## Analytical Application Sets

### 4/2 Introduction

#### Continuous emission monitoring

- Introduction
- Set CEM CERT
- Set CEM 1
- HM-1400 TRX
  - Total mercury analyzer system
  - Dust and opacity measurement
- D-R 220 dust and opacity measuring instrument
- D-R 290 dust and opacity measuring instrument
- D-R 320 dust measuring instrument
- D-R 808 dust measuring instrument
- D-RX 250 combination probe

#### Volume flow measurement

- D-FL 100 volume flow measuring system
- D-FL 220 volume flow measuring system
- D-ISC 100 display and control unit

#### Environmental and process data management systems

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### 4/39 Biogas analysis

- Set BGA

### 4/43 Continuous monitoring of hydrogen-cooled generators

- Set GGA
Overview

Standardization and the supply of complete packages are two trends that are currently on the up. This can be attributed to the fact that the same application is frequently required in different industrial sectors and overhead can be minimized in this case. Furthermore, customers often want to purchase turnkey systems to minimize the risk of any technical problems.

With its Analytical Application Set initiative, Siemens is making use of its wealth of experience to offer standardized packages that are designed with a single application in mind. Its range of applications can cover a variety of industrial sectors.

It is now possible to simply configure and order complete applications straight from the catalog, thereby sharply reducing the amount of time taken between the request and order. All Analytical Application Sets are tested in advance and provide a high level of safety and reliability. The different versions cover a broad spectrum of potential applications and ensure that the sets can be configured for both minimum and maximum requirements.

The order structure makes it possible to choose from different versions and module components, as well as configure the system and order it directly.
Overview

The combustion of different fuels causes not only the development of carbon dioxide and water vapor but also other environmentally harmful exhaust gas substances (e.g. dust, nitrogen oxides and carbon monoxide, etc.). Emission limit values are determined for these substances according to the state of combustion engineering. The compliance with these limits does not only protect the environment from air pollutants but also ensures optimum combustion in the combustion plants. Emission measurements are a central element for complying with these limit values.

These measurements are required to document whether legal requirements relating to emission limits are complied with. Emission measurements still serve as warranty from plant constructors to operators that the plant runs in accordance with the specification and the law.

There are two reasons why the measuring and monitoring of flue gases for emission components is one of the key topics in continuous gas analysis. First, because of the necessity to comply with the legal regulations and directives. Second, because process plant operators draw conclusions regarding process efficiency from the gas analysis, for example, in boiler control.

So called Continuous Emission Monitoring Systems (CEMS) are used for the determination of the exhaust gas components. In Europe, they are usually called Automated Measurements Systems (AMS). DIN EN 15267 determines corresponding minimum requirements and testing procedures for automated monitoring systems for the measurement of gases and particulate substances in the exhaust gas of stationary sources as well as for the measurement of the volume flow of the exhaust gas. It provides detailed procedures for the realization of the requirements for the first quality assurance level (QAL1) of DIN EN 14181 and, if required, the access data for the third quality assurance level (QAL 3).

Siemens expertise in the area of products and solutions for process analysis helps you meet all requirements for continuous emission monitoring quickly and smoothly in accordance with regional law. This solution package even ensures a secure investment in case of regulatory adjustments.

According to individual requirements, Siemens offers cold-extractive, hot-extractive, and in-situ automated monitoring systems.

The portfolio is completed by emission evaluation systems for data storage, visualization, remote transmission - permitted according to TA-Luft, 13., 17., 27., 30. and 31. BImSchV.

Siemens does not only offer standard solutions but also complete emission analysis systems, e.g. in turnkey analysis containers.
Analytical Application Sets
Continuous emission monitoring

Set CEM CERT

Overview

Set CEM CERT is a standardized and certified continuous emission monitoring system. Set CEM CERT is suitable for use in many plants which need to comply with European legislation according to Directive 2010/75/EU, the Industrial Emissions Directive.

The modular CEMS meets the current quality standards of EU directives EN 15267 and EN 14181. The number of components that need to be measured depends on the type of plant as well as the fuel used. The measurement of gas components takes place according to the cold-extractive measuring procedure. A sample flow is constantly being extracted for measurement purposes in the exhaust gas stack by means of a gas sampling probe and transported to the analysis cabinet. The modular system cabinet can be equipped with up to three analyzers and different sample preparation components.

Benefits

- The tested measuring ranges can be selected for a variety of ranges to ensure use in different areas of application for the CEMS (checked for suitability according to EN 15267-3: TÜV and MCERTS).
- The complete modular package allows the certified use of system components from different manufacturers (checked for suitability according to EN 15267-3: TÜV and MCERTS).
- Simple and fast to configure
- Very low costs of procurement and operation

Modular design

- Up to 3 analyzers with different measuring ranges can be configured
- Selection of sample gas cooler and NO\textsubscript{X} converter from leading manufacturers
- Electric heaters and air conditioners can be configured to extend the ambient temperature range
- Selection of versions with appropriate sampling probes, heated sample gas lines

Application

- Emission monitoring of power plants fueled with solid, gaseous or liquid fuels
- Emission monitoring of so-called TA air plants
- For plants in which corrosive aerosols (acid mist) may be encountered, suitable measures have to be taken to remove the corrosive aerosols from the gas matrix. To do this, a project-specific technical clarification is required in advance.

Design

Tested component design

The complete system consists of the following tested individual components:

- Sampling probe: M&C, type: SP2000; Bühler/Siemens, type: GAS222/7MB1943-2F
- Heated sample gas line: Winkler/Siemens, type: 7MB1943-2A
- Temperature controller: Siemens, type: SIRIUS
- Two-stage compressor gas cooler: M&C, type: CSS; Bühler, type: EGK 2-19
- Sample gas pump: Bühler/Siemens, type: P2.3/7MB1943-3C
- NO\textsubscript{X} converter: M&C, type: CG-2

Design of measuring instruments checked for suitability

The modular measuring system Set CEM CERT can consist of one or up to three of the following analyzers in combination with a system cabinet.

The analyzer checked for suitability is selected separately from the system based on the specific article number.

<table>
<thead>
<tr>
<th>Analyzer</th>
<th>Article number of the analyzer</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRAMAT 23</td>
<td>7MB2358-.....-....</td>
<td>3 NDIR components on 2 optical benches</td>
</tr>
<tr>
<td>ULTRAMAT 23</td>
<td>7MB2357-.....-....</td>
<td>2 NDIR components on 2 optical benches</td>
</tr>
<tr>
<td>ULTRAMAT 23</td>
<td>7MB2355-.....-....</td>
<td>1 NDIR component on 1 optical bench</td>
</tr>
<tr>
<td>SIPROCESS UV600</td>
<td>7MB2621-.....-....</td>
<td>3 UV components on 1 optical bench</td>
</tr>
<tr>
<td>ULTRAMAT 6</td>
<td>7MB2121-.....-....</td>
<td>1 NDIR component on 1 optical bench</td>
</tr>
<tr>
<td></td>
<td>7MB2101-.....-....</td>
<td>1 optical bench</td>
</tr>
<tr>
<td>ULTRAMAT 6; two-channel 19” rack unit</td>
<td>7MB2123-.....-....</td>
<td>2 NDIR components on 2 optical benches</td>
</tr>
<tr>
<td></td>
<td>7MB2124-.....-....</td>
<td>2 optical benches</td>
</tr>
<tr>
<td>OXYMAT 6</td>
<td>7MB2021-.....-....</td>
<td>1 paramagnetic O\textsubscript{2} measuring cell</td>
</tr>
<tr>
<td>ULTRAMAT / OXYMAT 6</td>
<td>7MB2023-.....-....</td>
<td>1 NDIR component on 1 optical bench</td>
</tr>
<tr>
<td></td>
<td>7MB2024-.....-....</td>
<td>1 paramagnetic O\textsubscript{2} sample chamber</td>
</tr>
</tbody>
</table>

NDIR = Non-dispersive infrared sensor
### Function

The modular measuring system consists of the following components:

- 1 heated sampling probe
- 1 heated sample gas line (length of the heated sample gas line can be selected up to 50 m)
- 1 sample gas cooler
- 1 sample gas pump
- 1 to 3 differently configurable analyzers

Once it has passed through the heated cable, the sample gas flows into a two-stage compressor gas cooler. Between the 1st and 2nd cooler stage there is sample gas pump with integrated gas return for regulating the sample gas flows. Once it has passed through the sample gas cooler, the gas path splits into different partial lines to supply up to three analyzers simultaneously with sample gas. An additional partial flow lets the sample gas excess flow out over a bypass.

To protect the analyzers, a condensate blocker is located directly upstream from the analyzers; it closes off the gas path when condensate enters the path.

A three-way valve is installed upstream from the pump to supply the zero gas for automatic zero-point calibration. A second three-way valve is installed downstream from the pump to supply zero gas and calibration gases from the pressurized gas cylinders. This three-way valve can offer calibration gases time-controlled from compressed gas cylinders for automatic calibration of zero point or reference point. Alternatively, calibration gases can be supplied manually by means of a three-way ball valve.

By default, the Set CEM CERT is operated by means of a touch screen panel (SIMATIC HMI, KTP700 BASIC) on the front of the measuring cabinet. Alternatively, the measuring device can also be operated by means of the individual analyzers.

### Technical specifications

#### Climatic conditions

- Ambient temperature: +5° ... +40 °C (standard)
- With heating: Min. -5 °C
- Relative humidity: 75% (annual average), non-condensing

#### Sample gas conditions

- Max. sample gas pressure at inlet to sample preparation system: 500 hPa (mbar)
- Max. moisture content in sample gas: 17 vol % (cooler type: CSS), 25 vol % (cooler type: EGK 2-19), with glass heat exchanger.
- Max. 200 °C at cabinet entry
- Approx. 60 l/h per analyzer
- Dust load: < 2 g/m²
- Mounting flange: DN 65, PN 6, form B
- Including temperature controller with Pt100
- With internal sampling tube, stainless steel, length: 1 m (can be shortened)
- With filter in probe, to 600 °C

#### Power supply

- Supply 1: 230 V AC, 50 … 60 Hz (-15%, +10%); on request
- Supply 2: 400 V AC, 50 … 60 Hz (-15%, +10%)
- Max. 4 000 VA; without heated sample gas line

#### System design

- Fusing of electronic consumers: 1-pole or 2-pole (selectable)
- Sample gas cooler: 2-stage
- Output signals: 4 … 20 mA; corresponding to the analyzer information or via PROFIBUS DP
- Additional digital inputs and outputs via PLC (SIMATIC S7-1200)
- Color: RAL 7035
- Weight: approx. 160 kg
- Sheet-steel cabinet/frame: Indoor installation
- Explosion protection classification: Installation outside the Ex zone
- Degree of protection: IP54
- Calibration: Semi-automatic for fully automatic; AUTOCAL on ULTRAMAT 23 freely adjustable up to max. 24-hour interval

#### Dimensions

- Sheet-steel cabinet (with base) for indoor installation: 2 100 x 800 x 800 mm (H x W x D)

500 mm spacing on the right or left must be provided for the cable inlet and connection of the heated sample gas line.

1) With NO and SO₂ concentration > 500 mg/m³, the glass heat exchanger must be used.
2) When the SIPROCESS UV600 analyzer is selected, the cooler type EGK 2-19 must be used due to the greater cooling capacity.

**Detailed information on the analyzers**

You can find detailed information on the analyzers under “Extractive continuous process gas analysis”. 

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Start menu on the SIMATIC HMI touch screen panel
Analytical Application Sets
Continuous emission monitoring

Set CEM CERT

Selection and ordering data

Suitability-tested emission measuring system (EN 15267) for the continuous emission measurement

7MB1957-700

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Rack

System cabinet 1 (2 100 x 800 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the left, with cabinet light, including side panels and base

System cabinet 2 (2 100 x 800 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the right, with cabinet light, including side panels and base.

Note: Must be approved by customer with individual acceptance test.

GFK cabinet 1 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the left, with cabinet light, base

GFK cabinet 2 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the right, with cabinet light, base

Note: Must be approved by customer with individual acceptance test.

Installation in custom cabinet; is ordered, delivered and invoiced as separate order item

Sampling probe

For dust loads up to 2 g/m³, including sampling pipe, length 1 000 mm, for temperatures ≤ 600 degrees Celsius, without weather protection cover, material of filter enclosure: stainless steel

Type: M&C; Version SP2000
Type: Bühler; GAS 222

Ventilation/cooling

Cabinet fan installed in side panel, with adjustable thermostat

Note: Must be approved for ULTRAMAT 23 by customer with individual acceptance test.

Energy-efficient cabinet air-conditioning unit installed in side panel, controlled via thermostat

Energy-efficient cabinet air-conditioning unit installed in side panel, controlled via thermostat, for outdoor installation in the GFK cabinet

Note: Must be approved by customer with individual acceptance test.

Heater

Without cabinet heating

Electrical frost protection heating installed in the cabinet for expansion of operating range of -5 °C (indoor installation) or -15 °C (outdoor installation)

Grounding of all electrical consumers

1-pole

2-pole

Sample gas cooler

Including two heat exchangers arranged in series connection.

Type: M&C, Version CSS
Type: Bühler, Version EGK-2, for increased cooling capacity

NO2/NO converter

Without NO2/NO converter

With NO2/NO converter, type: M&C, Version CG, with converter cartridge for conversion of NO2 into NO

Power supply

50 Hz or 60 Hz, including main switch

230 V AC, -15%, +10%

400 V AC, -15%, +10%, three-phase

Additional versions

Add “-Z” to article number and then add order code

Order code

Accessories

Condensation trap made of plastic with level monitoring

Acidification module for measuring of SO2 concentrations < 100 mg/m³; to prevent wash-out effects by the condensate

Note: Must be approved by customer with individual acceptance test.

PROFIBUS DP interface for querying status and measured signals.

Note: Must be approved by customer with individual acceptance test.
### Additional versions

#### Extractive process gas analyzers

A total of up to 3 analyzers in combination can be selected. Each of the analyzers must be ordered separately.

