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Analytical Application Sets

Introduction

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.

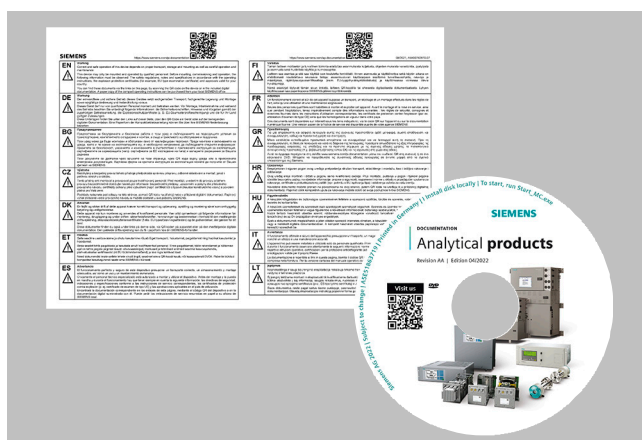
With its Analytical Application Set initiative, Siemens is making use of its wealth of experience to offer standardized packages that are designed with a single application in mind. Its range of applications can cover a variety of industrial sectors.

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.

More information

Supplied product documentation on DVD and safety notes



The scope of delivery of the Siemens products for process analytics includes a multilingual instruction sheet with **safety notes** as well as a uniform **DVD - "Analytical products"**.

This DVD contains the most important manuals and certificates for the Siemens process analytics portfolio. The delivery may also contain product-specific or order-specific printed materials. For more information, see section 7 "Appendix".

Download catalogs

The entire documentation is available for download free of charge in various languages at:

<http://www.siemens.com/processanalytics/documentation>

Certificates

All available certificates are listed on the internet at:

<http://www.siemens.com/processanalytics/certificate>

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 not only protects the environment from air pollutants but also ensures optimum combustion in the furnaces. 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 guarantee from plant constructors to operators that the plant runs in accordance with specifications 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 Measuring Systems (AMS). The standard EN 15267 determines corresponding minimum requirements and testing procedures for automated measuring systems (AMS) 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 the standard EN 14181 and, if required, the access data for the third quality assurance level (QAL3).

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

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

The portfolio is completed by emission evaluation systems for data storage, visualization, remote transmission - permitted according to German Technical Instructions on Air Quality Control (TA Luft), 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations.

Siemens offers not only 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_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_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.

Analyzer	Design
ULTRAMAT 23 Art. No. 7MB2358-.....	3 NDIR components on 2 optical benches
ULTRAMAT 23 Art. No. 7MB2357-.....	2 NDIR components on 2 optical benches
ULTRAMAT 23 Art. No. 7MB2355-.....	1 NDIR component on 1 optical bench
SIPROCESS UV600 Art. No. 7MB2621-.....	3 UV components on 1 optical bench
ULTRAMAT 6 Art. No. 7MB2121-..... and 7MB2011-.....	1 NDIR component on 1 optical bench
ULTRAMAT 6; two-channel 19" rack unit Art. No. 7MB2123-..... and 7MB2124-.....	2 NDIR components on 2 optical benches
OXYMAT 6 Art. No. 7MB2021-.....	1 paramagnetic O ₂ measuring cell
ULTRAMAT / OXYMAT 6 Art. No. 7MB2023-..... and 7MB2024-.....	1 NDIR component on 1 optical bench and 1 paramagnetic O ₂ sample chamber

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.

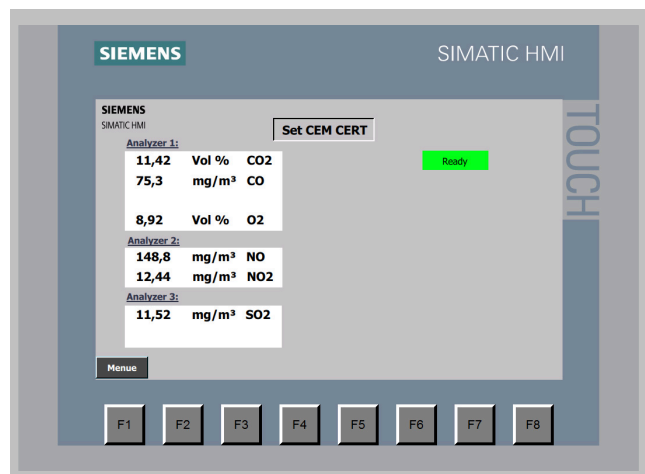
A three-way valve is installed upstream from the pump to supply the zero gas for automatic zero-point calibration.

Function (Continued)

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.



Start menu on the SIMATIC HMI touch screen panel

Selection and ordering data

Set CEM CERT		Article No. 7MB1957- ● ● ● ● ● - ● ● ● 0									
Suitability-tested emission measurement system (EN 15267) for continuous emission measurements											
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Rack											
Set CEM CERT, cabinet design (2 100 x 800 x 800 mm), sheet steel, sample gas connection left, with sample preparation, cable inlet above, device design in swing frame, for installation of max. 3 units 19" analyzers, analyzers, with cabinet light, including side panels, front panel and base, door stop on the right		0									
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, sample gas connections on the right, cable inlet above, with cabinet light, including side panels and base Note: Must be approved by customer with individual acceptance test		1									
GRP cabinet 1 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, sample gas connections on the left, cable inlet above, with cabinet light, base Note: Must be approved by customer with individual acceptance test		4									
GRP cabinet 2 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, sample gas connections on the right, cable inlet above, with cabinet light, base Note: Must be approved by customer with individual acceptance test		5									
FIDAMAT 6 emission measurement system, sheet-steel cabinet (800 x 700 x 600) with preparation for 1 FIDAMAT 6 analyzer unit. Note: FIDAMAT 6 analyzer must be ordered separately		6									
Installation in custom cabinet; is ordered, delivered and invoiced as separate order item		8									
Sampling probe											
For dust loads up to 2 g/m³, including sampling pipe, length 1 000 mm, for temperatures ≤ 600 °C, with weather protection cover ¹⁾ , material of filter enclosure: stainless steel											
Without										A	
Type: M&C; Version SP2000										B	
Type: Bühler; GAS 222										C	
Type: M&C; Version SP2000, with connections for 2 heated sample gas lines, without weather protection cover										F	
Type: Bühler; GAS 222, with connections for 2 heated sample gas lines										G	

Analytical Application Sets

Continuous emission monitoring

Set CEM CERT

Selection and ordering data (Continued)

Set CEM CERT						Article No.									
Suitability-tested emission measurement system (EN 15267) for continuous emission measurements						7MB1957-	●	●	●	●	●	-	●	●	0
Ventilation/cooling															
Cabinet fan installed in side panel, with adjustable thermostat														B	
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														C	
Energy-efficient cabinet air-conditioning unit installed in side panel, controlled via thermostat, for outdoor installation in the GRP cabinet														D	
Note: Must be approved by customer with individual acceptance test.															
Cabinet fan for FIDAMAT 6 emission measurement system installed in side panel, with adjustable thermostat														E	
Energy-efficient cabinet air-conditioning unit for FIDAMAT 6 emission measurement system installed in side panel, controlled via thermostat														F	
Heater															
Without cabinet heating														0	
Electrical frost protection heating installed in the cabinet for expansion of operating range of -5 °C (indoor installation) or -15 °C (outdoor installation)														1	
Grounding of all electrical loads															
1-pole														0	
2-pole														1	
Sample gas cooler															
Including two heat exchangers arranged in series connection.															
Without														0	
Type: M&C, Version CSS														1	
Type: Bühler, Version EGK-2, for increased cooling capacity														2	
NO₂/NO converter															
Without NO ₂ /NO converter															A
With NO ₂ /NO converter type: Bühler, BÜNO _x															B
With NO ₂ /NO converter, type: M&C, Version CG, with converter cartridge for conversion of NO ₂ into NO															C
Power supply															
50 Hz or 60 Hz, including main switch															
230 V AC, -15%, +10%															B
400 V AC, -15%, +10%, 3-phase															C

¹⁾ Exception: Option F is without weather protection cover.

Options	Order code
Add "-Z" to article number and specify order code	
Accessories	
Condensation trap made of plastic with level monitoring	A03
Acidification module for measuring SO ₂ concentrations < 50 mg/m ³ ; to prevent wash-out effects by the condensate.	A04
Note: Must be approved by customer with individual acceptance test.	
PROFIBUS DP interface for querying status and measured signals.	A13
Note: Must be approved by customer with individual acceptance test.	
Air Treater for FIDAMAT 6, for removing residual traces of hydrocarbons in the combustion gas of the FID; supplied unassembled, for wall mounting, incl. 2 m hose line	A14
Extractive process gas analyzers	
A total of up to 3 analyzers in combination can be selected.	
Each of the analyzers must be ordered separately.	
Analyzers mounting position 1	

Selection and ordering data (Continued)

Options	Order code
• Preparation for the installation of ULTRAMAT 23 (7MB2358-...../7MB2357-...../7MB2355-.....)	C10
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....)	C12
• Preparation for the installation of OXYMAT 6 (7MB2021-.....)	C14
Analzers mounting position 2	
• Preparation for the installation of ULTRAMAT 23 (7MB2358-...../7MB2357-...../7MB2355-.....)	C20
• Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....)	C21
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....)	C22
• Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....)	C23
• Preparation for the installation of OXYMAT 6 (7MB2021-.....)	C24
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....)	C25
Analzers mounting position 3	
• Preparation for the installation of ULTRAMAT 23 (7MB2358-...../7MB2357-...../7MB2355-.....)	C30
• Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....)	C31
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....)	C32
• Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....)	C33
• Preparation for the installation of OXYMAT 6 (7MB2021-.....)	C34
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....)	C35
Analzers mounting position 4	
• Preparation for installation of an additional LDS6 central unit (7MB6121-...0-0...). The LDS 6 central unit must be ordered separately with a CD6 sensor pair	C40
Heated line must be ordered as option D27 and 7MB1943-2AA31	
Fuse protection (25A) and regulator for heated sample gas line up to 50 m, the heated line must be ordered or provided under MLFB 7MB1943-2AA31	D27
Zero gas and calibration gas infeed	
Semi-automatic zero gas infeed for ULTRAMAT 23; max. number: 1	F01
Fully automatic zero gas infeed for a zero gas cylinder ¹⁾	F02
Fully automatic calibration gas infeed for the first calibration gas cylinder ¹⁾	F03
Fully automatic calibration gas infeed for the second calibration gas cylinder ¹⁾	F04
Fully automatic calibration gas infeed for the third calibration gas cylinder ¹⁾	F05

Analytical Application Sets

Continuous emission monitoring

Set CEM CERT

Selection and ordering data (Continued)

Options	Order code
Signal processing	
Analog signal processing 1 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M01
Analog signal processing 2 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M02
Analog signal processing 3 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M03
Analog signal processing 4 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M04
Analog signal processing 5 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M05
Analog signal processing 6 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	M06
Documentation	
Technical documentation of the Set CEM CERT and the configured analyzers	
German	N01
English	N02
French	N03
Hardware and software configurations corresponding to QAL1 according to EN 15267	Y27

¹⁾ Applies to ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6, SIPROCESS UV600. Max. quantity 3; 1x/used calibration gas cylinder. Option must be selected if the option C11 ... C15 was selected at least once.

