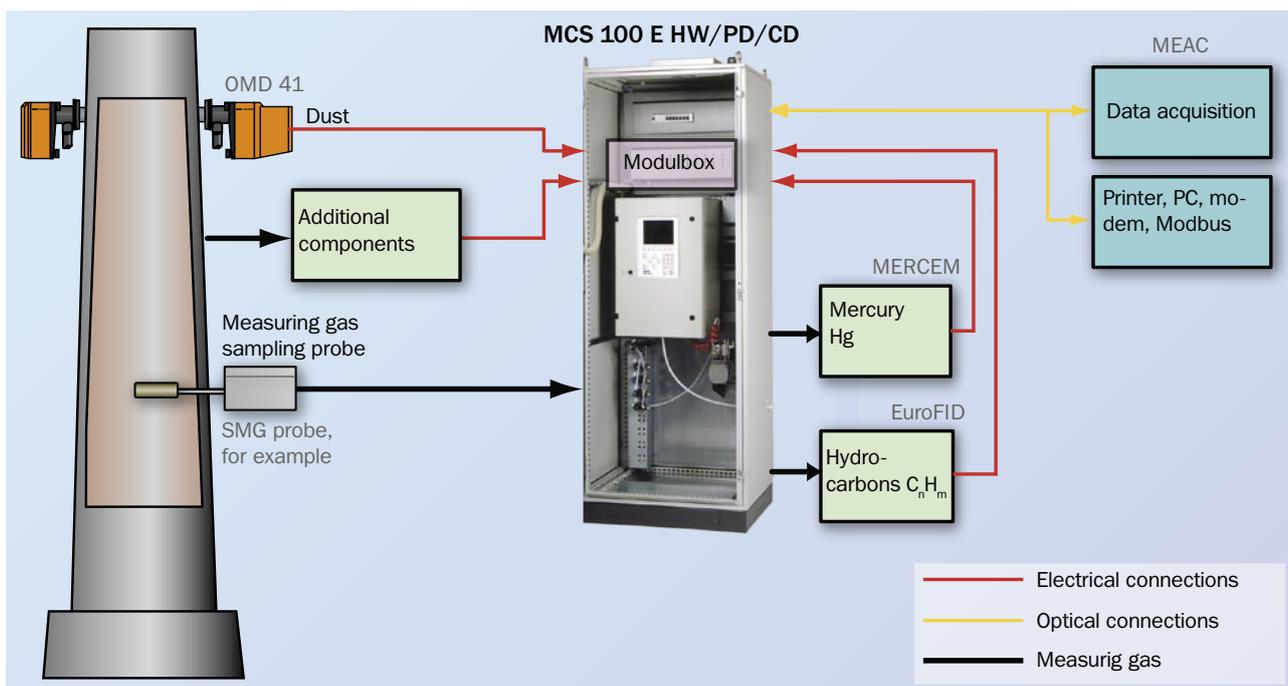
Special versions

The systems are housed in steel cabinets as standard. For outdoor installation, the systems are also available with glass-fiber-reinforced plastic housing and internal climate control (on request). The systems can be used safely with measuring gas lines of approximately 100 m in length.

Transportable systems in modular units are suitable for portable use.



Portable MCS 100 HW



System Technology

SICK-MAIHAK not only supplies but also designs complete gas analysis systems including everything from the measuring technology, officially recognized emissions monitoring to ready-to-use preinstalled, accessible analysis containers with all the necessary measuring devices.