<table>
<thead>
<tr>
<th>Analyzers mounting position 1</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)</td>
<td>C10</td>
</tr>
<tr>
<td>Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-...)</td>
<td>C11</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-...)</td>
<td>C12</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-...)</td>
<td>C13</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-...)</td>
<td>C14</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-...)</td>
<td>C15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyzers mounting position 2</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)</td>
<td>C20</td>
</tr>
<tr>
<td>Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-...)</td>
<td>C21</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-...)</td>
<td>C22</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-...)</td>
<td>C23</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-...)</td>
<td>C24</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-...)</td>
<td>C25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyzers mounting position 3</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)</td>
<td>C30</td>
</tr>
<tr>
<td>Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-...)</td>
<td>C31</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-...)</td>
<td>C32</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-...)</td>
<td>C33</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-...)</td>
<td>C34</td>
</tr>
<tr>
<td>Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-...)</td>
<td>C35</td>
</tr>
</tbody>
</table>

#### Sample gas line, electrically heated

Highly flexible, electrically heated sample gas line; can be regulated up to max. 200 °C, including temperature controller integrated in system cabinet.

<table>
<thead>
<tr>
<th>Length</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m</td>
<td>D01</td>
</tr>
<tr>
<td>10 m</td>
<td>D02</td>
</tr>
<tr>
<td>15 m</td>
<td>D03</td>
</tr>
<tr>
<td>20 m</td>
<td>D04</td>
</tr>
<tr>
<td>25 m</td>
<td>D05</td>
</tr>
<tr>
<td>30 m</td>
<td>D06</td>
</tr>
<tr>
<td>35 m</td>
<td>D07</td>
</tr>
<tr>
<td>40 m</td>
<td>D08</td>
</tr>
<tr>
<td>45 m</td>
<td>D09</td>
</tr>
<tr>
<td>50 m</td>
<td>D10</td>
</tr>
</tbody>
</table>

#### Electronic overcurrent protection for heated sample gas line

Grounding and temperature controller for heated sample gas line. The heated sample gas line must be ordered separately: see catalog AP 11 "Components for emission analysis".

<table>
<thead>
<tr>
<th>Length</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>D21</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>D22</td>
</tr>
<tr>
<td>Up to 15 m</td>
<td>D23</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>D24</td>
</tr>
<tr>
<td>From 21 m to 30 m</td>
<td>D25</td>
</tr>
<tr>
<td>From 31 m to 40 m</td>
<td>D26</td>
</tr>
</tbody>
</table>
Analytical Application Sets
Continuous emission monitoring

Set CEM CERT

**Additional versions**

**Zero gas and span gas infeed**
- Semi-automatic zero gas infeed for ULTRAMAT 23; max. number: 1
- Fully automatic zero gas infeed for a zero gas cylinder
- Fully automatic calibration gas infeed for the first calibration gas cylinder
- Fully automatic calibration gas infeed for the second calibration gas cylinder

1) Applies to:
- ULTRAMAT 6
- ULTRAMAT/OXYMAT 6
- OXYMAT 6
- SIPROCESS UV600

Maximum number: 3; 1x/used calibration gas cylinder
Option must be selected if the option C11 ... C15 was selected at least once.

**Order code**
- F01, F02, F03, F04, F05

**Signal processing**
Analog signal processing duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal

**Documentation**
Technical documentation of the des Set CEM CERT and the configured analyzers
- German
- English
- French

**Order code**
- M01
- N01, N02, N03

**Dimensional drawings**

Set CEM CERT, dimensions in mm
Analytical Application Sets
Continuous emission monitoring

Set CEM 1

Overview

The Set CEM 1 is a standardized system specially for monitoring the emission components in flue gases.

Benefits

Standardized complete system
- Highly exact and reliable monitoring of emission components in flue gases.
- Modular complete package with gas sampling system, sample gas preparation system and gas analyzers from one source
- Simple and fast to configure
- Tried and tested, harmonized and reliable set
- Low purchase price and economic operation

Proven technologies
- Up to 3 extractive analyzers (ULTRAMAT 23, OXYMAT 6) can be used
- In-situ measurements without sampling and preparation, using LDS 6 laser diode spectrometer; central unit can be built into cabinet

Simple operation
- Intuitive operation
- Configuration on large displays using plain text, in several languages

Simple maintenance
- Maintenance-friendly cabinet design with hinged frame and uniform design
- Digital display of maintenance requests on LOGO modules

Application

The monitoring of emission components in flue gases is one of the most important topics for continuous gas analysis. This is a result of legislation for monitoring emissions, e.g. for large combustion plants, and also due to the requirements of companies operating process plants who can draw conclusions on the process efficiency from the gas analyses, e.g. with boiler control, DENOX and DESOX plants.

The market requires a reliable complete system which is specially designed for the application. The Set CEM 1 (Continuous Emission Monitoring) offered by Siemens is a system which reliably covers all requirements associated with sampling, sample preparation, and gas analysis.

It is possible to determine the concentrations of the gaseous components CO, CO₂, NO, NOₓ, SO₂, O₂, HCl, HF, NH₃ and H₂O.

The ULTRAMAT 23 and OXYMAT 6 are used for the extractive, continuous process gas analysis.

The standardized Set CEM 1 provides great clarity and simple configuration facilities. Different versions mean that it is possible to appropriately adapt the system to the requirements. Standardization also means that not all imaginable versions can be included, and that it may not be possible to implement special requirements such as armored cables, varying gas compositions, customer-specific documentation or specific conductor labeling without an extra charge.

Design

Starting with a mounting frame with sample preparation system, it is possible to add additional units as options. These include:
- Sampling probe with weather protection hood
- Heated sample gas line
- Analyzers
- Air-conditioning unit
- NO₂/NO converter
- Sample preparation extension for an additional ULTRAMAT 23 analyzer
- Single and dual (electrically isolated, not electrically isolated) analog signal processing
- Power supply modules (115 V, 230 V, 400 V)
- Outer panels with steel-plate door or with window
- Single-pole and double-pole fusing
- Condensation bottle
- Coalescence filter

Sampling probe

The standard probe is fitted with a DIN flange DN 65, PN 6. The probe is provided with a regulated heater, and has a power consumption of 400 VA. It is supplied with a weather protection hood and 2 µm filter. The maximum dust concentration at the sampling point should not exceed 2 g/m³. The sampling pipe is 1 000 mm long, made of stainless steel, and has dimensions of 20 x 1.5 mm. The sample gas temperature must not exceed 600 °C.

It is also possible to purchase the Set CEM 1 without sample probe.
Cabinet cooling and ventilation

Optional outer panels can be selected for the sheet-steel mounting frames. This possibility allows use of the CEM 1 set in analysis cabinets as a rack design on one hand, or on the other as a cabinet design in halls requiring degree of protection IP54. Either a sheet-steel door without window or a glass door can be selected.

Base
Plinths with a height of 100 and 200 mm are additionally available.

Cabinet cooling and ventilation

Optional are a fan with outlet filter, an air-conditioning unit for indoor installation, and an air-conditioning unit for outdoor installation. The system can be ordered without a fan or air-conditioning unit if the side panels and the door with window are omitted.

The fan with outlet filter has a power consumption of 60 VA, and is fitted in the cabinet wall. The delivery also includes a thermostat with a power consumption of 25 VA.

The air-conditioning unit has a cooling power of 820 VA.
ULTRAMAT 23: CO, NO, SO₂
For measuring three infrared components.

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest tested measuring range</th>
<th>Switchable to</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0 ... 250 mg/Nm³</td>
<td>0 ... 1 250 mg/Nm³</td>
</tr>
<tr>
<td>NO</td>
<td>0 ... 400 mg/Nm³</td>
<td>0 ... 2 000 mg/Nm³</td>
</tr>
<tr>
<td>SO₂</td>
<td>0 ... 400 mg/Nm³</td>
<td>0 ... 2 000 mg/Nm³</td>
</tr>
</tbody>
</table>

One or two measuring ranges can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

ULTRAMAT 23: CO, NO, CO₂
For measuring three infrared components.

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<tr>
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<td>CO</td>
<td>0 ... 250 mg/Nm³</td>
<td>0 ... 1 250 mg/Nm³</td>
</tr>
<tr>
<td>NO</td>
<td>0 ... 400 mg/Nm³</td>
<td>0 ... 2 000 mg/Nm³</td>
</tr>
<tr>
<td>CO₂</td>
<td>0 ... 5 %</td>
<td>0 ... 25 %</td>
</tr>
</tbody>
</table>

One or two measuring ranges can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

The component CO₂ has not been type approved by the TÜV.

ULTRAMAT 23: CO₂
For measuring one infrared component.

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest measuring range</th>
<th>Largest measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>0 ... 5 %</td>
<td>0 ... 25 %</td>
</tr>
</tbody>
</table>

One or two limits can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

The component CO₂ has not been type approved by the TÜV.

The ULTRAMAT 23 analyzers can be optionally equipped with an electrochemical oxygen sensor.

O₂: Tested measuring ranges 0 to 10 / 25%

OXYMAT 6: O₂
For paramagnetic measurement of oxygen. Instead of ULTRAMAT 23 with electrochemical cell.

O₂: Tested measuring ranges 0 to 10 / 0 to 25%
Sample chamber without flow-type compensation branch, made of stainless steel 1.4571.

LDS 6: HCl

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest tested measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCl</td>
<td>0 ... 15 mg/Nm³</td>
</tr>
</tbody>
</table>

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 2 000 mm, applies to gases with a methane content < 15 mg/m³. Necessary gas temperature between 120 and 210 °C.

LDS 6: HF/H₂O

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest tested measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCl</td>
<td>0 ... 15 mg/Nm³</td>
</tr>
<tr>
<td>H₂O</td>
<td>0 ... 30 %</td>
</tr>
</tbody>
</table>

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA. The HF measurement has not been type approved by the TÜV.

Limitation:
Applies to measurement paths > 2 000 mm, applies to gases with a methane content < 15 mg/m³. Necessary gas temperature between 120 and 210 °C.

LDS 6: HF

HF: Smallest possible measuring range depends on the gas composition.

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA. The HF measurement has not been type approved by the TÜV.

Limitation:
Component has not been type approved by TÜV. Necessary gas temperature between 0 and 150 °C.

LDS 6: HF/H₂O

HF: Smallest possible measuring range depends on the gas composition.

H₂O: Smallest tested measuring range 0 to 30%

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA. The HF measurement has not been type approved by the TÜV.

Limitation:
Component has not been type approved by TÜV. Necessary gas temperature between 0 and 150 °C.
Analytical Application Sets
Continuous emission monitoring

Set CEM 1

**LDS 6: NH₃**

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest tested measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃</td>
<td>0 ... 20 mg/Nm³</td>
</tr>
</tbody>
</table>

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 1 250 mm. Necessary gas temperature between 0 and 150 °C.

**LDS 6: NH₃/H₂O**

<table>
<thead>
<tr>
<th>Component</th>
<th>Smallest tested measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃</td>
<td>0 ... 20 mg/Nm³</td>
</tr>
<tr>
<td>H₂O</td>
<td>0 ... 15 %</td>
</tr>
</tbody>
</table>

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N₂ on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 1 250 mm. Necessary gas temperature between 0 and 150 °C.

**Hybrid cable**

A hybrid cable is required to connect a central unit to one pair of sensors. Versions for 5, 10, 25, 40 and 50 m are available. Cable lengths cannot be combined. Lengths greater than 50 m can be ordered on request.

**Sensor cable**

A sensor cable is required to connect one pair of sensors. Versions for 5, 10 and 25 m are available. Cable lengths cannot be combined. Lengths greater than 25 m can be ordered on request.

**Electrical preparation for dust measurement**

Electrical preparation for connection of an external dust measurement to the system (contains a switch amplifier).

**Electrical preparation for flow measurement**

Electrical preparation for connection of an external flow measurement to the system (contains a switch amplifier).

**Electrical preparation for pressure measurement**

Electrical preparation for connection of an external pressure measurement to the system (contains a switch amplifier).

**Electrical preparation for temperature measurement**

Electrical preparation for connection of an external temperature measurement to the system (contains a switch amplifier).

**Electrical preparation for emission data memory on rail module**

On request.

**Electrical preparation for emission data memory in 19” rack unit**

On request.

**Additional LOGO for four or more 19” rack units**

Sets with more than three 19” rack units integrated require a LOGO extension module. The delivery also includes connection and programming.

**Core end labeling**

It is optionally possible to order core end labeling according to the Siemens standard (VDE 0100 Part 200).

**Documentation**

The Siemens standard documentation is available in German or English.

The documentation includes gas path diagram, circuit diagram, terminal diagram, installation diagram, consumable materials list, signal list, cable list, and parts list. Also included are technical data sheets and Operating Instructions for the components and devices used. The documentation language for parts provided by other suppliers may deviate. Plant description, LOGO program and test certificates are also included in the documentation.

The documentation contains no customer-specific/project-specific drawings, and consists of two folders and one CD per set.
Set CEM 1, gas flow chart including options
Analytical Application Sets
Continuous emission monitoring

Set CEM 1

**Function**

A sample is extracted via the heated sample gas probe. The dust concentration may be up to 2 g/m³, the sample gas temperature up to 600 °C. The gas is transported to the analysis cabinet via a heated sample gas line. The heating prevents condensate. The gas cooler cools and dries the sample in the analysis cabinet. Condensate is drained. The level in the condensate trap is monitored. For safety purposes, a coalescence filter can be provided in addition to the fine filter and moisture filter which are always present. The sample gas is analyzed by analyzers such as the ULTRAMAT 23, OXYMAT 6 and LDS 6. The ULTRAMAT 23 operates on the basis of molecular-specific absorption of infrared radiation or with an electrochemical oxygen measuring cell. The OXYMAT 6 is an analyzer for paramagnetic oxygen measurements. The in-situ LDS 6 laser diode spectrometer operates according to the molecular-specific absorption of near-IR radiation. The delivery may also include an NO2/NO converter which permits measurement of total nitrogen oxides. In order to qualify the set for low or high temperature ranges (-5, +45 °C), it is possible to use a cabinet heater or air-conditioning unit. Power supply versions are available for 115, 230 or 400 V AC. Electronic consumers can be provided with single-pole or double-pole fusing. The components of the sample preparation system and the analyzers are connected to LOGO modules via a digital signal, and transmit maintenance requirements. The analog signals can be processed either singly or twice. Electrical isolation is additionally possible for the double processing.