Technical specifications

Set CEM CERT	
Climatic conditions	
Ambient temperature	+5° ... +40 °C (standard)
• With heating	Min.-5 °C
Relative humidity	75% (annual average), non-condensing
Sample gas conditions	
Sample gas must not be flammable or explosive.	
Max. sample gas pressure at inlet to sample preparation system	500 hPa (mbar)
Max. moisture content in sample gas ¹⁾²⁾	<ul style="list-style-type: none"> • 17 vol.% (cooler type: CSS), with PVDF heat exchanger • 25 vol.% (cooler type: EGK 2-19), with glass heat exchanger
Sample gas temperature	Max. 200 °C at cabinet entry
Sample gas flow	Approx. 60 l/h per analyzer
Sampling probe	<ul style="list-style-type: none"> • Dust load: < 2 g/m³ • 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
Sample gas line, electrically heated	Max. 50 m
Power supply	
Supply 1	230 V AC, 50 ... 60 Hz (-15%, +10%); on request
Supply 2	400 V AC, 50 ... 60 Hz (-15%, +10%)
Power	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

Technical specifications (Continued)

Set CEM CERT	
Output signals	<ul style="list-style-type: none"> • 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 hazardous zone
Degree of protection	IP54
Calibration	Semi-automatic or 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 × 800 × 800 mm (H × B × T)

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

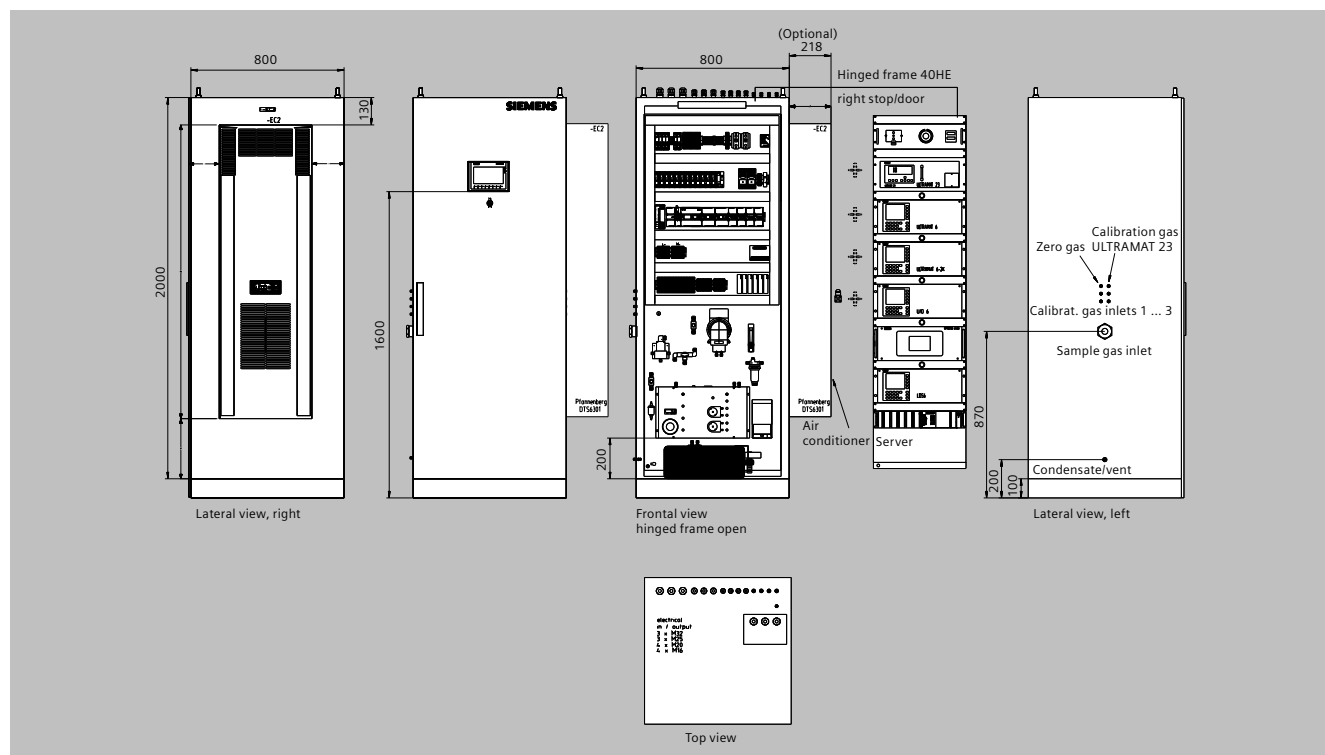
¹⁾ With NO and SO₂ concentration > 500 mg/m³, the glass heat exchanger must be used.

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 analytics".

Dimensional drawings



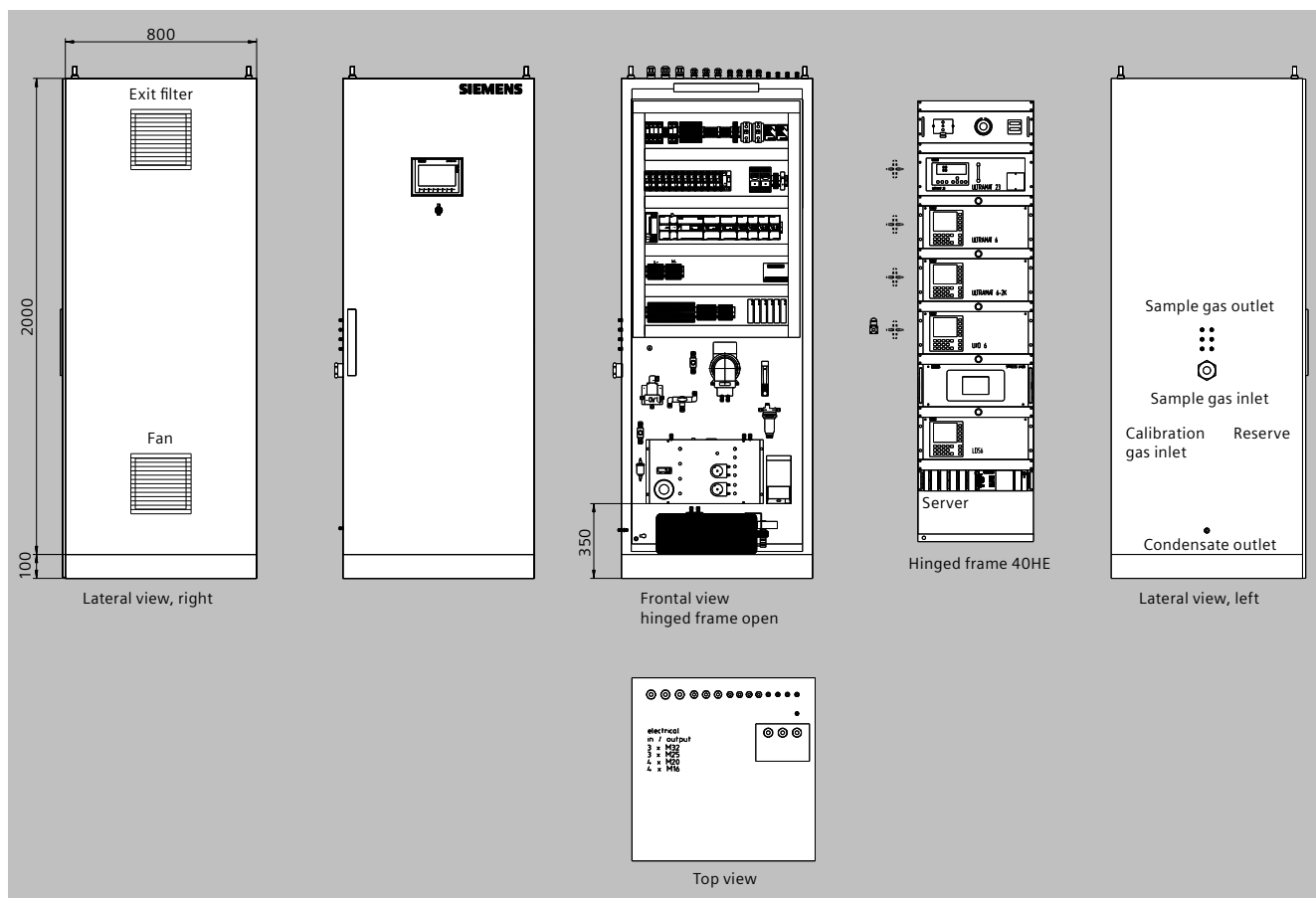
Set CEM CERT, version with refrigerator, dimensions in millimeter

Analytical Application Sets

Continuous emission monitoring

Set CEM CERT

Dimensional drawings (Continued)



Set CEM CERT, version with fan, dimensions in millimeter

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 requirement 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, NO_x, 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.

Analytical Application Sets

Continuous emission monitoring

Set CEM 1

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 two-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.

Heated sample gas line

The temperature of the heated line is regulated at 200 °C by a temperature controller. The power consumption is 100 VA per meter. The internal core is made of PTFE 4/6. The heated line can be up to 35 m in length. Lengths greater than 35 m can be provided upon special request. If desired, the system can also be supplied without a heated sample gas line.

Mounting frame

The basis of each Set CEM 1 is the mounting frame with hinged frame (40 U) for installation of up to five 19" rack units. The mounting frame includes a standardized sample preparation system designed for an ULTRAMAT 23.

The sample preparation system includes a 3/2-way solenoid valve, 3-way switchover ball valve, regulating valve, corrosion-resistant sample gas pump (power consumption 60 VA), condensation trap, room air suction filter with filter element, LOGO! for digital display of individual signals in the cabinet, 24 V DC power supply unit (power consumption 70 VA). Also included are a sample gas cooler (power consumption 200 VA) with integral heat exchanger, hose pump, moisture sensor with flow cell and Teflon filter. Teflon tubes connect the components. The external dimensions without plinth are 2 000 x 800 x 800 mm (H x W x D). A cabinet depth of 600 mm is also optionally available (not suitable for LDS 6). Hose and cable entry can take place from the left or right. A distance of 500 mm must be provided on the left or right at the installation site for hose and cable entry.

In addition to the sheet-steel mounting frames for indoor installation, an FRP version is also available for outdoor use. The FRP cabinet is always provided complete with side panels and plinth. The external dimensions are 2 080 x 800 x 600 mm (H x W x D). The GRP cabinet cannot be combined with the LDS 6.

Preparation of sample preparation system for second ULTRAMAT 23

The standard system with sample preparation system and electronics is prepared for one ULTRAMAT 23. If a second ULTRAMAT 23 is to be fitted, this option must be selected so that the sample preparation system and electronics are extended accordingly.

Additional filter

In addition to the fine filter and moisture filter which are always present, a coalescence filter can be optionally fitted in the sample preparation system.

Side panels with doors

Optional outer panels can be selected for the sheet-steel mounting frames. This possibility allows use of the Set CEM 1 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

Optionally available 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.

Design (Continued)**Frost protection heater**

The power consumption of the optional cabinet heater is 500 VA. The delivery includes a thermostat with a power consumption of 25 VA for controlling the frost protection heater.

Fusing of the analog signals

In addition to single-pole fusing of the electronic consumers, it is possible to provide two-pole fusing. The two-pole fuse is mainly required in Benelux countries.

Removal of condensation

A 19 liter condensation bottle can be provided as an option. It is also possible to order the system without a condensation bottle if the condensation can be removed on-site.

NO₂/NO converter

The mounting frame and cabinets can be optionally extended by a 19" rack unit with NO₂/NO converter with carbon cartridge. The power consumption is 520 VA. The flow is 90 l/h. An NO₂/NO converter is required if the share of NO₂ in the total NO_x is greater than 5% and/or if total NO_x is to be always determined.

Power supply

The system can be designed either for 115 V AC, 230 V AC or 400 V AC (-15%, +10%) with 50 or 60 Hz. Three phases, neutral and ground must be provided by the customer at 400 V AC.

Analog signal processing

As standard, the analog signals are simply connected to isolating terminals. As an option, the analog signals can be processed twice without electrical isolation by a diode module, or twice with electrical isolation.

Analyzers

The standardized set is prepared for an ULTRAMAT 23. The system can be supplemented by a second ULTRAMAT 23, OXYMAT 6 and/or LDS 6. Different measured components and measuring ranges are available for selection. Other combinations of measured components and measuring ranges are available on request, but you must check that the desired certificates and approvals are available. The analyzers, measured components and measuring ranges used are described briefly below.

Details on the analyzers, alternative measuring components and measuring ranges for process gas analysis can be found under the topics "Extractive continuous gas analyzers" and "In situ continuous gas analyzers".

ULTRAMAT 23: CO, NO

For measuring two infrared components.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 150 mg/Nm ³	0 ... 750 mg/Nm ³
NO	0 ... 100 mg/Nm ³	0 ... 500 mg/Nm ³

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, SO₂

For measuring three infrared components.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 250 mg/Nm ³	0 ... 1 250 mg/Nm ³
NO	0 ... 400 mg/Nm ³	0 ... 2 000 mg/Nm ³
SO ₂	0 ... 400 mg/Nm ³	0 ... 2 000 mg/Nm ³

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.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 250 mg/Nm ³	0 ... 1 250 mg/Nm ³
NO	0 ... 400 mg/Nm ³	0 ... 2 000 mg/Nm ³
CO ₂	0 ... 5%	0 ... 25%

Analytical Application Sets

Continuous emission monitoring

Set CEM 1

Design (Continued)

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 (German Technical Inspectorate).