Specifications and Technical Data

| Technical Data | | MCS 100 E System | | |
|-------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------|
| Measurement ranges | | MCS 100 E HW | MCS 100 E PD | MCS 100 E CD |
| | ■ HCl | 0...15 mg/m ³ ¹⁾ | 0...10 mg/m ³ ¹⁾ | — |
| | ■ CO | 0...75 mg/m ³ ¹⁾ | 0...50 mg/m ³ ¹⁾ | 0...50 mg/m ³ |
| | ■ NO | 0...200 mg/m ³ ¹⁾ | 0...50 mg/m ³ ¹⁾ | 0...50 mg/m ³ |
| | ■ NH ₃ | 0...20 mg/m ³ ¹⁾ | — | — |
| | ■ NO ₂ | 0...100 mg/m ³ ¹⁾ | 0...80 mg/m ³ ¹⁾ | 0...80 mg/m ³ |
| | ■ SO ₂ | 0...75 mg/m ³ ¹⁾ | 0...10 mg/m ³ ¹⁾ | 0...10 mg/m ³ |
| | ■ CO ₂ | 0...25 Vol.% ¹⁾ | 0...25 Vol.% ¹⁾ | 0...25 Vol.% |
| | ■ O ₂ | 0...21 Vol.% ¹⁾ | 0...21 Vol.% ¹⁾ | 0...21 Vol.% |
| | ■ H ₂ O | 0...40 Vol.% ¹⁾ | 0...5 Vol.% ¹⁾ | 0...5 Vol.% |
| | ■ N ₂ O | 0...100 mg/m ³ | 0...100 mg/m ³ | 0...100 mg/m ³ |
| | ■ CH ₄ | 0...100 mg/m ³ | 0...100 mg/m ³ | 0...100 mg/m ³ |
| Meas. gas components | | Continuous, max. 8 plus O ₂ ; further IR-active components and other meas. ranges avail. on request | | |
| Analyzer | | MCS 100 E – integrated in system cabinet | | |
| Measuring principle | | Infrared photometer, bifrequency and gas filter correlation proced.; spectral range from 1...16 μm | | |
| Display | | Monochrome 7.4" LC monitor, 640 x 480 pixels, illuminated | | |
| Keyboard | | Numerical touch-sensitive keyboard with arrow/function keys; external keyboard can be connected | | |
| Operation | | 2 levels for user and specialist (password); programs freely programmable | | |
| Computer; bulk memory | | IBM-compatible 686 CPU based on PC104 bus; 32 MB silicone disc | | |
| Cell | | Optical path length: 3 m or 6 m preset; temperature: 185 °C, optional 225 °C Volume 2 l; gas flow rate: 200 to 600 l/h (acc. to application), filter porosity: 10 μm | | |
| Measurement ranges | | 2 measurement ranges in each case with automatic switchover, freely programmable | | |
| Limit values | | 2 limit values in each case as change-over contact, freely programmable (optional) | | |
| Detection range | | <2% of the relevant measurement range | | |
| Zero drift | | Automatic zero point correction | | |
| Temp. influence | | <2% of the relevant measurement range/10 K | | |
| Cross sensitivity comp. | | Provision for 4 interference variables, external variables also possible | | |
| Barometric correction | | Range from 0.7 to 1.2 hPa atmospheric pressure (optional) | | |
| Sensitivity control | | Test gas, optional internal calibration filter | | |
| Response time T ₉₀ | | Plant and component specific, typically <200 s | | |
| System cabinet | | | | |
| Dimensions (H x W x D) | | 2100 mm x 800 mm 600 mm (height incl. 100 mm base) | | |
| Cabinet | | Material: sheet steel, color: RAL 7032 (pebble gray) | | |
| Weight | | Approx. 350...500 kg (depending on components) | | |
| Power supply | | 3-ph 230/115 V, +10/-15%; 50/60 Hz; opt.: 3-ph 115 V, +10/-15%; 60 Hz; special version available on request | | |
| Power consumption | | Cabinet: 1700 VA; heated gas line: 95 VA/m gas sampling filter: 450 VA; heated sampling probe: 150 VA | | |
| Ambient conditions | | Temperature: +5 to 35 °C humidity: up to 80% (without condensation) | | |
| Degree of protection | | IP 43; higher degrees of protection available on request | | |
| Maintenance interval | | 3 months | | |
| Standards | | EN 61010-1; EN 61326 | | |
| General system information | | | | |
| Interfaces | | Serial: RS 232, RS 485, modem, Modbus protocol, others available on request; parallel: optional | | |
| Signal outputs | | Digital: 50 V AC/4 A; 24 V DC/4 A; 50 V DC/0.8 A for maintenance and faults; others optional Analog (optional): 0/4 to 20 mA, resolution 12 bit, accuracy 0.5%, load 500 Ω | | |
| Signal inputs | | Optional: analog and digital | | |
| Requirements/compliances | | MCS100 E HW: 13 th /17 th Impl. Ord., EPA, GOST, MCert ²⁾ ; MCS 100 E PD: TA-Luft, 13 th /17 th Impl. Ord., MCert ²⁾ ; MS 100 E CD: GOST, corresponds to the requirements of the 13 th Impl. Ordinances | | |

¹⁾ Performance tested

²⁾ Being prepared

³⁾ Federal German Pollution Control Act (13th/17th Implementing Ordinances),

The dialogue continues.

Copy, complete and fax to +49 7641 469 11 49

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|-------------------------------|--|
| Company | |
| Name | |
| Job Title/Dept. | |
| Street | |
| ZIP, City | |
| Phone/Fax | |
| Industry/Field of Application | |

Yes, I would like to know more about the field of:

- | | |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Process gas analysis | <input type="checkbox"/> I would like a detailed consultation with one of your project advisors. Please arrange a meeting for me. |
| <input type="checkbox"/> Flue gas monitoring | |
| <input type="checkbox"/> Emission monitoring | |
| <input type="checkbox"/> Dust measurement | |
| <input type="checkbox"/> Volume flow measurement | |
| <input type="checkbox"/> Data acquisition and evaluation | |
| <input type="checkbox"/> Water analysis | |
| <input type="checkbox"/> Liquid analysis | |
| <input type="checkbox"/> Level measurement | |
| <input type="checkbox"/> Tunnel sensors | |
| <input type="checkbox"/> Special measuring technology | |

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