**Technical specifications**

<table>
<thead>
<tr>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hose material</td>
</tr>
<tr>
<td>Cables</td>
</tr>
<tr>
<td>Electrical design</td>
</tr>
<tr>
<td>Cable ID</td>
</tr>
<tr>
<td>Fusing of electronic consumers</td>
</tr>
<tr>
<td>Duplication of analog signals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Technical specifications</strong></th>
<th><strong>Dimensions (without plinth)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climatic conditions</strong></td>
<td>Depth of sheet-steel frame</td>
</tr>
<tr>
<td>Ambient temperature 0 ... 35 °C</td>
<td></td>
</tr>
<tr>
<td>With heater in sheet-steel cabinet Min. -5 °C</td>
<td></td>
</tr>
<tr>
<td>With heating in GRP cabinet Min. -15 °C</td>
<td></td>
</tr>
<tr>
<td>With air-conditioning Max. 52 °C</td>
<td></td>
</tr>
<tr>
<td>Relative humidity 70%, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Corrosive atmosphere No</td>
<td></td>
</tr>
<tr>
<td><strong>Gas inlet conditions</strong></td>
<td>Max. 800 mm x 800 mm (H x W x D)</td>
</tr>
<tr>
<td>Max. sample gas pressure at inlet to sample preparation system 500 hPa (mbar)</td>
<td></td>
</tr>
<tr>
<td>Max. moisture content in sample gas 17 vol.% 1)</td>
<td></td>
</tr>
<tr>
<td>Max. water dew point 60 °C</td>
<td></td>
</tr>
<tr>
<td>Min. sample gas pressure at inlet to sample preparation system 180 °C</td>
<td></td>
</tr>
<tr>
<td>Dust content at inlet to sample preparation system Dust-free</td>
<td></td>
</tr>
<tr>
<td>Sampling probe Sampling tube 20 x 1.5, 1 000 mm long, stainless steel, flange: DN 65, PN 6</td>
<td></td>
</tr>
<tr>
<td>Max. sample gas pressure at sampling probe 500 hPa (mbar)</td>
<td></td>
</tr>
<tr>
<td>Max. sample gas temperature at sampling probe 600 °C</td>
<td></td>
</tr>
<tr>
<td>Max. dust content at sampling probe 2 g/Nm³</td>
<td></td>
</tr>
<tr>
<td>Sample gas must not be flammable or explosive.</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>GRP cabinet (with plinth)</td>
</tr>
<tr>
<td>Supply 1 115 V AC (-15%, +10%)</td>
<td></td>
</tr>
<tr>
<td>Supply 2 230 V AC (-15%, +10%)</td>
<td></td>
</tr>
<tr>
<td>Supply 3 400 V AC (-15%, +10%)</td>
<td></td>
</tr>
</tbody>
</table>

It is necessary to provide a 500 mm gap to the right or left for the tube or cable inlet. Use of the LDS 6 requires a cabinet with a depth of 800 mm.  

1) Higher performance sample gas coolers can be offered upon request (not TÜV suitability-tested). A higher performance cooler is generally required for high sulfide content in fuels (e.g. heavy oil).

**Detailed information on the analyzers**

You can find detailed information on the analyzers in:

- “Extractive continuous process gas analysis”
- ULTRAMAT 23
- OXYMAT 6
- “In situ continuous process gas analysis”
- LDS 6
### Selection and ordering data

#### Set CEM 1 – Continuous Emission Monitoring

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7MB1953-77</td>
<td>Cannot be combined</td>
</tr>
</tbody>
</table>

#### Rack

<table>
<thead>
<tr>
<th>Rack</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Rack 1: 2 000 x 800 x 800 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19” rack units possible</td>
</tr>
<tr>
<td>1</td>
<td>Rack 2: 2 000 x 800 x 800 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19” rack units possible</td>
</tr>
<tr>
<td>2</td>
<td>Rack 3: 2 000 x 800 x 600 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19” rack units possible, not suitable for LDS 6</td>
</tr>
<tr>
<td>3</td>
<td>Rack 4: 2 000 x 800 x 600 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19” rack units possible, not suitable for LDS 6</td>
</tr>
<tr>
<td>4</td>
<td>Rack 5: 2 060 x 900 x 600 mm (H x W x D), GRP, base 80 mm, with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, with side panels, incl. door with window, max. five 19” rack units possible, not suitable for LDS 6</td>
</tr>
<tr>
<td>5</td>
<td>Rack 6: 2 060 x 900 x 600 mm (H x W x D), GRP, base 80 mm, with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, with side panels, incl. door with window, max. five 19” rack units possible, not suitable for LDS 6</td>
</tr>
</tbody>
</table>

#### Sampling probe

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without</td>
</tr>
<tr>
<td>B</td>
<td>Standard sampling probe</td>
</tr>
</tbody>
</table>

#### Ventilation/cooling

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without</td>
</tr>
<tr>
<td>B</td>
<td>Fan with outlet filter</td>
</tr>
<tr>
<td>C</td>
<td>Cabinet air-conditioning unit</td>
</tr>
<tr>
<td>D</td>
<td>Cabinet air-conditioning unit for GRP rack</td>
</tr>
</tbody>
</table>

#### Heating

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without</td>
</tr>
<tr>
<td>1</td>
<td>Cabinet heating</td>
</tr>
</tbody>
</table>

#### Fuse protection

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1-pole</td>
</tr>
<tr>
<td>1</td>
<td>2-pole</td>
</tr>
</tbody>
</table>

#### Removal of condensation

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without</td>
</tr>
<tr>
<td>1</td>
<td>19 l container with level monitoring</td>
</tr>
</tbody>
</table>

#### NO2/NO converter

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without</td>
</tr>
<tr>
<td>B</td>
<td>NO2/NO converter</td>
</tr>
</tbody>
</table>

#### Power supply

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115 V AC, -15 %, +10 %, 50 or 60 Hz</td>
</tr>
<tr>
<td>B</td>
<td>230 V AC, -15 %, +10 %, 50 or 60 Hz</td>
</tr>
<tr>
<td>C</td>
<td>400 V AC, -15 %, +10 %, 50 or 60 Hz (3 phases, neutral, ground provided by customer)</td>
</tr>
</tbody>
</table>

#### Connection set for heated line

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without controller</td>
</tr>
<tr>
<td>1</td>
<td>Standard controller (max. 35 m heated line can be connected)</td>
</tr>
</tbody>
</table>

**Note:**
The heated sample gas line must be ordered separately using Catalog AP 11.
## Analytical Application Sets
### Continuous emission monitoring

### Set CEM 1

<table>
<thead>
<tr>
<th>Additional versions</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add “-Z” to Article No. and specify Order code</td>
<td></td>
</tr>
<tr>
<td><strong>Bases</strong></td>
<td></td>
</tr>
<tr>
<td>Base for rack 1, 2, height 100 mm</td>
<td>A01</td>
</tr>
<tr>
<td>Base for rack 1, 2, height 200 mm</td>
<td>A02</td>
</tr>
<tr>
<td>Base for rack 3, 4, height 100 mm</td>
<td>A03</td>
</tr>
<tr>
<td>Base for rack 3, 4, height 200 mm</td>
<td>A04</td>
</tr>
<tr>
<td><strong>Rack accessories</strong></td>
<td></td>
</tr>
<tr>
<td>Outer panel painted, for rack 1 and 2, viewing door</td>
<td>B01</td>
</tr>
<tr>
<td>Outer panel painted, for rack 3 and 4, viewing door</td>
<td>B02</td>
</tr>
<tr>
<td>Outer panel painted, for rack 1 and 2, sheet steel door</td>
<td>B03</td>
</tr>
<tr>
<td>Outer panel painted, for rack 3 and 4, sheet steel door</td>
<td>B04</td>
</tr>
<tr>
<td><strong>ULTRAMAT 23, OXYMAT 6 extractive analyzers</strong></td>
<td></td>
</tr>
<tr>
<td>ULTRAMAT 23: CO, NO</td>
<td>C01</td>
</tr>
<tr>
<td>ULTRAMAT 23: CO, NO, SO₂</td>
<td>C02</td>
</tr>
<tr>
<td>ULTRAMAT 23: CO, NO, CO₂</td>
<td>C03</td>
</tr>
<tr>
<td>ULTRAMAT 23: CO₂</td>
<td>C04</td>
</tr>
<tr>
<td>ULTRAMAT 23: Electrochemical O₂ sensor for ULTRAMAT 23 expansion</td>
<td>C05</td>
</tr>
<tr>
<td>OXYMAT 6: OXYMAT paramagnetic O₂ analyzer</td>
<td>C06</td>
</tr>
<tr>
<td>Preperation for free choice ULTRAMAT 23 analyzer</td>
<td>C07</td>
</tr>
<tr>
<td><strong>Additional sample preparation components</strong></td>
<td></td>
</tr>
<tr>
<td>Coalescence filter</td>
<td>D02</td>
</tr>
<tr>
<td><strong>LDS 6 in-situ analyzers</strong></td>
<td></td>
</tr>
<tr>
<td>HCl including sensor pair</td>
<td>E01</td>
</tr>
<tr>
<td>HCl/H₂O including sensor pair</td>
<td>E02</td>
</tr>
<tr>
<td>HF including sensor pair, not suitability-tested</td>
<td>E03</td>
</tr>
<tr>
<td>HF/H₂O including sensor pair, not suitability-tested</td>
<td>E04</td>
</tr>
<tr>
<td>NH₃ including sensor pair</td>
<td>E05</td>
</tr>
<tr>
<td>NH₃/H₂O including sensor pair</td>
<td>E06</td>
</tr>
<tr>
<td><strong>LDS 6 hybrid cable per LDS 6</strong></td>
<td></td>
</tr>
<tr>
<td>5 m</td>
<td>F01</td>
</tr>
<tr>
<td>10 m</td>
<td>F02</td>
</tr>
<tr>
<td>25 m</td>
<td>F03</td>
</tr>
<tr>
<td>40 m</td>
<td>F04</td>
</tr>
<tr>
<td>50 m</td>
<td>F05</td>
</tr>
<tr>
<td>Customer-specific &gt; 50 m</td>
<td>F06</td>
</tr>
<tr>
<td><strong>LDS 6 connecting cable per LDS 6</strong></td>
<td></td>
</tr>
<tr>
<td>5 m</td>
<td>G01</td>
</tr>
<tr>
<td>10 m</td>
<td>G02</td>
</tr>
<tr>
<td>25 m</td>
<td>G03</td>
</tr>
<tr>
<td>Customer-specific &gt; 25 m</td>
<td>G04</td>
</tr>
<tr>
<td><strong>Electrical preparation</strong></td>
<td></td>
</tr>
<tr>
<td>Preparation for dust measurement</td>
<td>J01</td>
</tr>
<tr>
<td>Preparation for flow measurement</td>
<td>J02</td>
</tr>
<tr>
<td>Preparation for pressure measurement</td>
<td>J03</td>
</tr>
<tr>
<td>Preparation for temperature measurement</td>
<td>J04</td>
</tr>
<tr>
<td>Preparation for emission data memory – DIN rail module (on request)</td>
<td>J05</td>
</tr>
<tr>
<td>Preparation for emission data memory – 19” rack unit (on request)</td>
<td>J06</td>
</tr>
<tr>
<td><strong>Additional LOGO</strong></td>
<td></td>
</tr>
<tr>
<td>LOGO for a third and fourth 19” rack unit</td>
<td>K01</td>
</tr>
</tbody>
</table>
**Analytical Application Sets**

**Continuous emission monitoring**

**Set CEM 1**

### Additional versions

- **Core end labeling**
  - Single-core labeling Siemens standard

- **Analog signal processing**
  - Double, galvanically connected, 1 x per analog signal
  - Double, galvanically isolated, 1 x per analog signal

- **Documentation**
  - German
  - English
  - French (on request)

<table>
<thead>
<tr>
<th>Option</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L01</td>
</tr>
<tr>
<td></td>
<td>M01</td>
</tr>
<tr>
<td></td>
<td>M02</td>
</tr>
<tr>
<td></td>
<td>N01</td>
</tr>
<tr>
<td></td>
<td>N02</td>
</tr>
<tr>
<td></td>
<td>N03</td>
</tr>
</tbody>
</table>

### Dimensional drawings

- **Option:** Control cabinet ventilation (when using side walls) **
  - Either fan and outlet filter or air-conditioning unit
  - Mounting on left or right

- **Standard:** voltage 230 V/50 Hz, 1-pole fusing
  - Option: voltage 115 V/50 Hz / 400 V/50 Hz, 2-pole fusing

- **Spare location for converter (option)**

- **Option:** Electronic and pneumatic inputs and outputs either on left or right

- **Option:** Condensation bottle with level monitoring 19 liters

- **Available cabinet sizes:**
  - Metal: W x H x D: 800 x 2 000 x 600
  - Metal: W x H x D: 800 x 2 000 x 800
  - FRP: W x H x D: 900 x 2 140 x 600

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Set CEM 1 configuration, figure contains options, dimensions in mm
Analytical Application Sets
Continuous emission monitoring

HM-1400 TRX total mercury analyzer system

Overview

The HM-1400 TRX is a total mercury monitor for fully automatic and continuous measurement of emissions of mercury in flue gas ducts.

Benefits

- Continuous measurement
- Low maintenance dry reactor
- High operational reliability
- Easy maintenance, easy replacement of components
- Low cross sensitivities
- Integrated calibration gas generator for automatic reference point control
- Separate measurement of elemental and ionic mercury as an option

Application

The HM-1400 TRX monitors not only the performance of the mercury separators by measuring the total mercury concentration, but also reports and registers (also online) any violation of the high limits. As a result it is often possible to intervene directly in the process of the plant to be monitored and thus ensure reliable compliance with the specified limit values.