ULTRAMAT 23: CO₂

For measuring one infrared component.

Component	Smallest measuring range	Largest measuring range
CO ₂	0 ... 5%	0 ... 25%

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 (German Technical Inspectorate).

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

Component	Smallest tested measuring range
HCl	0 ... 15 mg/Nm ³

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: HCl / H₂O

Component	Smallest tested measuring range
HCl	0 ... 15 mg/Nm ³
H ₂ O	0 ... 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.

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 (German Technical Inspectorate).

Limitation:

Component has not been type approved by TÜV (German Technical Inspectorate). 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.

Design (Continued)

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 (German Technical Inspectorate).

Limitation:

Component has not been type approved by TÜV (German Technical Inspectorate). Necessary gas temperature between 0 and 150 °C.

LDS 6: NH₃

Component	Smallest tested measuring range
NH ₃	0 ... 20 mg/Nm ³

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

Component	Smallest tested measuring range
NH ₃	0 ... 20 mg/Nm ³
H ₂ O	0 ... 15%

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 connecting 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 DIN rail module

On request.

Electrical preparation for emission data memory in 19" rack unit

On request.

Additional LOGO! module for four or more 19" rack units

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

Analytical Application Sets

Continuous emission monitoring

Set CEM 1

Design (Continued)

Core end labeling

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

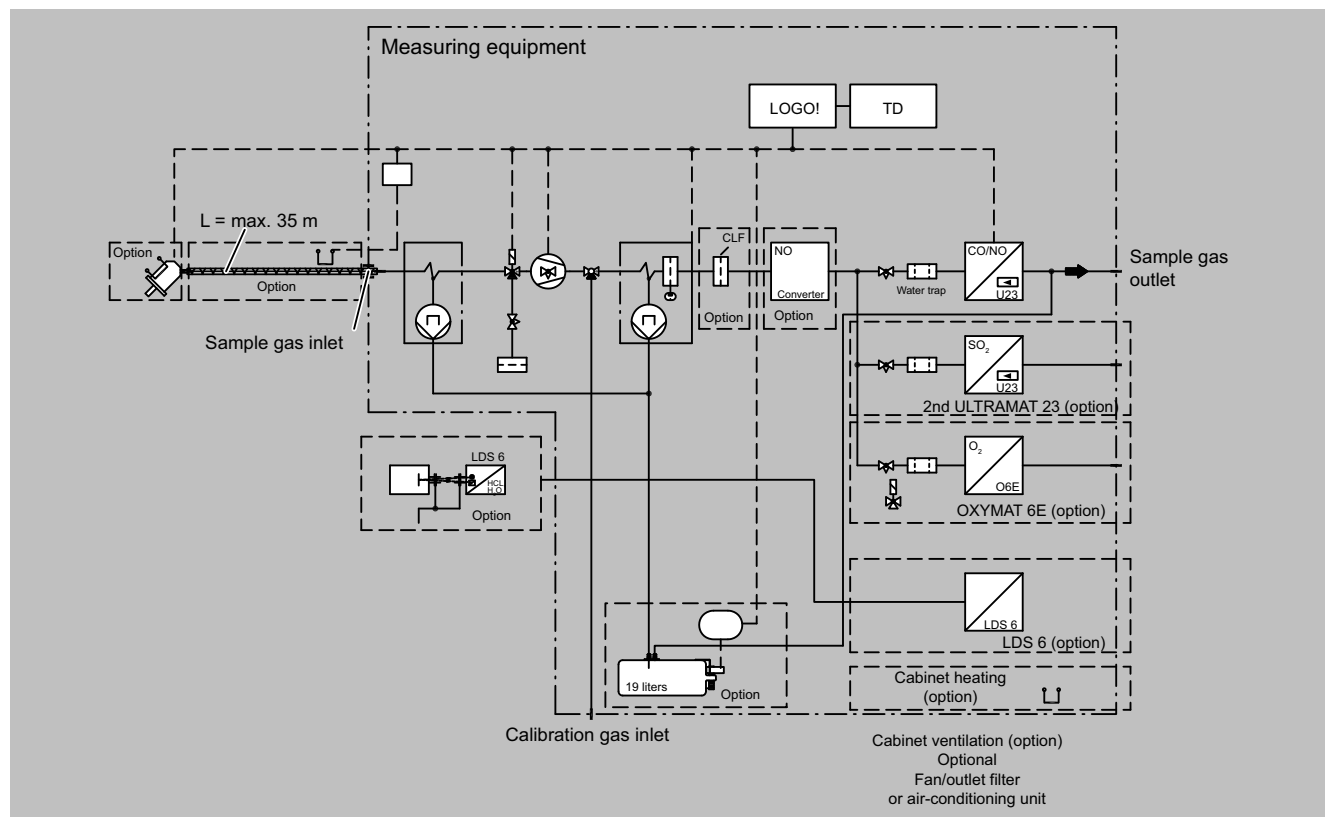
Documentation

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 specification sheets and Operating Instructions for the components and devices used.

The documentation language for parts provided by other suppliers may deviate. System description, LOGO! program and test certificates are also included in the documentation.

The documentation contains no customer-specific/project-specific markings, and consists of two folders and one CD per set.



Set CEM 1, gas flow chart including options

[illegible]

Analytical Application Sets

Continuous emission monitoring

Set CEM 1

Selection and ordering data (Continued)

Set CEM 1 – Continuous Emission Monitoring	Article No. 7MB1953- ● ● ● ● ● - ● ● ● ●											
Cabinet air-conditioning unit for GRP rack					D							
Heater												
Without					0							
Cabinet heating					1							
Fuse protection												
1-pole						0						
2-pole						1						
Removal of condensation												
Without									0			
19 l vessel with level monitoring									1			
NO₂/NO converter												
Without										A		
NO ₂ /NO converter										B		
Power supply												
115 V AC, -15%, +10%, 50 or 60 Hz											A	
230 V AC, -15%, +10%, 50 or 60 Hz											B	
400 V AC, -15%, +10%, 50 or 60 Hz (3 phases, neutral, ground provided by customer)											C	
Connection set for heated line												
Without controller												0
Standard controller (max. 35 m heated line can be connected)												1
Note:												
The heated sample gas line must be ordered separately using Catalog AP 11.												

Options	Order code
Add "-Z" to article number and then add order code	
ULTRAMAT 23, OXYMAT 6 extractive analyzers	
ULTRAMAT 23: CO, NO	C01
ULTRAMAT 23: CO, NO, SO ₂	C02
ULTRAMAT 23: CO, NO, CO ₂	C03
ULTRAMAT 23: CO ₂	C04
ULTRAMAT 23: Electrochemical O ₂ sensor for ULTRAMAT 23 expansion	C05
OXYMAT 6: Paramagnetic O ₂ OXYMAT analyzer	C06
Prepared for integration of any ULTRAMAT 23 of your choice	C07
Additional sample preparation components	
Coalescence filter	D02
LDS 6 in-situ analyzers	
HCl including sensor pair	E01
HCl/H ₂ O including sensor pair	E02
HF including sensor pair, not suitability-tested	E03
HF/H ₂ O including sensor pair, not suitability-tested	E04
NH ₃ including sensor pair	E05
NH ₃ /H ₂ O including sensor pair	E06
LDS 6 hybrid cable for each LDS 6	
5 m	F01
10 m	F02
25 m	F03
40 m	F04
50 m	F05

Selection and ordering data (Continued)

Options	Order code
LDS 6 connection cable for each LDS 6	
5 m	G01
10 m	G02
25 m	G03
Electrical preparation	
Preparation for dust measurement	J01
Preparation for flow measurement	J02
Preparation for pressure measurement	J03
Preparation for temperature measurement	J04
Preparation for emission data memory – DIN rail module (on request)	J05
Electrical preparation for emission data memory – 19" rack unit (on request)	J06
Additional LOGO! module	
LOGO! module for a 3rd and 4th 19" rack unit	K01
Core end labeling	
Single-core labeling Siemens standard	L01
Single-core labeling, customized	L02
Analog signal processing	
Double, electrically connected, 1 x per analog signal	M01
Double, electrically isolated, 1 x per analog signal	M02
Documentation	
German	N01
English	N02
French (on request)	N03

Technical specifications

Set CEM 1	
Climatic conditions	
Ambient temperature	0 ... 35 °C
• With heater in sheet-steel cabinet	Min. -5 °C
• With heating in GRP cabinet	Min. -15 °C
• With air-conditioning	Max. 52 °C
Relative humidity	70%, non-condensing
Corrosive atmosphere	No
Gas inlet conditions	
Max. sample gas pressure at inlet to sample preparation system	500 hPa (mbar)
Max. moisture content in sample gas	17 vol.% ¹⁾
Max. water dew point	60 °C
Min. sample gas pressure at inlet to sample preparation system	180 °C
Dust content at inlet to sample preparation system	Dust-free
Sampling probe	Sampling tube 20 × 1.5, 1 000 mm long, stainless steel, flange: DN 65, PN 6
Max. sample gas pressure at sampling probe	500 hPa (mbar)
Max. sample gas temperature at sampling probe	600 °C
Max. dust content at sampling probe	2 g/Nm ³
Sample gas must not be flammable or explosive.	
Power supply	
Supply 1	115 V AC (-15%, +10%)

Technical specifications (Continued)

Set CEM 1	
Supply 2	230 V AC (-15%, +10%)
Supply 3	400 V AC (-15%, +10%)
Connections	
Hose material	Teflon
Cables	Not armored, not halogen-free
Electrical design	According to IEC
Cable ID	Individual core labeling as option
Fusing of electronic consumers	1-pole; 2-pole as option
Duplication of analog signals	• Not electrically isolated as option • Electrically isolated as option
Installation	
Place of installation	
• In sheet-steel cabinet/frame	Indoor installation
• In GRP cabinet	Outdoor installation
Hazardous zone	Non-hazardous area
System design	
Version	Mounting frame or cabinet
Cabinet degree of protection	IP54
Automatic calibration	Yes, with ULTRAMAT 23
Dimensions (without plinth)	
Depth of sheet-steel frame	
• 800 mm (without plinth)	2 000 × 800 × 800 mm (H × W × T)
• 600 mm (without plinth)	2 000 × 800 × 600 mm (H × W × D)

Analytical Application Sets

Continuous emission monitoring

Set CEM 1

Technical specifications (Continued)

Set CEM 1	
GRP cabinet (with plinth)	2 080 × 900 × 600 mm (H × W × T)

It is necessary to allow 500 mm of clearance on the left or right for the hose/cable entry. The use of LDS 6 requires a cabinet with a depth of 800 mm.

Detailed information on the analyzers

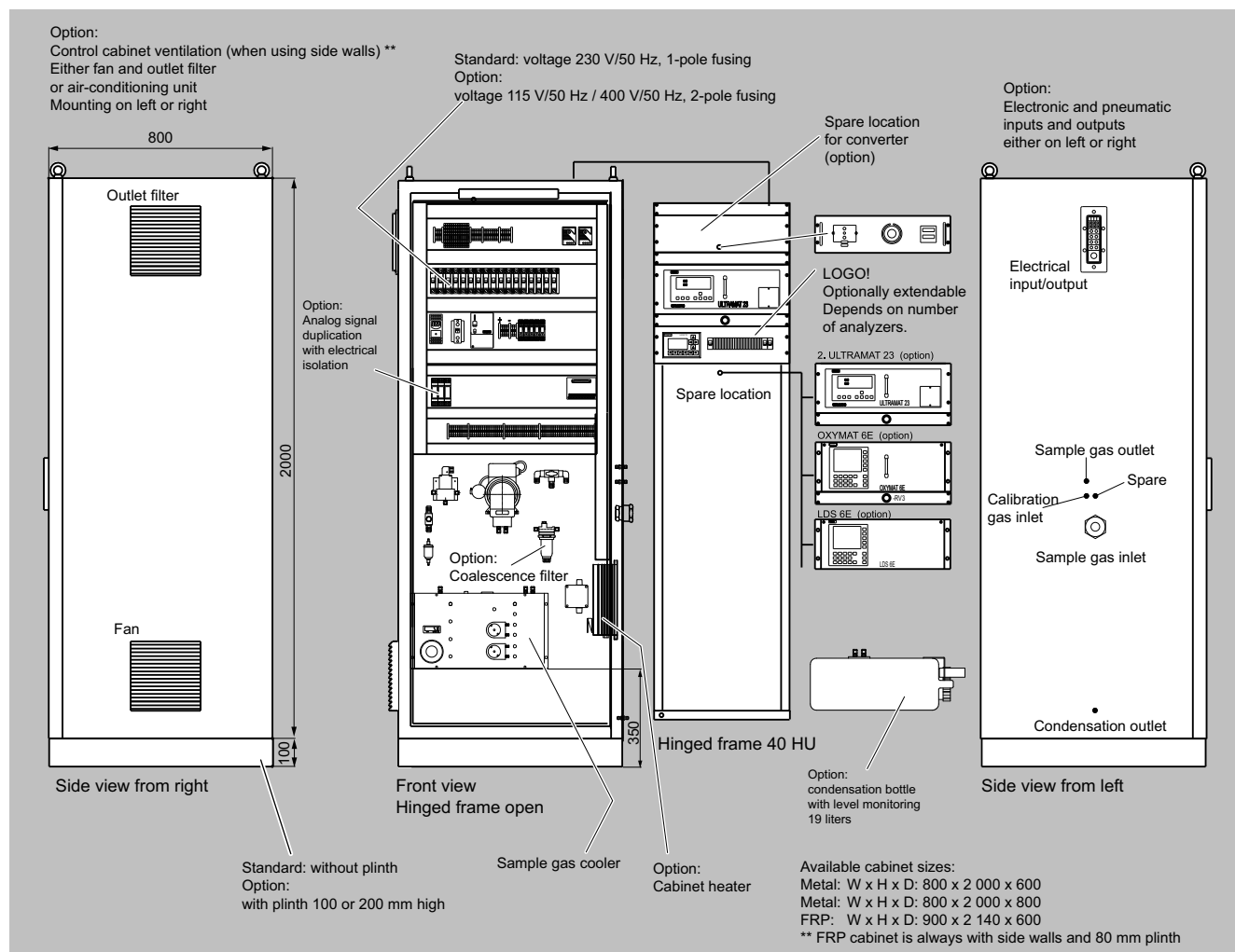
You can find detailed information on the analyzers in:
"Extractive continuous process gas analytics"

- ULTRAMAT 23
- OXYMAT 6

"In-situ continuous process gas analytics"

- LDS 6

Dimensional drawings



Set CEM 1 configuration, figure contains options, dimensions in mm

Overview



Total mercury analyzer for continuous process and emission monitoring with option for separate determination of elemental and oxidized mercury.

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 not only monitors 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

- Combustion plants
- Metal and steel industry
- Power plant industry
- Waste incineration
- Crematoria
- Scrap metal recycling

Approvals

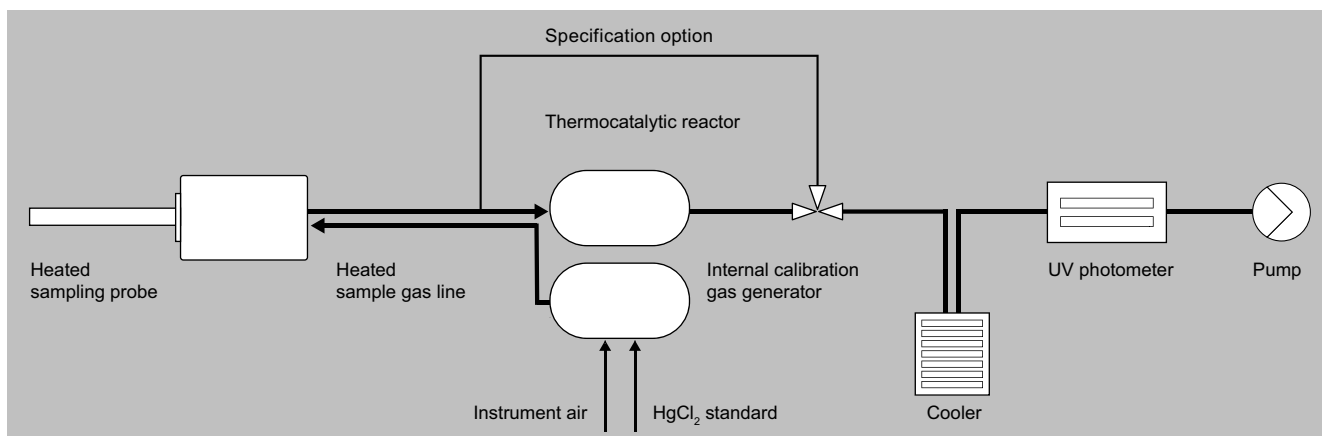
- TÜV Rheinland (German Technical Inspectorate), test report 936/21245908/A from 6 May 2019
- EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system

Design



HM-1400 TRX 2 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 pipe design to prevent faulty measurements (lower findings for the mercury concentration measurement due to the absorption properties of HgCl_2).

Thermocatalytic reactor

The total mercury analysis measures not only the elemental metallic mercury that is stored freely in the sample gas or deposited in the materials, but also measures the oxidized mercury that is found in the flue gas. The oxidized mercury must also be converted into elemental, 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

After thermocatalytic conversion, the Hg^0 -containing sample gas is dried in a sample gas cooler and any condensate is removed. The system pressure and the sample gas temperature are continuously recorded.

2-beam UV photometer

The dried sample gas enters the measuring cuvette, is measured there and then passed through selective filters for mercury, which completely absorbs the elemental mercury. The mercury-free sample gas then flows through the reference cuvette and is measured again. This principle of differential measurement between the two cuvettes means that, compared to the single-beam photometer with only one measuring cuvette, the measurement is less sensitive to spectrometric interference components. The measured signal from the photometer is received and processed by the internal PLC. The mercury concentration is output as 4 to 20 mA current signal to match the set measuring range of 0 to X $\mu\text{g}/\text{Nm}^3$ (dry).

Sample gas flow

When the sample gas volume flow leaves the 2-beam UV photometer, it passes through the sample gas pump. The volume flow of approx. 100 NI/h is set manually with the fine regulating valve. Sharp changes in the volume flow indicate leaks or blockages in the overall system.

Integrated HgCl_2 calibration gas generator

A HgCl_2 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 configured using a variety of concentrated reference solutions.

Optional

- Dilution device for aggressive and heavily dust-laden process gases
- Specification module for the separate measurement of elemental and oxidized mercury
- Side-mounted cooling device and/or cabinet heater for the extended temperature range of 0 ... 50 °C
- Heated sample pipe 0.6 m, 1.0 m, 1.5 m

Mode of operation

In the HM 1400 TRX 2 total mercury analysis system, the sample gas is processed by a combination of thermal and chemical treatment. The total mercury concentration is then continuously measured in a photometer. The concentration is calculated in $\mu\text{g}/\text{m}^3$ (dry in the standard condition), displayed and output via an analog output.

Technical specifications

HM-1400 TRX total mercury analyzer system	
General information	
Measured variable	Total mercury concentration in $\mu\text{g}/\text{m}^3$
Measuring ranges	0 ... 15/45/75 $\mu\text{g}/\text{m}^3$ (QAL1) and 0 ... 400 $\mu\text{g}/\text{m}^3$, 0 ... 3 000 $\mu\text{g}/\text{m}^3$ (depending on device version)
Measuring principle/measuring method	Extractive total mercury measurement by thermocatalytic conversion and atomic absorption spectroscopy
Dimensions (W × H × D)	1 700 × 800 × 500 mm
Weight	220 kg
Operating conditions in the channel	
	<ul style="list-style-type: none"> • Temperature: Max. 300 °C • Relative humidity: 0 ... 100% • Gauge pressure: -50 ... +20 hPa
Dimensions of the channel	Inside diameter: Min. 0.5 m
Ambient conditions	
	Temperature: <ul style="list-style-type: none"> • -20 ... +50 °C (sampling) • 0 ... +50 °C (analyzer)
Degree of protection	IP54 according to EN 60529
Interface	
	Analog output: 3 × 4 ... 20 mA, max. 500 ohm, configurable parameters Digital input: 8 × status input, configurable parameters Digital output: 9 × relay contact NO (normally open), configurable parameters
Operating voltage (electrical data)	
	<ul style="list-style-type: none"> • 230/400 V 3 × 25 A, N, PE, 50 Hz, max. 10 kVA • Measuring device 1 200 VA • Sampling probe 650 A • Sampling line 100 VA/m, max. 40 m without external support • Heated sample pipe 0.6 m/1.0 m/1.5 m, 600 VA/800 VA/1 200 VA
Instrument air supply	
	Only for operation with dilution or for internal drift check with reference gas (HgCl_2): <ul style="list-style-type: none"> • Dilution: 3 ... 13 bar, max. 100 l/h • Internal drift check: 3 ... 8 bar, max. 500 l/h (corresponds to 680 l/week)

More information

A HM-1400 TRX 2 total mercury analyzer system consists of, among other items:

- 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 2 Total Mercury Analysis System for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system / D-R 220 dust and opacity measuring instrument

Overview



The affordable solution for continuous, non-contacting dust and opacity measurement at medium to high concentrations in dry flue and process gases.

Benefits

- Easy installation for opacity monitoring and reliable emission monitoring
- Reliable measurement of medium to high dust concentrations
- Space-saving and simple installation
- Transmission measurement principle opens up a wide range of applications
- Use even under extreme sample gas conditions

Application

The D-R 220 allows emission measurement of dry flue and process gases even with a complex gas matrix directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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.

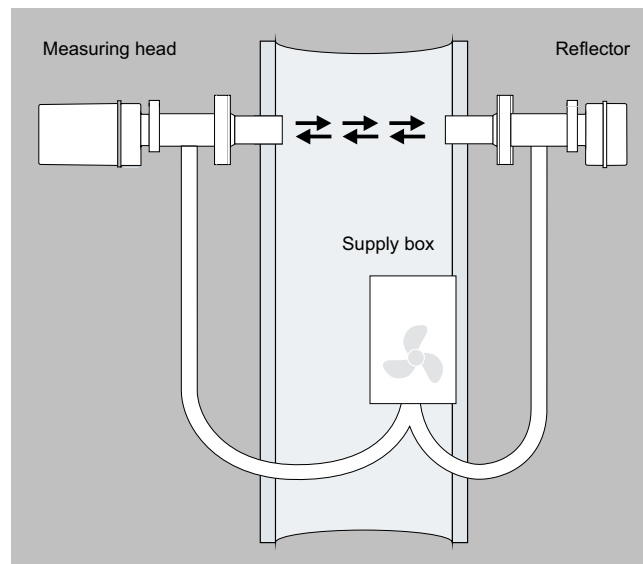
Application areas

- Power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, cement industry
- Plaster
- Clinker, waste incineration, power plant industry, scrap metal recycling, sinter plant

Approvals

- Product certified by TÜV Rheinland (German Technical Inspectorate): Tested AMS, regular monitoring, test mark number 0000051694_01

Design



D-R 220 system components

Measuring device

The transmitter and receiver optics are integrated together with the electronics in a sturdy, compact polyamide housing. The measuring device 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 device.

Supply unit D-TB 200 including purge air

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

Software D-ESI 100

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

The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

Up to eight connected devices can be easily configured and operated 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

HM-1400 TRX total mercury analyzer system / D-R 220 dust and opacity measuring instrument

Design (Continued)

- 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. By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

D-R 220 dust and opacity measuring instrument	
General information	
Measured variable	Extinction, opacity can be calibrated as dust concentration in mg/m ³
Measuring range	<ul style="list-style-type: none"> • Opacity: 0 ... 100% • Extinction: 0 ... 1.6 • Dust concentration: 0 ... 5 000 mg/m³
Measuring principle	Transmission, non-contacting and in situ measurement
Dimensions (W × H × D)	<ul style="list-style-type: none"> • Measuring device: <ul style="list-style-type: none"> - 150 × 132 × 214 mm - 150 × 132 × 331 mm (with purge flange) • Reflector: <ul style="list-style-type: none"> - 126 × 132 × 101 mm - 126 × 132 × 218 mm (with purge flange)
Weight	<ul style="list-style-type: none"> • Measuring device: 2.7 kg • Reflector: 1.6 kg
Operating conditions in the channel	
	<ul style="list-style-type: none"> • Temperature: Max. 200 °C, optional: 500 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: <ul style="list-style-type: none"> - -50 ... +10 hPa standard - -50 ... +50 hPa option
Dimensions of the channel	Inside diameter: 0.4 ... 10 m
Ambient conditions	
	<ul style="list-style-type: none"> • Installation location: indoor or outdoor installation¹⁾ • Temperature: -20 ... +50 °C
Degree of protection	
IP65 according to EN 60529	
Interface²⁾	
	<ul style="list-style-type: none"> • Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	
24 V DC, 0.4 A	
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

¹⁾ Weather protection cover required for outdoor installation.