Application areas

- Waste incineration plants
- Sewage sludge and hazardous waste incineration
- Coal-fired power plants
- Steel plants with scrap metal preparation
- Contaminated soil burning plants (thermal cleanup of soil)
- Crematoria
- Mercury mines and refineries
- Fluorescent light bulb recycling

Certifications

- Suitability-tested by TÜV North, test report 109 GMT007/8000632287 from 30 June 2011
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

Design

HM-1400 TRX system components

Sampling system
The sampling system consists of a sampling probe and a sampling line. Both components are heated to 180 °C. With flue gas temperatures < 200 °C, the sampling tube must also be in heated tube design to prevent faulty measurements (lower findings for the mercury concentration measurement due to the absorption properties of HgCl₂).

Gas patch switchover
The sample gas is extracted condensate-free from the exhaust stack with approx. 100 Nl/h and fed via a three-way ball valve to the thermocatalytic reactor. The path switchover is also heated and is operated as component of the measuring device by means of the device control. You can select between sample gas connection, reference connection or zero gas connection.
Thermocatalytic reactor
The total mercury analysis measures not only the elementary metallic mercury that is stored freely in the sample gas or deposited in the materials, but also measures the chemically bonded mercury that is found in the flue gas. The ionic mercury must also be converted into elementary, atomic mercury so that the detector can acquire and evaluate the total mercury. The thermocatalytic reactor carries out this function at a preset operating temperature.

Gas drying
Before the mercury content is determined, the now created sample gas containing Hg0 is dried while flowing through a Peltier cooler. At the same time the system pressure and the measured gas temperature are continuously recorded.

2-beam UV photometer
The sample gas enters the measuring cuvette and is then routed over a selective filter in which the mercury is absorbed. The sample gas thus freed from the mercury then flows through the reference cuvette. The advantage of this cuvette switching is that the entire gas matrix flows through both the measuring cuvette and the reference cuvette and most of the mercury is selectively filtered out before it reaches the reference cuvette. This principle of differential measurement means that the measurement is less sensitive to spectrometric interference components than the single-beam photometer that has only one cuvette. The measured signal from the photometer is taken over by the internal PLC.

Gas volume flow generation
When the sample gas volume flow leaves the 2-beam UV photometer, it passes through the vacuum pump which generates the gas flow. The volume flow of approx. 100 Nl/h is set manually with the fine regulating valve. The system pressure and sample gas temperature parameters are measured after the gas drying at the photometer, where the mercury is also measured, and are used ultimately to convert the gas volume flow to standard conditions. The mercury concentration as result of a measurement is output as 4 to 20 mA current signal to match the set measuring range of 0 to X µg/Nm³ (dry).

Integrated HgCl₂ calibration gas generator
A HgCl₂ calibration gas generator is integrated in the analyzer as a standard feature. The gas generator generates a defined mercury concentration and is used for regular zero point control. It can also be used to check the linearity of the device’s characteristic curve. The zero point control can be integrated automatically into the measuring sequence or triggered manually. The reference concentration can be freely parameterized.

Optional
- Diluter
- Specification module for the separate measurement of elemental and ionic mercury
- Side-mounted cooling device
- Heated sample pipe 0.6 m, 1.0 m, 1.5 m

Function
In the HM 1400 TRX total mercury analyzer the sample gas is converted into mercury vapor by a combination of thermal and chemical treatment. It is then continuously measured in a photometer. The sample gas flow is measured after a sample gas cooler at 2 °C. The concentration is calculated and displayed as "dry flue gas".

Technical specifications

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Total mercury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges</td>
<td>0 ... 45, 0 ... 75 to 0 ... 400 µg/Nm³</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>UV absorption</td>
</tr>
<tr>
<td>Sample gas temperature</td>
<td>0 ... 250 °C</td>
</tr>
<tr>
<td>Sample gas pressure</td>
<td>-50 ... +50 hPa</td>
</tr>
<tr>
<td>Channel diameter</td>
<td>&gt; 0.5 m</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>5 ... 40 °C</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Measured value outputs</td>
<td>2 x 0/4 ... 20 mA, 500 Ω</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>9 relay outputs, load capacity 250 V, 100 VA</td>
</tr>
<tr>
<td>Digital inputs</td>
<td>8 status inputs</td>
</tr>
<tr>
<td>Power supply</td>
<td>230/400 VAC, 50 Hz, 3 x L, N, PE</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1 200 VA</td>
</tr>
<tr>
<td>Sample line</td>
<td>650 VA</td>
</tr>
<tr>
<td>Sampling line</td>
<td>1 00 VA/m</td>
</tr>
<tr>
<td>Heated sample line 0.6 m</td>
<td>600 VA/800 VA/1200 VA</td>
</tr>
<tr>
<td>Heated sample line 1.0 m</td>
<td>1 700 x 800 x 500 mm</td>
</tr>
<tr>
<td>Heated sample line 1.5 m</td>
<td>220 kg</td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td>6 ... 8 bar (for calibration gas generator)</td>
</tr>
</tbody>
</table>

More information
A HM-1400 TRX total mercury analyzer consists of, for example:
- 1 sampling pipe, heated and temperature-controlled, with connecting cable
- 1 sampling probe, heated and temperature-controlled, with connecting cable
- 1 sampling line, heated and temperature-controlled
- 1 analyzer
- Operating instructions

Please consult your Siemens sales partner for information on how to correctly configure and order a HM-1400 TRX Total Mercury Analysis System for a Siemens CEMS project.
**Analytical Application Sets**

**Continuous emission monitoring**

**Dust and opacity measurement**

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**D-R 220 dust and opacity measuring instrument**

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**Overview**

Compact and economical transmissiometer for monitoring the opacity and medium to high dust concentrations in dry exhaust gas and process gas.

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**Benefits**

- In-situ measuring method
- Continuous measurement of opacity and dust concentration
- Automatic internal self-test, zero and reference point test
- Manual contamination control and manual linearity test
- Easy installation and commissioning due to universal control unit and calibration aid
- User-friendly operation with remote access option
- Economic, space-saving measuring system
- Operation with or without control unit possible

---

**Application**

The D-R 220 monitors not only the efficiency of the filter plants by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

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**Application areas**

- Measurements with changing exhaust gas velocities
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Boiler plants in industry, barracks, hospitals, schools
- Cement industry
- Monitoring of dust extraction and filter systems
- Process monitoring
- Emission monitoring on ships
- Measurement of dust load in halls or storage

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**Certifications**

Product certified by TÜV Rheinland (German Technical Inspect orate): Tested AMS, regular monitoring, test mark number 0000051694.

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**Design**

**Measuring head**

The transmitter and receiver optics are integrated together with the electronics in a sturdy, compact polyamide housing. The measuring head is mounted on the weld-in flange.

**Reflector**

The reflector is installed in a sturdy polyamide housing. The reflector is mounted on the weld-in flange directly opposite the measuring head.

**Supply unit D-TB 200 including purge air**

A hose connects the measuring head and the reflector with the supply box. The filtered air is used to keep the scattered light interfaces of the measuring head and the reflector clean. A cable connects the measuring head to the supply box.

**Software D-ESI 100**

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

**Optional**

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

**Measured-value acquisition**

In the simplest case the measured values and reference values are transferred to the plant’s control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

**Additional options**

- Neutral density filters for linearity check
- Sighting scope for easy alignment
Function

The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

The universal control unit D-IS 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-IS 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Technical specifications

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Opacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges</td>
<td>Extinction</td>
</tr>
<tr>
<td>Opacity</td>
<td>0 ... 20 to 0 ... 100%</td>
</tr>
<tr>
<td>Extinction</td>
<td>0 ... 0.1 to 0 ... 1.6</td>
</tr>
<tr>
<td>Dust 1)</td>
<td>0 ... 160 mg/m³</td>
</tr>
<tr>
<td></td>
<td>0 ... 5 000 mg/m³</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Transmission</td>
</tr>
<tr>
<td>Sample gas temperature</td>
<td>Above dew point, ≤ 200 °C standard, others on request</td>
</tr>
<tr>
<td>Sample gas pressure</td>
<td>-50 ... +50 hPa</td>
</tr>
<tr>
<td>Channel diameter</td>
<td>0.4 ... 10 m</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... +50 °C</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65</td>
</tr>
<tr>
<td>Measured value output</td>
<td>0/4 ... 20 mA. 400 Ω</td>
</tr>
<tr>
<td></td>
<td>RS 485 Modbus RTU</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>2 x NO contact, Load capacity 60 V DC/30 V AC/0.5 A</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC</td>
</tr>
<tr>
<td></td>
<td>0.4 A from the supply unit</td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td></td>
</tr>
<tr>
<td>Measuring head</td>
<td>150 x 132 x 214 mm</td>
</tr>
<tr>
<td></td>
<td>150 x 132 x 331 mm with purge flange</td>
</tr>
<tr>
<td>Reflector</td>
<td>126 x 132 x 101 mm</td>
</tr>
<tr>
<td></td>
<td>126 x 132 x 218 mm with purge flange</td>
</tr>
<tr>
<td>Weight</td>
<td>2.7 kg</td>
</tr>
<tr>
<td>Measuring head</td>
<td>1.6 kg</td>
</tr>
</tbody>
</table>

D-TB 200 supply unit

| Purge air supply                  | Integrated blower            |
| Power supply                      | 90 ... 264 V AC, 48 ... 62 Hz, 200 VA |
| Dimensions (H x W x D)            | 410 x 400 x 240 mm            |
| Weight                            | 10 kg                        |
| Degree of protection              | IP65                         |

1) With reference to 1 m of path length after gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 220 measuring system for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring
Dust and opacity measurement

D-R 290 dust and opacity measuring instrument

Overview

The D-R 290 is a dust and opacity measuring instrument for plants with small to medium dust concentrations.

Benefits

- In-situ measuring procedure, continuous measurement
- Super-wide band diode (SWBD), provides more stable measuring results in comparison to devices with conventional LEDs
- Convenient operation, remote access option
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Easy adjustment without additional equipment
- Data transmission via Modbus, in compliance with VDI 4201-3

Application

The D-R 290 monitors not only the efficiency of the filter plants by registering the residual dust content, but also instantaneously reports when permissible levels of dust emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

Application areas

- Furnace plants with semi-anthracite coal, brown coal, fuel oil and multi-fuel firing
- Converter plants, asphalt mixing plants
- Cement manufacturing plants
- Emission monitoring on ships

Certifications

- Suitability-tested by TÜV Cologne, test report 936/2126948/A
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

Design

D-R 290 system components

Measuring head

The transmitter and receiver optics are integrated together with the electronics to form a compact unit housed within a rugged and robust aluminum enclosure. The measuring head is mounted on the weld-in flange.

Reflector

The reflector is installed in a rugged and robust aluminum housing. The reflector is mounted on the weld-in flange directly opposite the measuring head.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Purge air unit

A hose connects the measuring head and the reflector with the purge air unit. The filtered air is used to keep the scattered light interfaces of the measuring head and the reflector clean.

Terminal box

Terminal box to output the data with connecting cable for the measuring head and customer terminal strip.

Optional

Universal control and display unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 universal control and display unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Quick-closing shutters

The quick-closing shutters are mounted on the measuring head and the reflector side between the weld-in flanges and the connected devices (measuring head, reflector). In the event of a fault (failure of the power supply or purge air), they automatically close the path between the exhaust gas duct and the measuring equipment.
Electronics for quick-closing shutter
A control electronics system is required for each quick-closing shutter.

Measured value acquisition
In the simplest case the measured values and reference values are transferred to the plant’s control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Weather protection covers
Weather protection covers are available to protect the measuring head, the reflector, the purge air unit and the terminal boxes when the measuring system is installed outdoors.

Additional options
• Explosion proof device version for Ex p, Zone 1 or Zone 2, 22
• Filter set for sensitivity and linearity control

Function
The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

The universal control unit D-ISC 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-ISC 100. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

### Technical specifications

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Measuring ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opacity</td>
<td>0 ... 20 to 0 ... 100%</td>
</tr>
<tr>
<td>Extinction</td>
<td>0 ... 0.1 to 0 ... 2.0</td>
</tr>
<tr>
<td>Dust(^1)</td>
<td>0 ... 80 mg/m(^3) up to 0 ... 5 000 mg/m(^3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample gas temperature</td>
<td>Above dew point up to 250 °C, optional up to 1,000 °C, depending on application</td>
</tr>
</tbody>
</table>

| Sample gas pressure           | -50 ... +20 hPa, optionally higher |
| Channel diameter              | 1 ... 18 m |
| Ambient temperature           | -40 ... +60 °C |
| Degree of protection          | IP65, Ex optional |

| Measured value outputs        | 0/4 ... 20 mA, 400 Ω |
| Digital outputs               | RS 485 Modbus RTU |
|                              | 2 x NC/NO contact, Load capacity 60 V DC/30 V AC/0.5 A |

| Power supply                  | 24 V DC/0.5 A |
| Dimensions (H x W x D)        | 370 x 190 x 400 mm |
|                               | 370 x 190 x 270 mm |
| Weight                        | 10 kg |
| Measuring head                | 7 kg |

### More information
Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 290 measuring system for a Siemens CEMS project.

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1) With reference to 1 m of path length after gravimetric calibration
Analytical Application Sets
Continuous emission monitoring
Dust and opacity measurement

D-R 320 dust measuring instrument

Overview

The D-R 320 is an optical dust measuring instrument for the smallest to medium dust concentrations in dry exhaust gas and process gas.