²⁾ Additional interfaces with control unit D-ISC 100.

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

HM-1400 TRX total mercury analyzer system / D-R 290 dust and opacity measuring instrument

Overview



For continuous, non-contacting dust and opacity measurement at medium to high concentrations in dry flue and process gases. Also suitable for difficult plant conditions.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of medium to high dust concentrations
- Space-saving and simple installation
- Long service life and high availability under extreme plant conditions

Application

The D-R 290 allows emission measurement of dry flue and process gases even in corrosive flue gases directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 290 is approved for regulatory emission monitoring and can therefore also be used for transmitting data to the authorities.

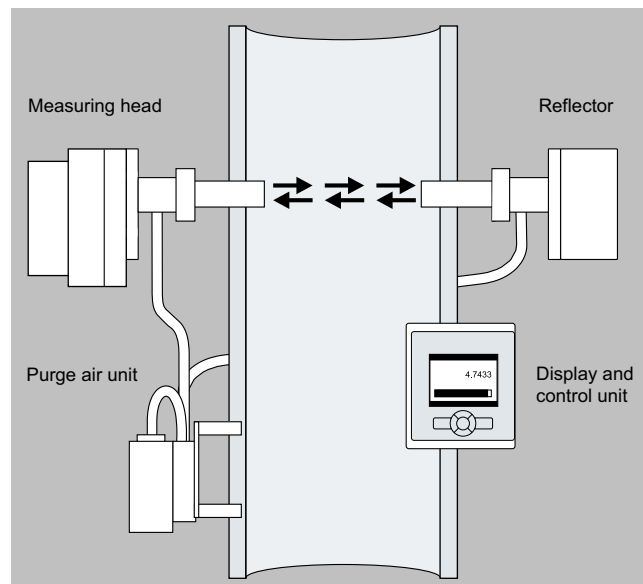
Application areas

- Power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, cement industry
- Plaster
- Clinker, waste incineration, power plant industry, scrap metal recycling, sinter plant

Approvals

- Suitability-tested by TÜV Cologne (German Technical Inspectorate), test report 936/21226948/A
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR 60 PS11

Design



D-R 290 system components

Measuring device

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 device 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 device.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions. The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Purge air unit

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

Terminal box

Terminal box to output the data with connecting cable for the measuring device and customer terminal strips.

Optional

Universal control unit D-ISC 100

Up to eight connected devices can be easily configured and operated 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.

Quick-closing shutters

The quick-closing shutters are mounted on the measuring device and the reflector side between the weld-in flanges and the connected devices (measuring device, reflector). In the event of a fault (failure of the power supply or purge air), they automatically close

Design (Continued)

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 device, the reflector, the purge air unit and the junction boxes when the measuring system is installed outdoors.

Additional options

- Explosion-proof device design 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. By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

D-R 290 dust and opacity measuring instrument	
General information	
Measured variable	Extinction, opacity can be calibrated as dust concentration in mg/m ³
Measuring range	<ul style="list-style-type: none"> • Opacity: min. 0 ... 20%, max. 0 ... 100% • Extinction: min. 0 ... 01, max. 0 ... 2.0 • Dust concentration: min. 0 ... 80 mg/m³, max. 0 ... 4 000 mg/m³
Measuring principle	Transmission, non-contacting and in situ measurement
Dimensions (W × H × D)	<ul style="list-style-type: none"> • Measuring device: 370 × 190 × 400 mm • Reflector: 370 × 190 × 270 mm
Weight	<ul style="list-style-type: none"> • Measuring device: 10 kg • Reflector: 7 kg
Operating conditions in the channel	
	<ul style="list-style-type: none"> • Temperature: Max. 250 °C, optional: 1 000 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: <ul style="list-style-type: none"> - -50 ... +50 hPa - -50 ... 0 hPa (ATEX/IECEX)
Dimensions of the channel	Inside diameter: 0.5 ... 18 m ¹⁾
Ambient conditions	
	<ul style="list-style-type: none"> • Installation location: Indoor or outdoor installation²⁾ • Temperature: <ul style="list-style-type: none"> - -40 ... +60 °C - -30 ... +60 °C (ATEX) - -20 ... +60 °C (IECEX)
Degree of protection	IP65 according to EN 60529

Technical specifications (Continued)

D-R 290 dust and opacity measuring instrument	
Interface³⁾	<ul style="list-style-type: none"> • Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	24 V DC/0.5 A
Purge air supply D-BL	
Purge air consumption	Approx. 60 m ³ /h @ 25 hPa
Operating voltage	115/230 V 50/60 Hz, LNPE
Dimensions	415 × 460 mm (base plate)
Weight	20 kg

¹⁾ Measuring section > 1 m.

²⁾ Weather protection cover required for outdoor installation.

³⁾ Additional interfaces with control unit D-ISC 100.

More information

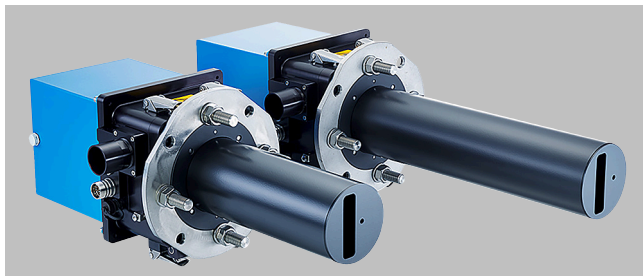
Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 290 measuring system for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system / D-R 320 dust measuring instrument

Overview



For continuous, non-contacting measurement of low to medium dust concentrations in dry flue and process gases. Also suitable for corrosive gases and hazardous areas.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of low dust concentrations
- Space-saving and simple installation
- Long service life and high availability under extreme plant conditions
- Low maintenance costs

Application

The D-R 320 allows emission measurement of dry flue and process gases even with a complex gas matrix directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 320 is approved for regulatory emission monitoring and can therefore also be used to transmit data to the authorities.

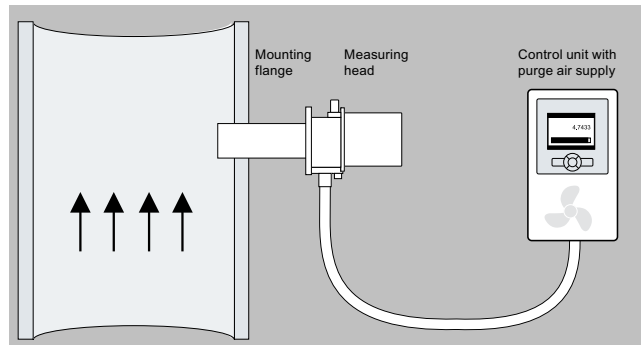
Application areas

- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, combustion plants, cement industry
- Plaster
- Clinker, recycling industry, waste incineration, waste incineration, combined heat and power plant, wood industry, power plant industry, scrap metal recycling, sinter plant

Approvals

- Suitability tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21225028/B dated 1 March 2015
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS11

Design



D-R 320 system components

Measuring device D-R 320 M

The measuring device is integrated together with the electronics in a compact unit in a rugged enclosure.

The measuring device consists of:

- Transceiver
- Swivel adapter
- Process connection
- Field diaphragm

This measuring unit is installed directly above the exhaust gas duct on a DN 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 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

Up to eight connected devices can be easily configured and operated 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 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

HM-1400 TRX total mercury analyzer system / D-R 320 dust measuring instrument

Design (Continued)

protected against overheating in the event of a fault. The measuring device takes over control of the quick-closing shutter.

Weather protection covers

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

Explosion-proof device design

An explosion-proof device design with pressurized enclosure according to Ex p, Zone 1, Zone 2 or Zone 22, as well as IECEx 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.

By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

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 automatic contamination correction. Any maintenance required is immediately indicated by the electronics.

Technical specifications

D-R 320 dust measuring instrument	
General information	
Measured variable	Scattered light units, can be calibrated as dust concentration in mg/m ³
Measuring range	<ul style="list-style-type: none"> Min. 0 ... 5 mg/m³ Max. 0 ... 200 mg/m³
Measuring principle	Backscatter, single-sided installation, non-contacting and in situ measurement
Dimensions (W × H × D)	200 × 190 × 260/410 mm
Weight	15 kg
Operating conditions in the channel	<ul style="list-style-type: none"> Temperature: Max. 600 °C Relative humidity: 0 ... 95%, no condensation Gauge pressure: <ul style="list-style-type: none"> -50 ... +50 hPa -50 ... 0 hPa (ATEX/IECEx)
Dimensions of the channel	<ul style="list-style-type: none"> Min. inner diameter: 0.7 m Max. wall thickness: 0.56 m
Ambient conditions	<ul style="list-style-type: none"> Installation location: indoor or outdoor installation¹⁾ Temperature: <ul style="list-style-type: none"> -40 ... +60 °C -30 ... +60 °C (ATEX) -20 ... +60 °C (IECEx)
Degree of protection	IP65 according to EN 60529

Technical specifications (Continued)

D-R 320 dust measuring instrument	
Interface²⁾	<ul style="list-style-type: none"> Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) RS 485 Modbus RTU, USB Status display: LED
Operating voltage	24 V DC/0.5 A
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

¹⁾ Weather protection cover required for outdoor installation.

²⁾ Additional interfaces with control unit D-ISC 100.

More information

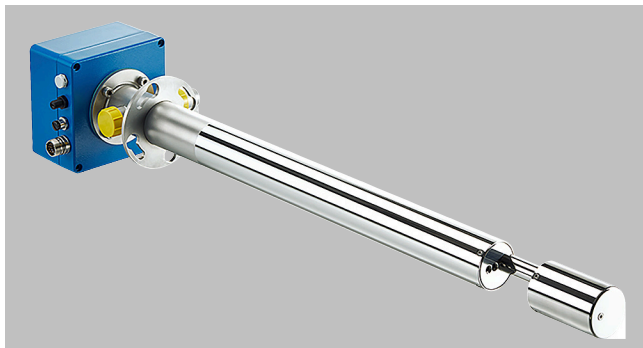
Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 320 measuring system for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system / D-R 808 dust measuring instrument

Overview



For continuous measurement of low to medium dust concentration in dry flue and process gases. Single-sided installation for difficult plant conditions.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of low dust concentrations
- Space-saving and simple installation
- Reliable emission monitoring
- Long service life

Application

The D-R 808 allows emission measurement of dry flue and process gases directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 808 is approved for regulatory emission monitoring and can therefore also be used to transmit data to the authorities.

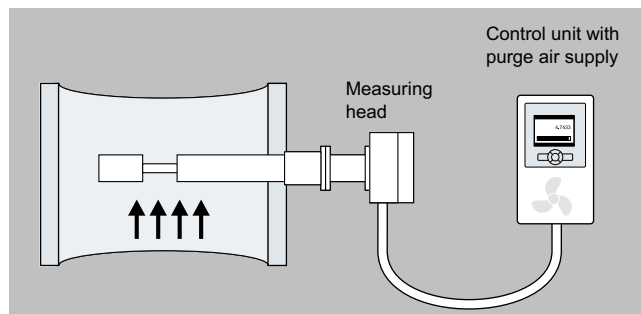
Application areas

- Building materials industry, power generation, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, combustion plants, recycling industry, waste incineration, combined heat and power plant, wood industry, power plant industry

Approvals

- Suitability-tested by TÜV Cologne (German Technical Inspectorate), test report 936/21232768/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS11

Design



D-R 808 system components

Measuring device

The transmitter and receiver optics are integrated together with the electronics in a compact unit in a rugged enclosure. 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.

Connecting 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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.