Benefits

- Continuous measurement of dust concentration
- Smallest certified measuring range 7.5 mg/m³
- Easy installation on standard flanges
- Easy setup without manual adjustment
- Automatic background light compensation, no light trap
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Integrated purge air regulation and purge air control
- Certified according to DIN EN 15267-3
- Data transmission via Modbus, in compliance with VDI 4201-3

Application

The D-R 320 monitors not only the efficiency of the filter plants by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

Application areas

Continuous emission measurements, e.g. in the following areas:
- Waste incineration
- Cement industry
- Power plant industry
- Woodworking industry
- Chemical industry
- Iron and steel industry

Process monitoring, e.g.:
- Monitoring of ventilation systems
- Monitoring of filter systems

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21217455/A
- Certified according to DIN EN 15267-3
- MCERTS

Design

D-R 320 system components

Measuring head D-R 320 M

The measuring head is integrated together with the electronics in a compact unit in a rugged enclosure. The measuring head consists of:
- Transceiver
- Swivel adapter
- Process connection
- Field diaphragm

This measuring unit is installed directly above the exhaust gas duct on a DIN 100 PN 6 or ANSI 4" 150 lb flange. No adjustment is required.

Supply unit D-TB 200 with purge air supply

The supply unit of the dust concentration measuring instrument D-R 320 is used to supply electricity and purge air and provides the connection for the transfer of the measured data. The regulated purge air is used to keep the optical interfaces of the transmission and reception optics of the D-R 320 clean. The device automatically reports any failure of the purging air.
**Software D-ESI 100**

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

**Optional**

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

**Measured value acquisition**

In the simplest case the measured values and reference values are transferred to the plant’s control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

**Quick-closing shutter**

The swivel adapter can be optionally replaced by an adapter with a fully integrated quick-closing shutter. By using this quick-closing shutter, the path between the measuring device and the exhaust gas is closed mechanically, but not airtight, in the event of a fault (failure of power supply or purge air). The measuring device is temporarily protected against overheating in the event of a fault. The measuring head takes over control of the quick-closing shutter.

**Weather protection covers**

A weather protection cover is available to protect the measuring system when it is installed outdoors.

**Explosion-proof device version**

An explosion-proof device version with pressurized enclosure according to Ex p, Zone 1 or Zone 2 is available for use in hazardous areas.

**Function**

The device operates according to the backscattering principle. This means the light of a laser diode illuminates the dust particles in the measuring volume of the exhaust gas duct. The light reflected by the particles is measured and evaluated.

The automatic background compensation via a patented optical system with integrated double detector is the unique feature. This enables quick and easy commissioning without adjustment. A light trap is not required.

The universal control unit D-ISC 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

**Control functions**

The D-R 320 automatically performs zero and span check as well as contamination check at regular intervals and on demand. The device features an automatic contamination correction. Need for maintenance is immediately indicated by the electronics.

**Technical specifications**

<table>
<thead>
<tr>
<th>Measuring head</th>
<th>Measuring ranges</th>
<th>Measuring principle</th>
<th>Sample gas temperature</th>
<th>Sample gas pressure</th>
<th>Channel diameter</th>
<th>Ambient temperature</th>
<th>Degree of protection</th>
<th>Measured value outputs</th>
<th>Digital outputs</th>
<th>Power supply</th>
<th>Dimensions (H x W x D)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured variable</td>
<td>0 ... 5 mg/m³ to 0 ... 200 mg/m³</td>
<td>Backscattering</td>
<td>0 ... 600 °C</td>
<td>-50 ... +50 hPa</td>
<td>&gt; 0.7 m</td>
<td>-40 ... +60 °C</td>
<td>IP65</td>
<td>0/4 ... 20 mA, 400 Ω</td>
<td>2 x NC/NO contact</td>
<td>Load capacity 60 V DC/30 V AC/0.5 A</td>
<td>Power supply</td>
<td>24 V DC/0.5 A</td>
</tr>
<tr>
<td>Measured range</td>
<td>Measuring principle</td>
<td>Sample gas temperature</td>
<td>Sample gas pressure</td>
<td>Channel diameter</td>
<td>Ambient temperature</td>
<td>Degree of protection</td>
<td>Measured value outputs</td>
<td>Digital outputs</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Measured range</td>
<td>Measuring principle</td>
<td>Sample gas temperature</td>
<td>Sample gas pressure</td>
<td>Channel diameter</td>
<td>Ambient temperature</td>
<td>Degree of protection</td>
<td>Measured value outputs</td>
<td>Digital outputs</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Measured range</td>
<td>Measuring principle</td>
<td>Sample gas temperature</td>
<td>Sample gas pressure</td>
<td>Channel diameter</td>
<td>Ambient temperature</td>
<td>Degree of protection</td>
<td>Measured value outputs</td>
<td>Digital outputs</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td></td>
</tr>
</tbody>
</table>

**Supply unit D-TB 200**

Purge air supply | Integrated blower | 90 ... 264 V AC, 48 ... 62 Hz, 0.37/0.43 kW, 400 VA | Power supply | Dimensions (H x W x D) | Weight | Degree of protection |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge air supply</td>
<td>Integrated blower</td>
<td>90 ... 264 V AC, 48 ... 62 Hz, 0.37/0.43 kW, 400 VA</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td>Degree of protection</td>
</tr>
<tr>
<td>Purge air supply</td>
<td>Integrated blower</td>
<td>90 ... 264 V AC, 48 ... 62 Hz, 0.37/0.43 kW, 400 VA</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td>Degree of protection</td>
</tr>
<tr>
<td>Purge air supply</td>
<td>Integrated blower</td>
<td>90 ... 264 V AC, 48 ... 62 Hz, 0.37/0.43 kW, 400 VA</td>
<td>Power supply</td>
<td>Dimensions (H x W x D)</td>
<td>Weight</td>
<td>Degree of protection</td>
</tr>
</tbody>
</table>

**More information**

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 320 measuring system for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring
Dust and opacity measurement

**D-R 808 dust measuring instrument**

**Overview**

The D-R 808 is an optical dust measuring instrument for the smallest to medium dust concentrations in dry exhaust gas and process gas.

**Benefits**

- In-situ measuring procedure with continuous measurement
- One-sided installation without optical alignment
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Long service life due to integrated purge air monitoring
- Smallest certified measuring range 0 to 7.5 mg/m³
- Remote access possible
- Data transmission via Modbus, in compliance with VDI 4201-3

**Application**

The D-R 808 not only monitors the efficiency of the filter systems by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant to be monitored and thus ensure reliable compliance with the specified limits.

**Areas of application**

Continuous emission measurements, e.g. in the following areas:
- Waste incineration
- Cement industry
- Power plant industry
- Woodworking industry
- Chemical industry
- Iron and steel industry

Process monitoring, e.g.:
- Monitoring of ventilation systems
- Monitoring of filter systems

**Certifications**

- Suitability-tested by TÜV Cologne, test report 936/21232768/B
- Certified according to DIN EN 15267-3
- MCERTS

**Design**

**Measuring device**

The transmitter and receiver optics are integrated together with the electronics in a compact unit in a rugged housing. The measuring probe made of stainless steel 1.4404 can be supplied in two lengths of approx. 400 and 800 mm (from mounting flange).

**Supply unit D-TB 200 with purge air supply**

The supply unit of the dust concentration measuring instrument D-R 808 is used to supply electricity and purge air and provides the connection for the transfer of the measured data. The purge air is used to keep the optical interfaces of the D-R 808 clean. The device automatically reports any failure of the purging air.

**Mounting flange 130/240/500 mm**

The connection flange made of carbon steel or stainless steel 1.4571 should protrude approximately 30 mm into the channel.

**Software D-ESI 100**

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

**Optional**

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

**Measured value acquisition**

In the simplest case the measured values and reference values are transferred to the plant’s control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

**Weather protection covers**

Weather protection covers are available to protect the measuring system for outdoor installation.
**Function**

The D-R 808 device operates according to the forward-scattering principle. The concentrated and modulated light from a laser diode penetrates the measuring volume. The light scattered by the dust particles in the forward direction is measured and evaluated.

**Technical specifications**

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Dust concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges</td>
<td>0 ... 5 mg/m³ to 0 ... 200 mg/m³ ¹)</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Forward scattering</td>
</tr>
<tr>
<td>Sample gas temperature</td>
<td>Above dew point up to 350 °C</td>
</tr>
<tr>
<td>Sample gas pressure</td>
<td>-50 ... +50 hPa</td>
</tr>
<tr>
<td>Channel diameter</td>
<td>&gt; 0.3 m</td>
</tr>
<tr>
<td>Probe length</td>
<td>400/800 mm</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40 ... +60 °C</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65</td>
</tr>
<tr>
<td>Measured value outputs</td>
<td>1 x 0/4 ... 20 mA, 400 Ω, RS 485 Modbus RTU</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>2 x NC/NO contact, Load capacity 60 V DC/30 V AC/0.5 A</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC/0.5 A</td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td>160 x 160 x 600/1 000 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 3 kg/7 kg</td>
</tr>
</tbody>
</table>

**Supply unit D-TB 200**

<table>
<thead>
<tr>
<th>Purge air supply</th>
<th>Integrated blower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>90 ... 264 V AC, 48 ... 62 Hz, 200 VA</td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td>410 x 400 x 240 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>10 kg</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65</td>
</tr>
</tbody>
</table>

¹) After gravimetric calibration

**More information**

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 808 measuring system for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring
Dust and opacity measurement

D-RX 250 combination probe

Overview

MCERTS-certified dust measuring instrument, combined with a flow, temperature and absolute pressure measurement for monitoring small to medium dust concentrations in dry exhaust gas and process gas.

Benefits

- Only one probe/installation opening in the exhaust gas duct
- Compact design, no moving parts, no consumable parts
- Continuous conversion to normalized dust concentration in mg/Nm³ and to normalized volume flow in Nm³/h
- LCD display in mg/Nm³, Nm³/h, °C and hPa, one analog output for each measured variable
- Parameterization at the control unit without the need of a PC or other tools

Application

By combining four selected measuring functions in a single device it is possible to automatically calculate the pollutant mass flow for the preparation of the emission declaration in addition to monitoring the pollutant dust.

Application areas

- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Monitoring of dust extraction and filter systems

Not suitable for use behind electrostatic filters.

Certifications

- Suitability-tested by TÜV Cologne, test report 936/800006/A
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS incl. testing according to DIN EN 15267-3

Design

D-RX 250 system components

Probe

The probe consists of the probe measuring rod and the measured value processing by the electronics in the measuring head. The probe measuring rod is a probe section that protrudes into the dust duct and is fastened with a flange in the duct. It is insulated in design because of the triboelectric measurement and has two chambers for differential pressure measurement. The two chambers for pressure measurement are connected to a differential pressure transmitter. One of the two chambers is also connected to the absolute pressure transmitter in the transmitter. The gas temperature is measured via a measurement resistance in a third chamber in the center of the probe section. The electronic measured value processing is performed in the probe housing. The temperature of the measurement resistance and the triboelectric raw value are determined here. The two raw values of temperature and tribo signal are transferred digitally to the transmitter.

Differential pressure transducer

The differential pressure transmitter converts the differential pressure, created by the gas flowing in the probe measuring rod, into a gas velocity variable.

Transmitter

The transmitter supplies the voltages for the probe and the measuring transmitter for absolute pressure and differential pressure, reads in the raw measured values of these modules and transfer the measured values to the evaluation unit via the RS 485 interface. The transmitter reads the probe values of the triboelectric measured signal and the temperature through the RS 485 interface.

The differential pressure transmitter is connected to the transmitter by a two-wire cable. The absolute pressure transmitter is located inside the transmitter housing. It receives the pressure from a chamber of the probe rod.
Control and evaluation unit

The control and evaluation unit reads out the raw measured values from the transmitter. The measured values for normalized dust concentration and normalized volume flow are calculated in the unit.

It is possible to output all analog values via Modbus or 4/20-mA signals and all status signals via floating contacts.

Measured value acquisition

In the simplest case a recorder is used to record the measured values and the reference values. The measured values and status signals that are output can also be fed into an emission calculator system for further processing.

Optional

- Weather protection cover
- Change-over cock for back purging/zero point control
- Automatic cyclical probe backflush for high dust concentrations
- Hastelloy probes for corrosive gases
- Purge air connection at flange

Function

Dust concentration

The dust concentration is calculated according to the triboelectric measuring principle. The tribo probe measures the electrical charge of the incident particles.

Volume flow

The measurement of the volume flow is based on the mechanical action principle. The probe has two separate chambers, between which a differential pressure builds up under flow.

Absolute pressure

The absolute pressure in the flue gas is measured by a pressure transmitter in one chamber of the probe.

Temperature

The temperature is measured directly in the center of the flue gas in a separate chamber within the probe with a temperature sensor.

Technical specifications

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Dust concentration</th>
<th>Volume flow</th>
<th>Pressure</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges</td>
<td>0 ... 10 to 0 ... 500 mg/Nm³</td>
<td>0 ... 9,999,999 Nm³/h(1)</td>
<td>800 ... 1300 hPa</td>
<td>0 ... 200 °C, optional 0 ... 350 °C</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Tribo electric</td>
<td>Differential pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample gas temperature</td>
<td>Above dew point up to 200 °C, optional up to 350 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample gas humidity</td>
<td>&lt; 80 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample gas pressure</td>
<td>-200 ... +200 hPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel diameter</td>
<td>0.3 ... 5 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... +50 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measured value outputs</td>
<td>4 x 0/4 ... 20 mA, 500 Ω Modbus RTU (RS-485)</td>
<td>7 relay outputs, load rating 48 V/0.5 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td>6 floating inputs</td>
<td>115/230 VAC, 50/60 Hz, 50 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td>180 x 180 x (340 + probe length) mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>250/400/700/1000 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>9.5 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe</td>
<td>22 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Options</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe backflush, purge air supply</td>
<td>3 bar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolator purging, continuous purge air supply</td>
<td>Approx. 2 m³/h</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Flue gas velocity > 5 m/s concentration after gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-RX 250 combined probe sensor for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring
Volume flow measurement

D-FL 100 volume flow measuring system

Overview
Suitability-tested and certified dynamic pressure probe measuring system. For measuring the velocity and volume flow of exhaust gas, air or process gas in ducts, pipes or chimneys.