HM-1400 TRX total mercury analyzer system / D-R 808 dust measuring instrument

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. By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

D-R 808 dust measuring instrument	
General information	
Measured variable	Scattered light units, can be calibrated as dust concentration in mg/m ³
Measuring range	<ul style="list-style-type: none"> Min. 0 ... 5 mg/m³ Max. 0 ... 200 mg/m³
Measuring principle	Forward scattering, in situ measurement, single-sided installation
Dimensions (W × H × D)	160 × 160 × 600/1 000 mm
Weight	Approx. 3/7 kg
Operating conditions in the channel	
Dimensions of the channel	<ul style="list-style-type: none"> Temperature: Max. 350 °C, optional 500 °C Relative humidity: 0 ... 95%, no condensation Gauge pressure: -50 ... +50 hPa
	<ul style="list-style-type: none"> Min. inner diameter: 0.3 m Max. wall thickness: 0.47 m
	Probe Length: 400/800 mm
Ambient conditions	
<ul style="list-style-type: none"> Installation location: indoor or outdoor installation¹⁾ Temperature: -40 ... +60 °C 	
Degree of protection	
IP65 according to EN 60529	
Interface²⁾	
<ul style="list-style-type: none"> Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) RS 485 Modbus RTU, USB Status display: LED 	
Operating voltage	
24 V DC/0.5 A	
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

¹⁾ Weather protection cover required for outdoor installation.

²⁾ Additional interfaces with control unit D-ISC 100.

More information

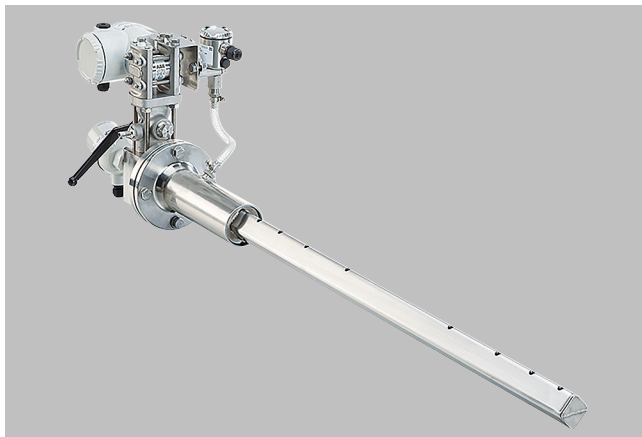
Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 808 measuring system for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system / D-FL 100 volume flow measuring system

Overview



System for continuous volume flow measurement in dry gases. Reliable, even under extreme operating conditions.

Benefits

- Certified for regulatory emission monitoring
- Accurate measurement of speed and volume flow even under demanding operating conditions
- Space-saving and simple single-sided installation (optional)
- Suitable for operation in hazardous areas (optional)
- Suitable for use in hot gases

Application

The D-FL 100 continuously determines the sample gas speed for reliable emission monitoring, even in hot or aggressive gases, and in small to large flues. The D-FL 100 can be used for reliable emission monitoring even in hazardous areas. The measuring system is therefore ideal for process control and process optimization.

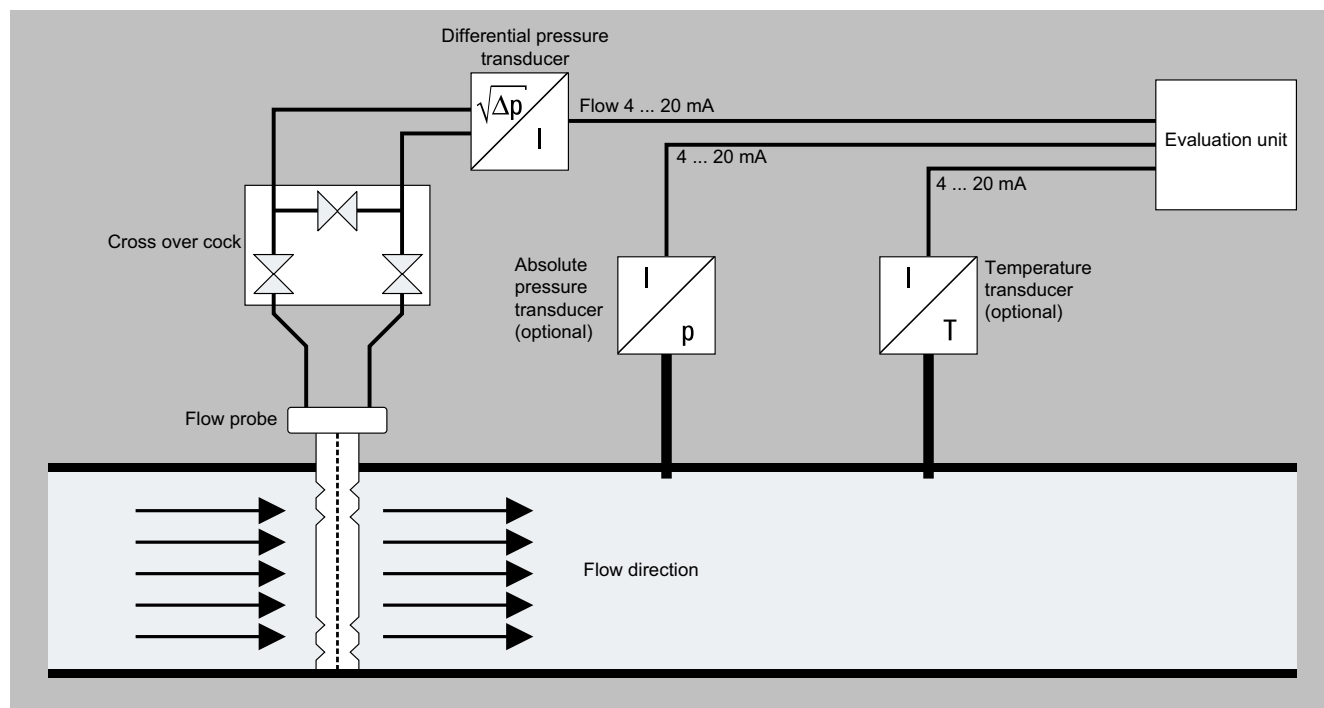
Application areas

- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery, combustion plants, cement industry
- Plaster
- Clinker, power plant industry, waste incineration, crematories, process monitoring

Approvals

- Suitability-tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21218492/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS

Design



D-FL 100 system components

Measuring probes

Each probe is custom manufactured to meet the requirements of the application. Different sizes are available depending on the flue diameter and dust load:

- Probe type 1: 300 ... 2 000 mm
- Probe type 2: $\leq 4\,000$ mm
- Probe type 3: $> 4\,000$ mm

Placement of the transmitter

- 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

Multiway cock

Cross-over device for the backflush of the averaging pitot tube

Differential pressure transmitter

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

Counter bearing

A counter bearing is required for a probe mounted on two sides. The counter bearing not only supports the probe 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 transmitter. 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.

Analytical Application Sets

Continuous emission monitoring

HM-1400 TRX total mercury analyzer system / D-FL 100 volume flow measuring system

Design (Continued)

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions for D-FL 100-20.

The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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

Weather protection covers are available to protect the probe head and the back purging control when the measuring system is installed outdoors.

Transmitters

- Absolute pressure transmitter
- Temperature transmitter

Additional options

Probe material

Different materials are available for the probes for applications with high temperatures and/ or aggressive exhaust gases.

Ex version

The transmitters and the automatic backflush are also available in explosion-proof 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

D-FL 100 volume flow measuring system

General information	
Measured variable	Differential pressure, speed, volume flow, volume flow (normalized), temperature, pressure
Measuring range	<ul style="list-style-type: none"> • Speed: 3 ... 50 m/s • Volume flow: 0 ... 3 000 000 m³/h
Measuring principle	Differential pressure measuring principle, in situ measurement, continuous measurement, single-sided or two-sided installation
Dimensions (W × H × D)	<ul style="list-style-type: none"> • Evaluation unit A/P: 231 × 160 × 105 mm • Evaluation unit M: 62 × 90 × 54 mm • Measuring probe 1: 24 × 22 × 400 ... 2 000 mm • Measuring probe 2: 54 × 50 × 2 000 ... 4 000 mm • Measuring probe 3: 100 × 90 × 4 000 ... 8 000 mm

Technical specifications (Continued)

D-FL 100 volume flow measuring system	
Weight	<ul style="list-style-type: none"> • Measuring system with probe type 1: 19 kg + 1 kg/m probe length • Measuring system with probe type 2: 27 kg + 3.6 kg/m probe length • Measuring system with probe type 3: 28 kg + 6.8 kg/m probe length • Evaluation unit: 1 kg
Operating conditions in the channel	<ul style="list-style-type: none"> • Temperature: Max. 850 °C¹⁾ • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: -50 ... +50 hPa • Dust concentration: Max. 30/100/150 mg/m³, depending on the probe version
Dimensions of the channel	<ul style="list-style-type: none"> • Inside diameter: 0.4 ... 9 mm • Wall thickness: Max. 300/800/1 300 mm, depending on the probe version
Ambient conditions	<ul style="list-style-type: none"> • Ambient temperature: <ul style="list-style-type: none"> - -20 ... +50 °C (certified) - -40 ... +60 °C (optional) • Air humidity: 30 ... 60% relative humidity, non-condensing
Degree of protection	<ul style="list-style-type: none"> • Evaluation unit: <ul style="list-style-type: none"> - IP65 (implemented in enclosure) - IP20 (implemented in DIN rail module) • Differential pressure sensor: IP67
Interfaces	<ul style="list-style-type: none"> • Analog output: 1 × 4 ... 20 mA, maximal 400 ohm, floating • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A • Modbus RS 485 RTU, USB

Technical specifications (Continued)**D-FL 100 volume flow measuring system**

Operating voltage	<ul style="list-style-type: none">• 24 V DC, 0.5 A (standard)• 90 ... 264 V AC, 48 ... 62 Hz (option)
Purge-air supply (optional)	6 ... 8 bar for backflush

¹⁾ Higher temperature on request.

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

HM-1400 TRX total mercury analyzer system / D-FL 220 volume flow measuring system

Overview



For continuous, non-contacting volume flow measurement in dry and damp gases. Reliable, even under demanding operating conditions.

Benefits

- Certified for regulatory emission monitoring
- Precise measurement of the gas speed and volume flow
- Suitable for measurement in damp and aggressive gases
- Long service life and high availability even under extreme plant conditions
- Low maintenance costs

Application

The D-FL 220 continuously determines the sample gas speed for reliable emission monitoring, even in damp and aggressive gases, and in small to very large flues. Even at very low speeds (< 3 m/s), the D-FL 220 can be used for reliable emission monitoring. The measuring system is therefore ideal for process control and process optimization.

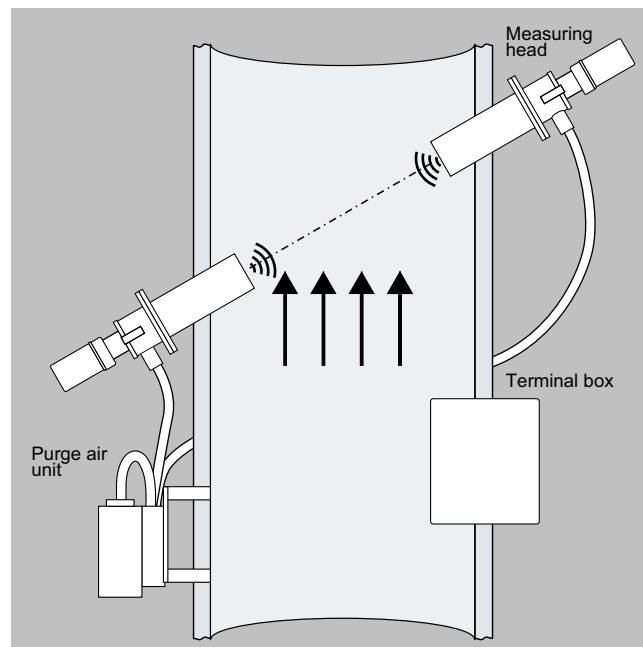
Application areas

- Volume flow measurement at low speeds
- Plants with damp and/or aggressive exhaust gas
- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery, combustion plants, cement industry
- Plaster
- Clinker, power plant industry, waste incineration, crematories, process monitoring

Approvals

- Suitability-tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21218490/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS6

Design



D-FL 220 system components

Measuring devices

Two identically designed measuring devices 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 is proportional to the speed 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 air flange

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

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 devices to the purge air unit. The filtered air is used to cool the measuring devices and to keep the transmitters 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Design (Continued)