Benefits
- Reliable measurement of exhaust gas velocity, even at high temperatures
- Calculation of the volume flow with standard conditions
- Certified, economic measuring system
- Versions with or without counter-support and for point measurement
- Easy operation via remote access using web interface

Application
As an in-situ measuring system, the measuring equipment determines the measured values without sampling directly in the duct through which gas is flowing.

Application areas
- Volume flow measurement at high temperatures and high pressure
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Process monitoring
- ATEX applications

Certifications
- Suitability-tested by TÜV Cologne, test report 936/21218492/A
- Itemized in the list of suitable measuring devices for continuous emission measuring
- Certified according to DIN EN 15267-3
- MCERTS

Design
D-FL 100 system components

Measuring probes
Each D-FL 100 measuring probe is a customized product for the respective measuring location. Three different sizes are available depending on the length of the planned measurement path:
- Probe 1: 0.4 to 2 m
- Probe 2: 2 to 4 m
- Probe 3: 4 to 8 m

Types
- D-FL 100 probe mounting, with mounting of the transmitter on the measuring probe
- D-FL 100 hose mounting, with connection of the transmitter via hose line.

Cross-over cock
Cross-over device for the backflush of the dynamic pressure probe
**Differential pressure transducer**

The transducer is delivered with factory set defaults for the order-specific configuration. The zero point should be calibrated after the installation.

**Counter-support**

A counter-support is required for a probe mounted on two sides. The counter-support supports the probe not only mechanically, but also enables the compensation of the temperature-dependent longitudinal expansion of the probe.

**Mounting tubes with flange**

Mounting tubes made of stainless steel 1.4571, adapted to the plant conditions, are available in various lengths. A single flange is required for a one-sided probe; otherwise two flanges are always required.

**Evaluation unit**

The evaluation unit D-FL 100-20 evaluates the measured signal from the differential pressure transducer. A 4 to 20 mA current signal is available as measured value output. A Modbus interface according to VDI 4201 for the connection of an emission evaluation calculator with digital interface is available in addition to the 4 to 40 mA current signal output. The front panel contains five LEDs and one USB port. The LEDs signal the system’s current status/operating state.

The various parameters, such as standard density, substitute values for pressure and temperature in the exhaust gas duct, k-factor and measuring ranges are input via the USB port with the help of a PC or the associated software D-ESI 100.

**Optional**

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions for D-FL 100-20. The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Universal control unit D-ISC 100 with evaluation unit D-FL 100-20

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Automatic back purging unit

An automatic backflush device to keep the measuring openings clean is available for applications with high dust loads.

Weather protection covers

A weather protection cover is available to protect the probe head and the back purging control when the measuring system is installed outdoors.

**Transmitters**

- Absolute pressure transducer
- Temperature transmitter

**Options**

- Special designs in other materials for applications with particularly aggressive exhaust gases or higher gas temperatures:
- Differential pressure transmitter in Ex-version

**Function**

The D-FL 100 measuring system operates according to the mechanical action principle dynamic/differential pressure measurement with two-chamber probe. The measuring probe has two separate chambers between which the flow builds up a differential pressure. The evaluation unit determines the gas velocity and the volume flow (standardized or under operating conditions), taking into account the measuring section, sample gas temperature and gas pressure.

**Technical specifications**

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Flue gas velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges</td>
<td>3 ... 50 m/s</td>
</tr>
<tr>
<td></td>
<td>0 ... 3 000 000 m³/h</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Differential pressure</td>
</tr>
<tr>
<td>Sample gas temperature</td>
<td>Above dew point up to 450 °C standard, others on request</td>
</tr>
<tr>
<td>Sample gas pressure</td>
<td>-50 ... +50 hPa Standard, others on request</td>
</tr>
<tr>
<td>Channel diameter</td>
<td>&gt; 0.5 m</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... +50 °C Standard, others on request</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65</td>
</tr>
<tr>
<td>Measured value output</td>
<td>0/4 ... 20 mA, 500 Ω</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>2 relay outputs, load rating 48 V/0.5 A</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC, 0.5 A</td>
</tr>
<tr>
<td>Dimensions</td>
<td>90 ... 264 V AC, 48 ... 62 Hz</td>
</tr>
<tr>
<td>Evaluation units</td>
<td>231 x 160 x 105 mm</td>
</tr>
<tr>
<td></td>
<td>62 x 90 x 54 mm</td>
</tr>
<tr>
<td>Probes</td>
<td>24 x 22 x 400 ... 2 000 mm</td>
</tr>
<tr>
<td></td>
<td>54 x 50 x 2 000 ... 4 000 mm</td>
</tr>
<tr>
<td></td>
<td>100 x 90 x 4 000 ... 8 000 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>32 kg + 6.8 kg/m probe length</td>
</tr>
<tr>
<td>Purge-air supply (optional)</td>
<td>6 ... 8 bar for backflush</td>
</tr>
</tbody>
</table>

1) Optional pressure and temperature correction

**More information**

Please consult your Siemens sales partner for information on how to correctly configure and order a D-FL 100 measuring system for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring
Volume flow measurement

D-FL 220 volume flow measuring system

Overview
Suitability-tested and certified ultrasonic measuring system for measuring the velocity and volume flow of exhaust gas, air or process gas in pipes or chimneys, in particular in wet and aggressive flue gases.

Benefits
- In-situ measuring method
- Measurement possible below dew point and for high dust concentrations
- Continuous measurement of normal volume flow and gas velocity
- Automatic zero point and reference point control
- Easy operation via remote access using web interface

Application
As an in-situ measuring system, the measuring equipment determines the measured values without sampling directly in the duct through which gas is flowing.

Application areas
- Volume flow measuring at low speeds
- Plants with damp and/or aggressive exhaust gas
- Volume flow measurement at high dust content
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Process monitoring

Certifications
- Suitability-tested by TÜV Cologne, test report 936/21218490/A
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

Design
D-FL 220 system components

Measuring heads
Two identically designed measuring heads are used. Depending on the application data, different depth-of-penetration lengths are required, for example, from 100 to 1 100 mm. A 4-to-20-mA current signal is available as measured value output which measures the velocity and/or the volume flow and can be connected, for example, to an emission evaluation calculator. Two relay contacts are available for signaling. Also available is a Modbus interface according to VDI 4201-3 for the connection of an emission evaluation calculator with digital interface. The various parameters are entered during the installation on site. The USB port is on the rear.

Purge flanges
The purge air is supplied to each of the two measuring heads via a purge flange for cooling and cleaning the ultrasonic transducers. A toggle-type fastener connects the purge flange to the measuring head.

Mounting tubes with flange
Mounting tubes made of stainless steel 1.4571 or of glass-fiber reinforced plastic, adapted to the plant conditions, are available.

Purge air unit
A hose connects the two measuring heads to the purge air unit. The filtered air is used to cool the measuring heads and to keep the transducers clean.

Terminal box
Terminal box to output the data with connecting cable for the two sensors and customer terminal strip.

Software D-ESI 100
Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.
Optional
Universal control unit D-ISC 100
The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Measured value acquisition
In the simplest case the measured values and reference values are transferred to the plant’s control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Weather protection covers
Weather protection covers are available to protect the measuring heads when the measuring system is installed outdoors.

Additional options
- Absolute pressure transducer
- Temperature transmitter

Function
The D-FL 220 measuring system operates according to the acoustic transit time differential method.
Two identical sensors transmit and receive ultra-sonic pulses reciprocally. The system calculates precisely the gas velocity and the gas temperature from the transit time difference dependent on the direction. The volume flow is calculated taking into consideration the cross-section, the sample gas temperature and the absolute pressure. The D-FL 220 performs internal self-monitoring routines and is very low maintenance.

Technical specifications

| Measured variables | • Flue gas velocity |
|                    | • Volume flow¹ |
| Measuring ranges  | • 0 ... 40 m/s |
|                    | • 0 ... 5 000 000 m³/h |
|                    | • 0 ... 400 °C |
| Measuring principle | Ultrasonic transit-time differential |
| Sample gas temperature | Above dew point, up to 300 °C standard, others on request |
| Sample gas pressure | -50 ... +20 hPa |
| Channel diameter | 0.5 ... 13 m, temperature-dependent |
| Ambient temperature | -20 ... +50 °C, measuring head |
| Degree of protection | -40 ... +70 °C |
| Measured value output | IP65 |
| Digital outputs | 0/4 ... 20 mA, 400 Ω |
|                   | RS 485 Modbus RTU |
|                   | 2 x NC/NO contact, load capacity 60 V DC/30 V AC, 0.5 A |
| Power supply | 24 V DC/0.5 A |
| Dimensions (H x W x D) | 113 x 84 x 188 mm |
| • Measuring head housing | 190 x 190 x 330 mm with purge flange |
| • Measuring probe (D x L) | 110 x 230 … 2 270 mm, others on request |
| Weight | 6.5 kg (sensor head 610 mm with purge flange, weight depending on version) |

Purge air supply

| Purge air quantity | 40 m³/h (50 hPa)/60 m³/h (25 hPa) |
| Power supply | 115/230 V, 50/60 Hz, 0.37/0.43 kW |
| Dimensions (H x W x D) | 480 x 450 x 320 mm |
| Weight | 12 kg |
| Degree of protection | IP55 |

¹) Optional pressure and temperature correction

More information
Please consult your Siemens sales partner for information on how to correctly configure and order a D-FL 220 measuring system for a Siemens CEMS project.
Analytical Application Sets
Continuous emission monitoring

D-ISC 100 display and control unit

Overview

The D-ISC 100 universal control unit permits the connection of up to 8 sensors combining dust and volume flow measurements on one display.

Benefits

- Operation, parameterization and data transmission of connected sensors
- Connection of up to 8 sensors to a control unit
- Large liquid crystal display (LCD) for display of the measured values
- Automatic detection of connected sensors
- Modular design, expandable with expansion modules
- Integrated purge air supply for one sensor optional
- Installation in the vicinity of the measuring device or in the control room

Application

The control unit can supply a single sensor or a system consisting of two sensors with power. Several sensors that are connected via a network can also be connected to the D-ISC 100. In this case, each of the sensors must be supplied with power by means of a separate terminal box, supply unit or evaluation unit. The interconnection and the connection to the operating unit is made via Modbus. A version of the control unit with an integrated purge air blower is available for D-R 220, D-R 320 and D-R 808.

The display provides an immediate overview of the status of the connected devices. The current measured values can be displayed without the necessity of direct access to the sensors. It is also possible to visualize the measured values with bar chart display.

The connected sensors can be queried, controlled and parameterized with the control unit. Operation takes place directly via the membrane keyboard of the control unit. Alternatively, you can connect a PC via the integrated USB port. In conjunction with the Web server technology software D-ESI 100, remote support is possible via the Internet.

The control unit can be extended with expansion modules. They are available either as software modules (e.g. Modbus RTU, Modbus TCP) or DIN rail modules (e.g. analog input/output, digital input/output).

Certifications

Type-tested according to European directive EN 15267 for continuous emission measurements in connection with the test reports no. 936/21217455, 936/21218492, 936/21218490 and 936/21232768/B of the Technical Inspectorate of the Rhineland region (TÜV Rheinland)

Design

The universal control unit D-ISC 100 is available in four different versions:

- D-ISC 100 C
  - Control unit in compact field housing
  - Can be expanded with software modules
- D-ISC 100 M
  - Control unit in field housing
  - Can be expanded with software modules
  - Expandable with up to 4 standard mounting rail modules.
- D-ISC 100 P
  - Control unit in field housing with integrated purge air blower (for D-R 220, D-R 320, D-R 808)
  - Can be expanded with software modules
  - Expandable with up to 2 standard mounting rail modules
- D-ISC 100 R
  - Control unit for 19" rack
  - Can be expanded with software modules
  - Expandable with 4 DIN rail modules

Optional

Software modules

- Modbus RTU module
- Modbus TCP module

Standard mounting rail modules

- Analog input module with 4 analog inputs: 0 to 20 mA with 2/4 mA live zero, load 50 Ω
- Analog output module with 4 analog outputs: 0 to 20 mA with 4 mA live zero, max. load 400 Ω
- Digital input module with 8 digital inputs
- Digital output module with 8 digital outputs
## Technical specifications

### Base unit

<table>
<thead>
<tr>
<th></th>
<th>D-ISC 100 C</th>
<th>D-ISC 100 M</th>
<th>D-ISC 100 P</th>
<th>D-ISC 100 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>-20 °C ... +50 °C, -40 … +60 °C optional</td>
<td>-20 °C ... +50 °C</td>
<td>-20 °C ... +50 °C</td>
<td>-20 °C ... +50 °C</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65</td>
<td>IP20</td>
<td>IP20</td>
<td>IP20</td>
</tr>
<tr>
<td>Measured value output</td>
<td>0/4 ... 20 mA, 400 Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td>2 relay outputs, load capacity 60 V DC / 30 V AC/0.5 A floating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td>None</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Power supply</td>
<td>90 ... 264 V AC, 48 ... 62 Hz</td>
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<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>200 VA</td>
<td>200 VA</td>
<td>360 VA</td>
<td>200 VA</td>
</tr>
<tr>
<td>Dimensions</td>
<td>230 x 200 x 111 mm</td>
<td>278 x 415 x 174 mm</td>
<td>410 x 400 x 240 mm</td>
<td>267 x 483 x 255 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>5 kg</td>
<td>10 kg</td>
<td>20 kg</td>
<td>10 kg</td>
</tr>
<tr>
<td>Purge air supply</td>
<td>-</td>
<td>-</td>
<td>Integrated blower for D-R 220/D-R 320/D-R 808</td>
<td>-</td>
</tr>
</tbody>
</table>

### More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-ISC 100 control unit for a Siemens CEMS project.
**Analytical Application Sets**
Environmental emission monitoring
Environmental and process data management system

**D-EMS 2000**

**Overview**

The D-EMS 2000 environmental and process data management system is a modular system for the continuous acquisition, long-term storage, calculation and visualization of environmental and process data.

**Benefits**

- Instrument for monitoring legally prescribed limit values and recording their observance
- Emission monitoring and remote data transmission to the authorities
- Corresponds to EU guidelines 2010/75/EU and EN 14181
- Adjustable to any plant size through to complete assessment of complex industrial sites
- Continuous monitoring of 1 to 320 components per system workstation
- Interconnection of any number of components via data networks
- Visualization available in 19 languages

**Application**

The D-EMS 2000 standard system is designed for small to medium sized industrial sites whose emission data, immission data or process data must be recorded in line with government regulations for measured data logging.

**Approvals**

- Suitability-tested by TÜV in accordance with German TA-Luft 1., 2., 13., 17., 27., 30. and 31. BImSchV
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to DIN EN 15267-2
- MCERTS certified

**Design**

*Measured data acquisition:*

Analog/digital inputs as:
- 19' rack with ring memory
- Local DIN rail modules

Data communication via bus systems, Modbus RTU/ TCP, PROFIBUS, Elan, OPC UA (Modbus and PROFIBUS according to VDI 4201).
### Function

#### Data sources
- Emission data
- Immission data
- Meteorological data
- Water data
- Process data

#### Data export
- Data interface to MS-Excel with option of further measured data evaluation, e.g. for fulfillment of environmental protection officer’s reporting duties
- Measured data can be transferred to authorities via standard remote communication or via Internet
- Merging of measured data e.g. for greenhouse emission trading
- Remote service interface for fast and cost effective service

#### Data security
- Industrial type evaluation PC with vibration-proof hard disks in RAID 1 array and special air cooling with filter system
- Paperless data storage to replace recorders and printers is possible through integrated data security, which is guaranteed on several levels in the system
- Intermediate storage of the raw input values at minute intervals in data communication unit D-MS 500 KE
- Storage of raw input values in one-second intervals
- Data backup on external redundant drive

#### Internet/intranet connection
- Data transmission to an Internet server with HTML standard masks via standard software (MS Internet Explorer)
- Password protected control of daily emission values including the classification records

#### Visualization
- Measured data logging according to official regulations
- Classification tables, daily, monthly and annual records
- Representation of current, prognostic and historic measured data in bar/linear form
- Pollutant compensation, characteristics curve and correlation
- Automatic alarm and information system

#### Annual emission declaration
- Automatic preparation of annual emission declaration, from the individual values stored in the system, according to 11. BlmSchV
- Compatible with official software, import/export module
- Automatic filling in of forms
- Reading in of historical emission declarations

### More information
Please consult your Siemens sales partner for information on how to correctly configure and order a D-EMS 2000 environmental and process data management system for a Siemens CEMS project.
Overview

The D-EMS 2000 CS environmental and process data management system is an affordable compact system for small to medium plants.

Benefits

- Independently operating module for the acquisition, long-term storage, calculation and visualization of environmental and process data
- Instrument for monitoring legally prescribed limit values with automatic recording
- Continuous monitoring of 1 to 12 components, connected via bus communication or hard-wired
- Compact system, no additional evaluation PC required
- Windows-based and certified D-EMS 2000 software
- All modules of the D-EMS 2000 system can be used
- Visualization available in 19 languages

Application

The D-EMS 2000 CS compact system is designed for small to medium sized industrial plants whose emission data, immission data or process data must be recorded in line with public authority regulations for measured data logging.

Approvals

- Suitability-tested by TÜV in accordance with German TA-Luft 1., 2., 13., 17., 27., 30. and 31. BImSchV
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to DIN EN 15267-2
- MCERTS certified

Design

Three available device types:
- Compact system in 19", 3HM rack
- Desktop version with monitor / keyboard / mouse
- 19", 1HM slide-in unit with extendable keyboard and hinged monitor

Technical specifications

Device versions

- Compact system in 19" 3HM rack
- Desktop version with monitor / keyboard / mouse
- 19" slide-in assembly

Computer

- Intel based dual-core PC with Windows 10, 2 GB RAM and 120 GB SSD

Inputs/outputs

- Max. 3 cards:
  - Combination card 4 AI, 8 DI, 2 AO, 4 DO
  - Input card 8 AI, 15 DI
  - Output card 8 AO
  - Output card 16 DO

Connection of bus systems

- Modbus RTU / TCP, PROFIBUS, Elan, OPC UA (Modbus and PROFIBUS according to VDI 4201)
- Analog / digital inputs: 12/24
- Analog / digital outputs: 12/24

Interfaces

- 1 x VGA
- 2 x USB
- 1 x RJ 45
- 3 x serial (RS 232 or RS 485)
- BNC for DCF77 - radio clock

Ambient temperature

5 ... 40 °C

Degree of protection

IP20

Operating voltage

115/230 V AC, 50/60 Hz, 100 VA

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-EMS 2000 CS compact system for a Siemens CEMS project.
Overview

The Set BGA (biogas analyzer) is a standardized system for stationary, continuous operation for the analysis of landfill gas, sewage gas or biogas.

Benefits

Standardized complete system
The standardized complete system has a modular configuration and can thus be used at various measuring locations for different measuring tasks.
- Simple and fast to configure
- Field-tested and matched Set in rugged industrial design
- Extremely high long-term stability
- The Set BGA is based on the proven ULTRAMAT 23

Field-proven, reliable technologies
- Autocalibration function with ambient air reduces the maintenance requirements
- Detonation protection in accordance with EN 12874
- Modular system design based on long-term tested components
- LEL sensor for cabinet monitoring (optional)

Simple operation
- Intuitive menu guidance
- Configuration on large displays with plain text
- Two freely-configurable limits per measured component

Application

The efficiency of biogenic production processes and optimum operation of the plant largely depends on continuous monitoring of the biogas composition. The basic version of the Set BGA analyzes CH₄ and CO₂ using the proven ULTRAMAT 23 IR analyzer. The concentrations of O₂ und H₂S are optionally measured using electrochemical sensors and also converted into output signals of 4 to 20 mA. In this manner, the Set BGA contributes to operational safety and explosion protection in addition to process optimization.

The modular design of the system takes into account the physical conditions of the gas with regard to temperature and moisture in that various gas preparation components for heating or drying the sample gas can be configured as required.

The gas mixture can be explosive at critical concentration ratios between methane and oxygen. Even if such critical gas compositions occur extremely rarely, the danger of ignition must nevertheless be avoided. For this reason, the Set BGA is designed with a high safety standard and even the basic version is equipped with flow monitoring and detonation protection in accordance with EN 12874 in the sample gas path. To increase safety even further, a gas sensor for monitoring the ambient air can be connected as an option.

It is also possible to monitor up to six measuring points using an optional sample switching cabinet. In this case the sample flows are sucked in continuously using a powerful pump in order to achieve fast measuring times.
Analytical Application Sets
Biogas analysis

Set BGA

Design

The Set BGA consists of the following components:
• ULTRAMAT 23 analyzer with four measured components max.
• Analyzer cabinet with modularly configurable gas preparation components
• Cabinet for measuring point switchover (option)
• Heated line (option)

The ULTRAMAT 23 is selectable with two IR components (CO₂ and CH₄). Furthermore, the configuration can be equipped with an electrochemical oxygen sensor and/or an electrochemical hydrogen sulfide sensor. The corresponding measuring ranges are listed in the table below.

<table>
<thead>
<tr>
<th>Measured component</th>
<th>Smallest measuring range</th>
<th>Largest measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>0 ... 20 %</td>
<td>0 ... 100 %</td>
</tr>
<tr>
<td>CH₄</td>
<td>0 ... 20 %</td>
<td>0 ... 100 %</td>
</tr>
<tr>
<td>O₂</td>
<td>0 ... 5 %</td>
<td>0 ... 25 %</td>
</tr>
<tr>
<td>H₂S (low)</td>
<td>0 ... 5 ppm</td>
<td>0 ... 50 ppm</td>
</tr>
</tbody>
</table>

The ULTRAMAT 23 calibrates the IR components and the electromechanical oxygen sensor automatically with ambient air. Calibration with calibration gas is recommended once a year or after oxygen sensor replacement. In order to comply with the technical specification data, the hydrogen sulfide sensor must be calibrated every three months. An appropriate calibration gas is therefore required. It is supplied to the analyzer through a manually switchable ball valve.

Technical specifications

<table>
<thead>
<tr>
<th>Installation</th>
<th>Ambient temperature</th>
<th>5 ... 38 °C, with cabinet heating ± 0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>Indoor/outdoor installation (configurable)</td>
<td></td>
</tr>
<tr>
<td>Gas inlet conditions</td>
<td>Sample gas pressure</td>
<td>• With pump, depressurized suction mode, selectable with internal or external pump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision must be made for a pressure reduction for pressures greater than 1 200 mbar absolute</td>
</tr>
<tr>
<td></td>
<td>Pump performance</td>
<td>Adjustable to 60 ... 80 Nl/h</td>
</tr>
<tr>
<td></td>
<td>Sample gas temperature</td>
<td>Max. 45 °C, with moisture saturation</td>
</tr>
<tr>
<td>Power supply</td>
<td>Supply 1</td>
<td>200 ... 240 V AC, 47 ... 63 Hz</td>
</tr>
<tr>
<td></td>
<td>Supply 2</td>
<td>100 ... 120 V AC, 47 ... 63 Hz</td>
</tr>
<tr>
<td></td>
<td>Power consumption</td>
<td>Approx. 180 VA (without cooler and sample preparation)</td>
</tr>
<tr>
<td>Connection systems</td>
<td>Teflon hose</td>
<td>With PVDF screwed glands</td>
</tr>
<tr>
<td></td>
<td>Connection systems</td>
<td>Metric (6 mm) or imperial (1/4&quot;) selectable</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Set BGA measuring system (W x H x D)</td>
<td>600 x 781 x 600 mm</td>
</tr>
<tr>
<td></td>
<td>Sample preparation</td>
<td>600 x 600 x 220 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Set BGA measuring system</td>
<td>Approx. 50 kg</td>
</tr>
<tr>
<td></td>
<td>Sample preparation</td>
<td>Approx. 22 kg</td>
</tr>
<tr>
<td>System design</td>
<td>System housing</td>
<td>3-part sheet-steel housing with window</td>
</tr>
<tr>
<td></td>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td></td>
<td>Cabinet conditioning</td>
<td>Fan</td>
</tr>
<tr>
<td></td>
<td>Cooling system</td>
<td>Peltier cyclone cooler (optional)</td>
</tr>
<tr>
<td></td>
<td>Sample preparation</td>
<td>Max. six sample streams can be controlled using Logo module with fast loop pump in separate housing</td>
</tr>
<tr>
<td></td>
<td>Analog outputs</td>
<td>Per component 0/2/4 ... 20 mA; NAMUR, floating, max. load 750 Ω</td>
</tr>
<tr>
<td>Measured components / measuring ranges</td>
<td>CH₄</td>
<td>0 ... 100 vol.% to 0 ... 20 vol.% (NDIR)</td>
</tr>
<tr>
<td></td>
<td>CO₂</td>
<td>0 ... 100 vol.% to 0 ... 20 vol.% (NDIR)</td>
</tr>
<tr>
<td></td>
<td>O₂</td>
<td>0 ... 25 vol.% to 0 ... 5 vol.% (electrochemical or paramagnetic optionally selectable)</td>
</tr>
<tr>
<td></td>
<td>H₂S</td>
<td>0 ... 5 ppm to 0 ... 50 ppm (electrochemical); optional</td>
</tr>
<tr>
<td>Safety assemblies</td>
<td>Assembly 1</td>
<td>Detonation protection FS01</td>
</tr>
<tr>
<td></td>
<td>Assembly 2</td>
<td>Flow measurement with limit monitoring at the output</td>
</tr>
<tr>
<td></td>
<td>Assembly 3</td>
<td>LEL monitoring (optional)</td>
</tr>
<tr>
<td>Comment</td>
<td></td>
<td>• The system concept of the Set BGA is based on the preconfigured ULTRAMAT 23 solutions (7MB2335-..., 7MB2337-...)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The technical performance data concerning the measuring response correspond to the catalog data of the ULTRAMAT 23. The preconfigured version does not contain any ULTRAMAT 23 add-ons or retrofitting sets.</td>
</tr>
</tbody>
</table>
### Selection and ordering data

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Set BGA basic configuration, including flame arrestor</th>
<th>Cannot be combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>7MB1955-</td>
<td>Click on the Article No. for the online configuration in the PI Life Cycle Portal.</td>
<td></td>
</tr>
</tbody>
</table>

#### Gas connections, external
- 6 mm: 0
- ¼ inch: 1

#### Sample conditioning
- Without gas cooling: A
- Passive cooling (supplied separately): B
- Peltier cooler, integrated in Set BGA enclosure: C

#### Enclosure design
- Not heated: A
- Electrically heated: B

#### Pump design
- Internal pump in analyzer: 1
- External pump, fitted in Set BGA enclosure: 2

#### Power supply
- AC 120 V, 60 Hz: 0
- AC 230 V, 50 Hz: 1
- AC 110 V, 50 Hz: 2
- AC 220 V, 60 Hz: 3

#### Infrared measured components
- Version with one measured component
  - Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring methane; mounted in 19-inch rack unit for installation in wall cabinet
    - Specification:
      - Measured component CH₄
        - Smallest measuring range: 0 ... 20 %
        - Largest measuring range: 0 ... 100 %
- Version for two measured components
  - Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring carbon dioxide and methane; mounted in 19-inch rack unit for installation in wall cabinet
    - Specification:
      - 1. Measured component CO₂
        - Smallest measuring range: 0 ... 20 %
        - Largest measuring range: 0 ... 100 %
      - 2. Measured component CH₄
        - Smallest measuring range: 0 ... 20 %
        - Largest measuring range: 0 ... 100 %
- Version with one measured component
  - Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring carbon dioxide; mounted in 19-inch rack unit for installation in wall cabinet.
    - Specification:
      - Measured component CO₂
        - Smallest measuring range: 0 ... 0.5 %
        - Largest measuring range: 0 ... 2.5 %