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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 transmitter
- 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

D-FL 220 volume flow measuring system	
General information	
Measured variable	Volume flow (operation), volume flow (normalized), speed, temperature
Measuring range	<ul style="list-style-type: none"> • Speed: 0 ... 40 m/s • Volume flow: 0 ... 5 000 000 m³/h
Measuring principle	Ultrasonic transit time difference method, in situ measurement, continuous measurement, double-sided installation, non-contacting measurement
Dimensions	<ul style="list-style-type: none"> • Enclosure dimensions (W × H × D) <ul style="list-style-type: none"> - 113 × 84 × 188 mm - 190 × 190 × 330 mm (with purge flange) • Measuring probe (D × L): 110 × 230 ... 2,270 mm, others on request
Weight	6.5 kg (sensor head 610 mm with purge flange, weight depending on version)
Operating conditions in the channel	
Dimensions of the channel	<ul style="list-style-type: none"> • Temperature: Max. 300 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: -50 ... +20 hPa
	<ul style="list-style-type: none"> • Inside diameter: 0.5 ... 14 m, depending on operating conditions in the channel • Wall thickness: Max. 800 mm

Technical specifications (Continued)

D-FL 220 volume flow measuring system	
Ambient conditions	<ul style="list-style-type: none"> • Temperature: <ul style="list-style-type: none"> - -40 ... +70 °C (measuring device) - -40 ... +60 °C (certified) • Air humidity: 30 ... 60% relative humidity, non-condensing
Degree of protection	IP65 according to EN 60529
Interfaces	<ul style="list-style-type: none"> • Analog output: 1 × 4 ... 20 mA, maximal 400 ohm, floating • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A • Modbus RS 485 RTU, USB
Operating voltage	24 V DC/0.5 A
Purge air supply D-BL	
Purge air consumption	Approx. 60 m³/h @ 25 hPa
Operating voltage	115 230 V 50/60 Hz, LNPE
Dimensions (H × W)	415 × 460 mm
Weight	Approx. 20 kg

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



Control unit including power supply and optional purge air supply

Benefits

- Space-saving and simple installation
- Simple and efficient system installation
- Operation at any time and from anywhere
- Suitable for use in extreme ambient conditions and in hazardous zones
- Reliable operation at various distances from the sensor installation site

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 control unit is made via Modbus. A version of the control unit with an integrated purging 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 interface. 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 DIN rail modules. Thus, for example, analog inputs/outputs or digital inputs/outputs can be adapted to the system requirements.

Approvals

Type-tested according to European directives EN 15267 and EN 14181 for continuous emission measurements in connection with the test reports no. 936/21225028/B (D-R 320), 936/21218492/C (D-FL 100), 936/21218490/C (D-FL 220) and 936/21232768/C (D-R 808) of TÜV Rheinland (German Technical Inspectorate).

Design

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

- D-ISC 100 C
 - Control unit in compact field enclosure
- D-ISC 100 M
 - Control unit in field enclosure
 - Expandable with up to 4 standard DIN rail modules
- D-ISC 100 P
 - Control unit in field enclosure with integrated purging air blower (for D-R 220, D-R 320, D-R 808)
 - Expandable with up to 2 DIN rail modules
- D-ISC 100 R
 - Control unit for 19" rack
 - Expandable with up to 4 standard DIN rail modules

Optional

Software modules

The software modules will be standard as of 1 Jan. 2022.

DIN rail modules

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

Technical specifications

Basic unit

	D-ISC 100 C	D-ISC 100 M	D-ISC 100 P	D-ISC 100 R
General information				
Dimensions	270 × 266 × 120 mm	319 × 439 × 175 mm	529 × 454 × 241 mm	267 × 483 × 258 mm
Weight	5 kg	10 kg	20 kg	10 kg
Degree of protection	IP65	IP65	IP65	IP20
Ambient conditions				
Temperature	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C
Purge air supply	-	-	Integrated blower for D-R 220/D-R 320/D-R 808	-
Inputs and outputs				
Measured value output	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm
• Analog output	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)
• Digital output	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)
Expansion modules (optional)				
• Analog output	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA
• Analog input	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA
• Digital output	8 × NC/NO	8 × NC/NO	8 × NC/NO	8 × NC/NO
• Digital input	8 × NC/NO	8 × NC/NO	8 × NC/NO	8 × NC/NO
Auxiliary power				
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz
Power consumption	200 VA	200 VA	450 VA	200 VA

More information

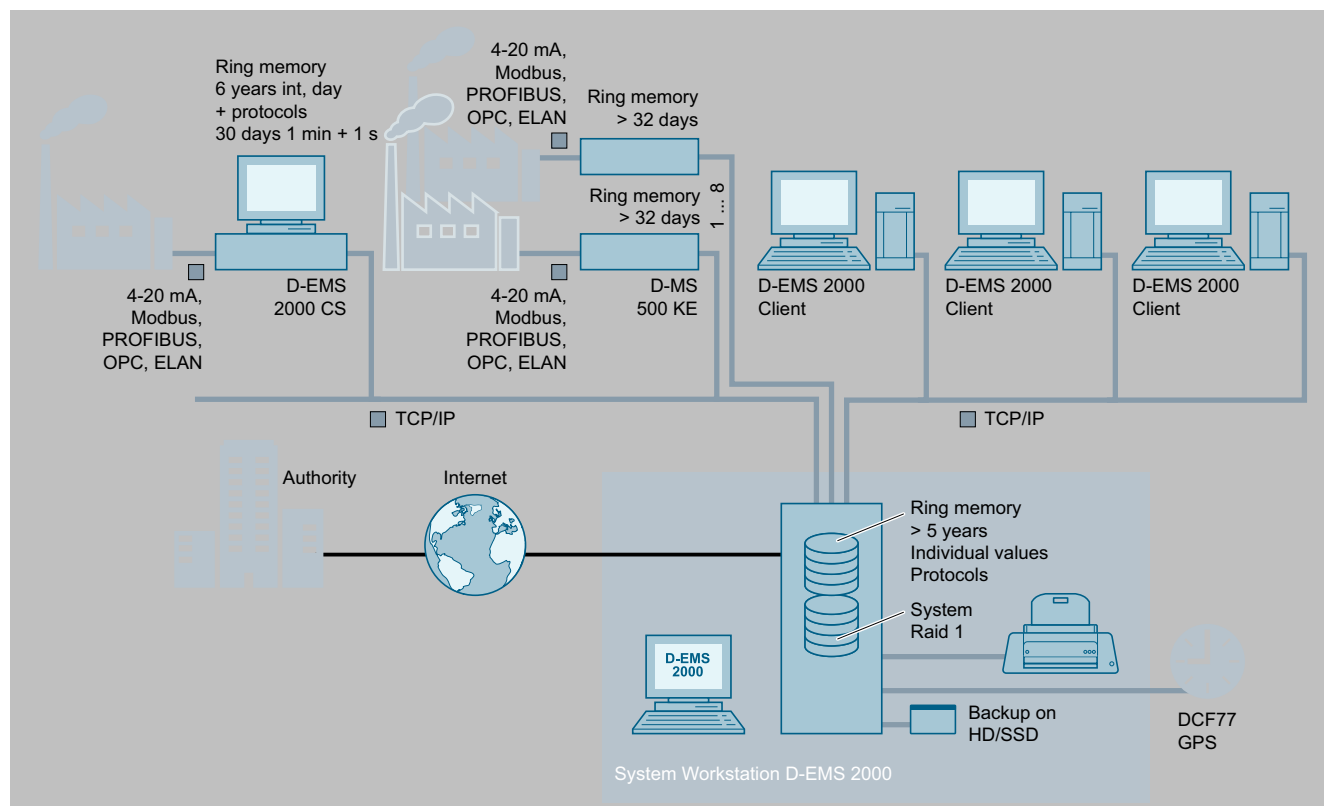
Please consult your Siemens sales partner for information on how to correctly configure and order a D-ISC 100 control unit for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

D-ISC 100 display and control unit / 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 German Technical Inspectorate (TÜV) for systems in accordance with German Technical Instructions on Air Quality Control (TA Luft), 1st, 2nd, 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to 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. BImSchV
- Compatible with official software, import/export module
- Automatic filling in of forms
- Reading in of historical emission declarations

More information

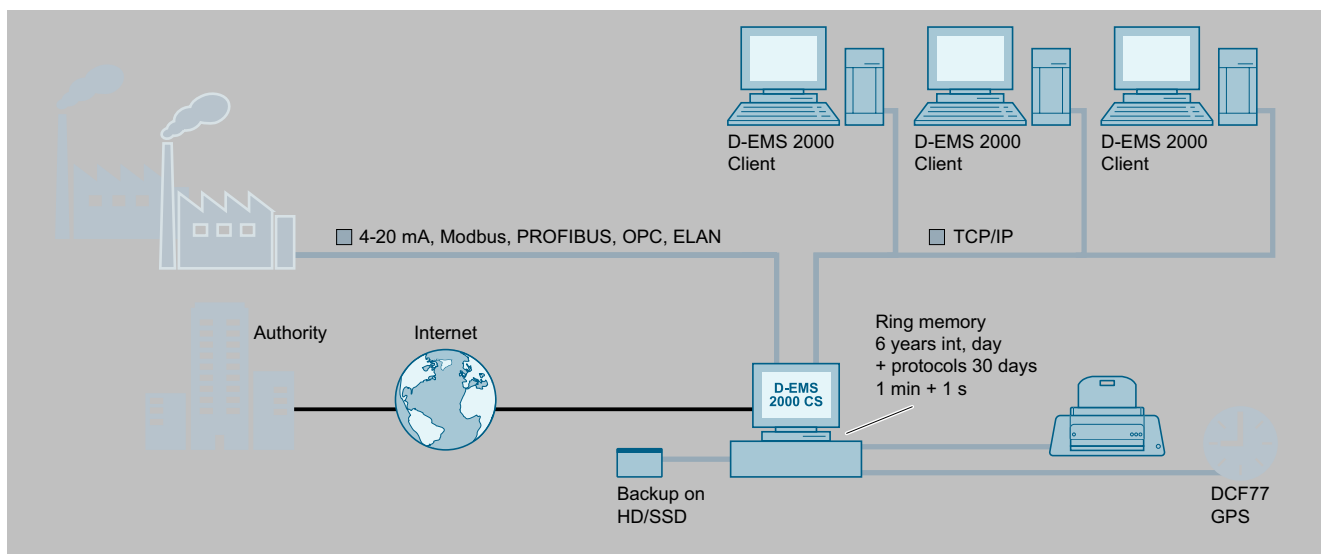
Please consult your Siemens sales partner for information on how to correctly configure and order a D-EMS 2000 environmental and process data management system for a Siemens CEMS project.

Analytical Application Sets

Continuous emission monitoring

D-ISC 100 display and control unit / D-EMS 2000 CS

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 German Technical Inspectorate (TÜV) for systems in accordance with German Technical Instructions on Air Quality Control (TA Luft), 1st, 2nd, 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to 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

D-EMS 2000 CS	
Device designs	<ul style="list-style-type: none"> • Compact system in 19" 3 U 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: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 (CO_2 and CH_4). 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.

Measured component	Smallest measuring range	Largest measuring range
CO_2	0 ... 20%	0 ... 100%
CH_4	0 ... 20%	0 ... 100%
O_2	0 ... 5%	0 ... 25%
H_2S (low)	0 ... 5 ppm	0 ... 50 ppm

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.