#### Oxygen measurement
- Gas analyzer without oxygen sensor: A
- Electrochemical oxygen sensor; sensitive to CO₂
  - Specification:
    - Smallest measuring range: 0 ... 5 %
    - Largest measuring range: 0 ... 25 %
    - Repeatability: approx. 0.05 % O₂
- Paramagnetic oxygen measuring cell; no sensor wear
  - Specification:
    - Smallest measuring range: 0 ... 2 %
    - Largest measuring range: 0 ... 100 %
    - Repeatability: < 1 % of smallest measuring range
# Analytical Application Sets

**Biogas analysis**

## Set BGA

<table>
<thead>
<tr>
<th>Set BGA basic configuration, including flame arrestor</th>
<th>7MB1955-</th>
<th>Cannot be combined</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H₂S measurement</strong></td>
<td>A</td>
<td>D</td>
</tr>
<tr>
<td>Without H₂S sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With H₂S sensor, 0 ... 5 ppm to 0 ... 50 ppm</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td><strong>Documentation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>German, 1 set (paper and CD)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>English, 1 set (paper and CD)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>French, 1 set (paper and CD)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

### Further versions (add-ons)

Add “-Z” to Article No. and specify Order code

- Heated sample gas line, self-regulating, Ex-proof
  - Length: 5 m, supplied separately
  - Length: 10 m, supplied separately
  - Length: 15 m, supplied separately
  - Length: 20 m, supplied separately
  - Length: 25 m, supplied separately
  - Length: 30 m, supplied separately
  - Length: 35 m, supplied separately

- Communication
  - PROFIBUS PA interface
  - PROFIBUS DP interface

- Fast loop design and sample switching
  - 2-stream sample switching with Logo and external pump
  - 3-stream sample switching with Logo and external pump
  - 4-stream sample switching with Logo and external pump
  - 5-stream sample switching with Logo and external pump
  - 6-stream sample switching with Logo and external pump

- Gas sensor for leak monitoring of the Set BGA system
  - Alarm monitoring: 20 % LEL methane
Overview

The standardized Set GGA (Generator Gas Analyzer) has been specially designed for monitoring hydrogen-cooled turbo generators.

Benefits

**Standardized complete system**
- Simple and fast to configure
- Field-proven, harmonized and reliable set
- Low purchase price and economic operation
- Suitable for optimizing the efficiency of H₂-cooled turbo generators

**Field-proven, reliable technologies**
- High-precision and reliable purity monitoring of hydrogen
- Microchip-based thermal conductivity measurement
- Redundant measuring system
- SIL 1 certificate for the analysis hardware

**Simple operation**
- Intuitive menu prompting
- Configuration on large displays with plaintext
- Use of CO₂ and AR as inert gas possible

Application

This set is used in power generation applications. Turbo generators in power plants are cooled with gas in order to increase their efficiency. In spite of the strict safety requirements hydrogen is used as a cooling gas. This offers huge advantages over air. These include considerably better cooling properties, lower friction loss on rotating parts, and a higher electrical breakdown strength. These features enable hydrogen to satisfy the requirements for the turbo generator to reach an optimum level of efficiency.

However, mixtures of hydrogen and air with a hydrogen content of anything from 4 to 77 % are explosive. For safety reasons, it is imperative that this is prevented during operation filling and emptying of the turbo generators. International standards (EN 60034-3 and IEC 842) state that redundant safety monitoring with two independent operating systems must be used for this.

In addition, contamination of the hydrogen cooling gas reduces the efficiency of the turbo generator, as it leads to considerably higher friction loss. For a 970 MW generator, a difference of 4% is equivalent to a 0.8 MW difference in power. There are also good reasons related to cost-effectiveness why the cooling gas should be continuously monitored for contamination.

The Set GGA is a complete solution for monitoring hydrogen-cooled turbo generators, with the dual benefit of being simple to handle and having low initial investment costs.

Design

The Set GGA is available in the following versions:
- Generator Gas Analyzer (GGA)
- GGA with test gas skid
- GGA with test gas skid and installation frame

Analyzers

The GGA contains two CALOMAT 6E analyzers (19” rack unit versions). From the gas sampling system right through to the gas outlet, these are completely separate from one another, thereby ensuring full redundancy.

The CALOMAT 6E is a continuous gas analyzer for determining H₂ and He in binary or quasi-binary gas mixtures.

To measure the hydrogen and inert gases continuously, the exact thermal conductivity of the sample gas mixture is measured and the concentration calculated from this. Only binary gas mixtures can be directly measured.

The CALOMAT 6E is used to measure 0 to 100 % CO₂/Ar in air, 0 to 100 % H₂ in CO₂/Ar or 80 to 100 % H₂ in air, in the context of monitoring hydrogen-cooled turbo generators, on account of its high measuring range dynamics.

The units are approved for use in ATEX Zone 2. Gas mixtures may also be fed in according to the definition of Zone 1. In terms of tightness and compressive strength, the measuring cell and entire physical structure of the gas path, from inlet to outlet, are certified up to 55 000 hPa . This is much higher than the pressure that arises when oxyhydrogen gas is ignited.

A flame arrester at the sample gas inlet provides additional safety.

The integrated LCD display shows the measured values, status bar and measuring ranges simultaneously.

The T90 time is less than 5 s. This means that the delay between the measurement and displaying the result is very short.

Tests carried out under harsh field conditions have indicated that the 3-week drift of the measurement results is less than 0.1 %. Combined with a repeatability value of 0.1 %, this ensures that the measurement results gathered will be both accurate and precise.

Analyzer cabinet

Another feature of the GGA is a protective cabinet for the analyzers. This provides a compact location where the system can be easily installed, and offers protection against dust and water. The system is approved in accordance with IP54 degree of protection.

The cabinet measures 616 x 615 x 600 mm (H x D x W) and is made from painted sheet steel.

A key advantage of this type of construction is that it eliminates the need for a restricted breathing enclosure, allowing maintenance to be carried out without any difficulty. If a restricted breathing enclosure is required, it must be ensured that the system is operated in an airtight room. Restoring the restricted breathing enclosure once maintenance procedures have been performed is a costly and time-consuming process.

To keep operating and maintenance costs low, the GGA set supports natural cabinet ventilation and a filter element provides protection against particles of dirt. Purging with instrument air is not necessary.
Analytical Application Sets
Continuous monitoring of hydrogen-cooled generators

Set GGA

Test gas skid

The analyzers and analyzer cabinet are supplied as part of the basic configuration of the set. As an option, however, it is also possible to obtain a suitable test gas skid on a mounting plate.

The test gas skid is responsible for preparing the extracted sample ready for analysis. This ensures that the sample, calibration and inert gases are fed into the analyzers at the right pressure and flow rate, and without having been mixed with other gases.

The skid is fully equipped with a flame arrestor, stopcock ball valve, stainless steel overflow regulator, single-stage pressure reducer, stainless steel 5-way transfer ball valve, all-metal flow meter for air, 1-channel isolating switch amplifier and installation material. The flowmeters are designed to transmit a limit monitoring signal. The connection is made on-site.

The test gas skid guarantees that all the requirements in terms of safety, quality and simplicity are satisfied when connecting sample, calibration and inert gases.

Installation frame

The installation frame is a supplementary feature of the set. It enables free-standing installation of the analyzer cabinet and test gas skid.

The installation frame is supplied in a fully assembled state (including feet). Its overall height is 2 000 mm.

Function

There are three distinct processes in monitoring hydrogen-cooled turbo generators: normal operation, filling and emptying.

The measuring task entails preventing a gas mixture of hydrogen and air outside the specified limits, or detecting the risk of this happening in good time, as well as monitoring the hydrogen purity.

During normal operation, the purity of the generator cooling gas is monitored. If the purity falls below a specific limit (e.g. < 95 % H₂), a message is output. The monitored range is 80 to 100 % H₂ in air.

Filling the generator is a two-stage procedure: first, the air in the generator is replaced by inert gas (argon or CO₂), and then this is replaced by hydrogen. During this, the concentration trends of the gases are measured and the replacement processes monitored. To prevent explosive mixtures from being formed, it is necessary to monitor the measuring range of 0 to 100 % inert gas in air in the first step and 0 to 100 % H₂ in inert gas in the second step.

The procedure is performed in reverse when emptying the generator: The hydrogen is first replaced with inert gas and the generator is then filled with air. The measuring tasks remain unchanged in this case. Here it is necessary to monitor the measuring ranges of 0 to 100 % H₂ in inert gas first, and then 0 to 100 % inert gas in air.
## Technical specifications

### Climatic conditions
- **Ambient temperature**: 5 ... 50 °C
- **Relative humidity**: 70%, non-condensing
- **Corrosive atmosphere**: No

### Gas inlet conditions
- **Calomat 6E**
  - **Sample gas pressure**: 800 ... 1 100 hPa (absolute)
  - **Sample gas flow**: 30 ... 90 l/h (0.5 ... 1.5 l/min)
- **Test gas skid**
  - **Sample gas pressure**: 55 000 hPa (absolute)
  - **Sample gas flow**: 30 ... 90 l/h (0.5 ... 1.5 l/min)

### Power supply
- **Supply 1**: 200 ... 240 V AC, 48 ... 63 Hz
- **Supply 2**: 100 ... 120 V AC, 48 ... 63 Hz
- **Supply 3**: 24 V DC for switch amplifiers

### Type of connections
- **Pipe material**: Stainless steel
- **Connections/components**
  - Metric (6 mm)
  - Imperial (¼”)

### Cabling
- **Electrical design**: According to IEC
- **Type of cables**: Non-armored cables
- **Cable ID**: No single core labeling

### Installation
- **Site**: Interior
- **Ex-zone analyzer**: ATEX II, 3G

### System design
- **Version**: Cabinet
- **Degree of protection**: IP54
- **Automatic calibration**: No
- **Signal outputs**: 4 ... 20 mA/floating contact max. 24 V AC/DC 1 A
- **With sample gas return flow**: On request

### Measuring response
- **Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature**
- **Output signal fluctuation**: < ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (σ = 0.25%)
- **Zero point drift**: < 1%/week of the smallest possible span according to rating plate
- **Measured-value drift**: < 0.5%/of the smallest possible span according to rating plate
- **Repeatability**: < 1% of the current measuring range
- **Detection limit**: 1% of the current measuring range
- **Linearity error**: < ± 1% of the current measuring range

### Influencing variables
- **Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature**
- **Ambient temperature**: < 1%/10 K referred to smallest possible span according to label
- **Accompanying gases**: Deviation from zero point
- **Sample gas flow**: < 0.1% of the smallest possible span according to rating plate with a change in flow of 0.1 l/h within the permissible flow range
- **Sample gas pressure**: < 1% of the current measuring range with a pressure change of 100 hPa
- **Auxiliary power**: < 0.1% of the current measuring range with rated voltage ± 10%

### Analysis gas analyzer

<table>
<thead>
<tr>
<th>Component</th>
<th>Measuring point designation</th>
<th>Generator gas analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concentration</td>
<td>Unit</td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>Typical</td>
</tr>
<tr>
<td>Ar/CO₂ in air</td>
<td>0</td>
<td>100</td>
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<tr>
<td>H₂ in Ar/CO₂</td>
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<td>100</td>
</tr>
<tr>
<td>H₂ in air</td>
<td>80</td>
<td>50</td>
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<tr>
<td>Sample temperature</td>
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<td>50</td>
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<tr>
<td>Dust content</td>
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<td>0</td>
</tr>
<tr>
<td>H₂O dew point</td>
<td>-50</td>
<td>-50</td>
</tr>
<tr>
<td>Aggregate state, sample¹</td>
<td>Gaseous</td>
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¹ Standard state at 20 °C, 101.3 kPa
## Analytical Application Sets
Continuous monitoring of hydrogen-cooled generators

### Set GGA

<table>
<thead>
<tr>
<th>Selection and ordering data</th>
<th>Article No.</th>
<th>Cannot be combined</th>
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<tr>
<td>Set GGA</td>
<td>7MB1950-...</td>
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- Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

<table>
<thead>
<tr>
<th>Gas connections</th>
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<tr>
<td>6 mm pipe</td>
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<td>1/4&quot; pipe</td>
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<table>
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<th>Version</th>
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<tr>
<td>H₂ monitoring (turbo generators)</td>
<td>G A</td>
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<table>
<thead>
<tr>
<th>Add-on electronics</th>
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<td>Without</td>
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<table>
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<tr>
<th>Auxiliary power</th>
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<tr>
<td>100 ... 120 V AC, 47 ... 63 Hz</td>
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<tr>
<td>200 ... 240 V AC, 47 ... 63 Hz</td>
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<table>
<thead>
<tr>
<th>Variants</th>
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<tbody>
<tr>
<td>Set GGA, cable glands M20x1.5 power supply with cable diameter of 6 ... 12 mm</td>
<td>A</td>
</tr>
<tr>
<td>Set GGA, with test gas skid, cable glands M20x1.5 power supply with cable diameter of 6 ... 12 mm (sampling unit on stainless steel plate), delivery batch in 2 parts</td>
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<tr>
<td>Set GGA, cable glands M25x1.5 power supply with cable diameter of 14 ... 18 mm</td>
<td>C</td>
</tr>
<tr>
<td>Set GGA, with test gas skid factory-assembled on mounting frame, cable glands M20x1.5 power supply with test gas skid (PA on stainless steel plate), ready mounted on frame, delivery batch 1 part</td>
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</table>

<table>
<thead>
<tr>
<th>Explosion protection</th>
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<tbody>
<tr>
<td>Certificate: ATEX II 3G, flammable and non-flammable gases</td>
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<table>
<thead>
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<td>French</td>
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<td>Spanish</td>
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</table>
Continuous monitoring of hydrogen-cooled generators

Set GGA

Dimensional drawings

Test gas skid, fully piped with VA pipe 6 x 1
Weight: 115 kg

Set GGA, dimensions in mm, figure corresponds to 7MB1950-0GA00-1EB0