Set BGA measuring system



2-stream sample preparation

Selection and ordering data

Set BGA basic configuration, including flame arrestor	Article No. 7MB1955- ● ● ● ● ● - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.										
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".										
Gas connections, external										
6 mm								0		
1/4 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		
Auxiliary power										
120 V AC, 60 Hz								0		
230 V AC, 50 Hz								1		
110 V AC, 50 Hz								2		
220 V AC, 60 Hz								3		
Infrared measured components										
Version with one measured component (CH ₄) Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring methane; mounted in 19-inch rack unit for installation in wall cabinet. <u>Specification:</u> Measured component CH ₄ • smallest adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100%								0		
Version for 2 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. <u>Specification:</u> 1st measured component CO ₂ • smallest adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100% 2nd measured component CH ₄ • smallest adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100%								1		
Version with one measured component (CO ₂) Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring carbon dioxide; mounted in 19-inch rack unit for installation in wall cabinet. <u>Specification:</u> Measured component CO ₂ • smallest adjustable measuring range: 0 ... 0.5% • largest adjustable measuring range: 0 ... 2.5%								2		
Oxygen measurement										
Gas analyzer without oxygen sensor									A	
Electrochemical oxygen sensor; resistant to CO ₂ <u>Specification:</u> • smallest adjustable measuring range: 0 ... 5% • largest adjustable measuring range: 0 ... 25% • repeatability: approx. 0.05% O ₂									B	
Paramagnetic oxygen measuring cell; no sensor wear <u>Specification:</u> • smallest adjustable measuring range: 0 ... 2% • largest adjustable measuring range: 0 ... 100% • repeatability: < 1% of smallest measuring range									C	
H₂S measurement										
Without H ₂ S sensor									A	
With H ₂ S sensor, 0 ... 5 ppm to 0 ... 50 ppm									D	
Documentation										
German, 1 set (paper and CD)										0
English, 1 set (paper and CD)										1

Analytical Application Sets

Biogas analysis

Set BGA

Selection and ordering data (Continued)

Set BGA basic configuration, including flame arrestor	Article No.
French, 1 set (paper and CD)	7MB1955- ● ● ● ● - ● ● ● ●
	2

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Heated sample gas line, self-regulating, Ex-proof	
• Length: 5 m, supplied separately	A01
• Length: 10 m, supplied separately	A02
• Length: 15 m, supplied separately	A03
• Length: 20 m, supplied separately	A04
• Length: 25 m, supplied separately	A05
• Length: 30 m, supplied separately	A06
• Length: 35 m, supplied separately	A07
Communication	
• PROFIBUS PA interface	A12
• PROFIBUS DP interface	A13
Fast loop design and sample switching	
• 2-stream sample switching with Logo and external pump	B02
• 3-stream sample switching with Logo and external pump	B03
• 4-stream sample switching with Logo and external pump	B04
• 5-stream sample switching with Logo and external pump	B05
• 6-stream sample switching with Logo and external pump	B06
Gas sensor for leak monitoring of the Set BGA system	
• Alarm monitoring: 20% LEL methane	C01

Technical specifications

Set BGA	
Installation	
Ambient temperature	5 ... 38 °C, with cabinet heating ± 0 °C
Place of installation	Indoor/outdoor installation (configurable)
Gas inlet conditions	
Sample gas pressure	<ul style="list-style-type: none"> With pump, depressurized suction mode, selectable with internal or external pump Provision must be made for a pressure reduction for pressures greater than 1 200 mbar absolute
Pump performance	Adjustable to 60 ... 80 NI/h
Sample gas temperature	Max. 45 °C, with moisture saturation
Power supply	
Supply 1	200 ... 240 V AC, 47 ... 63 Hz
Supply 2	100 ... 120 V AC, 47 ... 63 Hz
Power consumption	Approx. 180 VA (without cooler and sample preparation)
Connection systems	
Teflon hose	With PVDF screwed glands

Technical specifications (Continued)

Set BGA	
Connection systems	Metric (6 mm) or imperial (1/4") selectable
Dimensions	
Set BGA measuring system (W × H × D)	600 × 781 × 600 mm
Sample preparation (W × H × D)	600 × 600 × 220 mm
Weight	
Set BGA measuring system	Approx. 50 kg
Sample preparation	Approx. 22 kg
System design	
System housing	3-part sheet-steel enclosure with inspection window
Degree of protection	IP54
Cabinet conditioning	Fan
Cooling system	Peltier cyclone cooler (optional)
Sample preparation	Max. six sample streams can be controlled using Logo module with fast loop pump in separate enclosure
Analog outputs	Per component 0/2/4 ... 20 mA; NAMUR, floating, max. load 750 Ω

Technical specifications (Continued)

Set BGA	
Measured components / measuring ranges	
CH ₄	0 ... 100 vol.% to 0 ... 20 vol.% (NDIR)
CO ₂	0 ... 100 vol.% to 0 ... 20 vol.% (NDIR)
O ₂	0 ... 25 vol.% to 0 ... 5 vol.% (electrochemical or paramagnetic optionally selectable)
H ₂ S	0 ... 5 ppm to 0 ... 50 ppm (electrochemical); optional
Safety assemblies	
Assembly 1	Detonation protection F501
Assembly 2	Flow measurement with limit monitoring at the output
Assembly 3	LEL monitoring (optional)
Comment	<ul style="list-style-type: none"> The system concept of the Set BGA is based on the pre-configured ULTRAMAT 23 solutions (7MB2335-..., 7MB2337-...) The technical performance data concerning the measuring response corresponds to the catalog data of the ULTRAMAT 23. The pre-configured version does not contain any ULTRAMAT 23 add-ons or retrofitting sets.

Analytical Application Sets

Continuous monitoring of hydrogen-cooled generators

Set GGA

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.

Application (Continued)

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

Analizers

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.

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

Design (Continued)

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 involved 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 thresholds, or detecting the risk of this happening in good time.
- Monitoring the hydrogen purity.

Normal operation

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

Filling the generator

Filling the generator is a two-step procedure: first, the air in the generator is replaced by inert gas (argon or CO₂). The inert gas is then replaced by hydrogen. During this procedure, the concentration trends of the gases are measured, and the replacement processes monitored.

To ensure that no potentially explosive mixtures arise:

- In the first step, the measuring range of 0 to 100% inert gas in the air must be monitored.
- In the second step, the measuring range of 0 to 100% H₂ in the inert gas must be monitored.

Emptying the generator

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 the inert gas first, and then 0 to 100% inert gas in the air.

Analytical Application Sets

Continuous monitoring of hydrogen-cooled generators

Set GGA

Selection and ordering data

Set GGA	7MB1950-	Article No.									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.		●	●	●	0	●	-	●	●	●	●
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connection											
6 mm pipe		0									
¾" pipe		1									
Version											
H ₂ monitoring (turbo generators)			G	A							
Add-on electronics											
Without						0					
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz								0			
200 ... 240 V AC, 48 ... 63 Hz								1			
Device design											
Set GGA, cable glands M20 x 1.5, power supply with cable diameter of 6 ... 12 mm									A		
Set GGA, with calibration gas skid, cable glands M20 x 1.5, power supply with cable diameter of 6 ... 12 mm (sample preparation on stainless steel plate), delivery batch in 2 shipments									B		
Set GGA, cable glands M25 x 1.5, power supply with cable diameter of 14 ... 18 mm									C		
Set GGA, with calibration gas skid pre-mounted on frame, cable glands M20 x 1.5, power supply with calibration gas kit (PA on stainless steel plate), pre-mounted on frame, delivery batch in 1 shipment									E		
Explosion protection											
Certificate: ATEX II 3G, flammable and non-flammable gases										B	
Documentation											
German											0
English											1
French											2
Spanish											3

Technical specifications

Set GGA	
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)
Calibration 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 isolation amplifiers
Type of connections	
Pipe material	Stainless steel
Connections/components	<ul style="list-style-type: none"> • Metric (6 mm) • Imperial (¾")
Cabling	
Electrical design	According to IEC
Type of cables	Non-armored cables
Cable ID	No single core labeling
Installation	
Place of installation	Interior
Hazardous zone analyzer	ATEX II, 3G

Technical specifications (Continued)

Set GGA	
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 nameplate, with electronic damping constant of 1 s ($\tau = 0.25\%$)
Zero point drift	< 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< 0.5% of the smallest possible measuring span according to nameplate
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 measuring span according to nameplate
Accompanying gases	Deviation from zero point
Sample gas flow	< 0.1% of the smallest possible measuring span according to nameplate 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 variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%

Generator gas analyzer

Analysis Component	Measuring point designation Concentration			Generator gas analyzer			
	Min.	Typical	Max.	Unit	Measured component	Measuring range Small	Large
Ar/CO ₂ in air	0	-	100	Vol.%	Yes	0	100
H ₂ in Ar/CO ₂	0	-	100	Vol.%	Yes	0	100
H ₂ in air	80	-	100	Vol.%	Yes	80	100
Sample temperature	-	50	-	°C	-	-	-
Dust content	-	0	-	mg/m ³	-	-	-
H ₂ O dew point	-	-50	-	°C	-	-	-
Aggregate state, sample ¹⁾	Gaseous	-	-	-	-	-	-

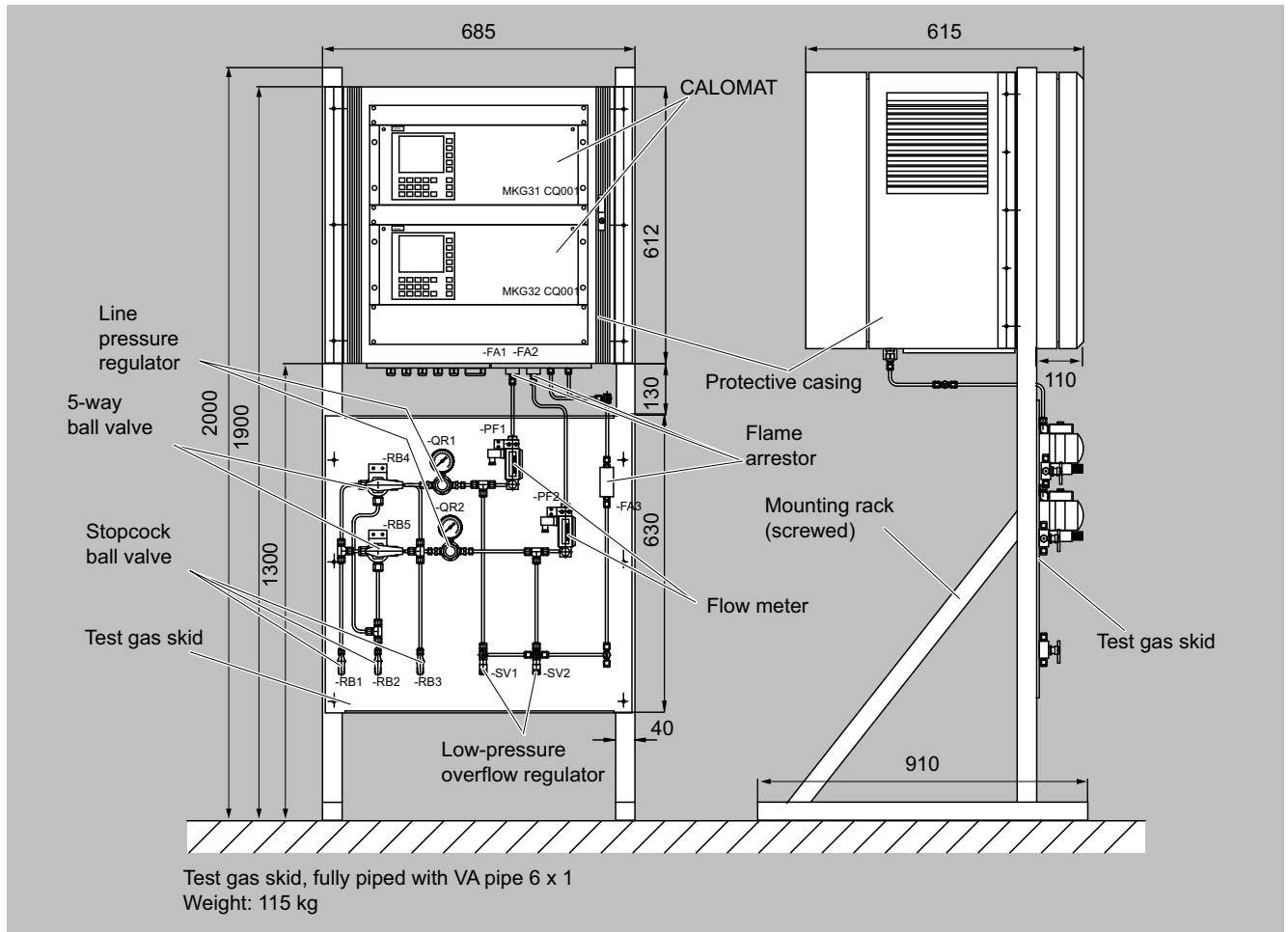
¹⁾ Standard state at 20 °C, 101.3 kPa.

Analytical Application Sets

Continuous monitoring of hydrogen-cooled generators

Set GGA

Dimensional drawings



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