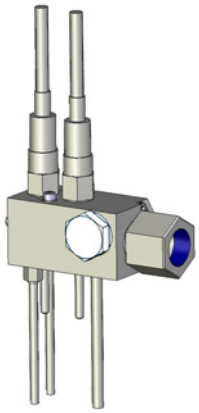
OPERATING INSTRUCTIONS

GM960
Boiler Wall Monitor

Description
Operation
Maintenance



SICK
Sensor Intelligence.

Document Information

Described Product
Product name: GM960

Document ID
Title: Operating Instructions GM960
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Manufacturer
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Original Documents
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Please contact the publisher in case of doubt.

Legal Information
Subject to change without notice.

Warning Symbols


Hazard (general)


Hazard by voltage

Hazard in potentially explosive atmospheres


Hazard by noxious substances


Hazard by high temperatures and hot surfaces


Hazard for the environment/nature/organic life

Warning Levels / Signal Words

DANGER
Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING
Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols


Important technical information for this product


Important information on electric or electronic functions


Nice to know


Supplementary information


Link to information at another place

GM960

1 Important Information

Main safety information
Main operating information
Intended use
User responsibility

1.1 Intended use

1.1.1 Purpose of the device

Boiler wall monitor GM960 is a qualitative trend measuring system for observing the flue gas atmosphere present on the inner boiler wall of a steam generator.

GM960 provides the operator with measuring signals and data which serve to accurately assess the real-time risk of corrosion and to derive the sustained corrosive load of the inner boiler wall.

1.1.2 Product identification

Product name:	GM960
Manufacturer:	SICK AG Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany

Two type plates are located on each system component. The upper type plate describes the overall GM960 system. The lower type plate belongs to the respective system component.

- Master unit (PC)
- Connection unit
- Boiler wall probe (in insulating housing)

1.1.3 Installation location

Boiler wall monitor GM960 is designed for operation on steam generators in a boiler housing in power plants.

WARNING: Risk of explosion in potentially explosive atmospheres

► Do not use the GM960 in potentially explosive atmospheres.

1.2 Responsibility of user

> ***NOTICE:*** **Responsibility for the safety of a system**
> The person setting the system up is responsible for the safety of the system in which the device is integrated.

- ► Read all Operating Instructions before putting GM960 into operation.
- ► Observe all safety information.
- ► If anything is not clear: Please contact SICK Customer Service.

Designated users

All operators of the GM960 should be specifically trained on this device, knowledgeable of relevant regulations and able to assess potential hazards related to its operation.

Correct use

- This Manual presumes that the GM960 has been delivered as specified during project planning and with the relevant delivery state of the GM960 (→ delivered system documentation).
  - ► If you are not sure whether the GM960 complies with the planned state or the delivered system documentation:
    Please contact SICK Customer Service.
- ► The GM960 should only be used as described in these Operating Instructions. The manufacturer assumes no responsibility for any other use.
- ► Maintenance work should be performed as prescribed in this Manual.
- ► Do not attempt any work on or repairs to the GM960 unless described in this Manual.

> Additional work as described in “GM960 Technical Information” should only be performed by trained technicians.

Do not modify the GM960 in any way unless specifically instructed and permitted to do so by the manufacturer.
Failure to observe these precautions could result in:

- Voiding the manufacturer's warranty
- Causing the GM960 to become dangerous

Special local conditions

- ► Follow all local laws, regulations, and company policies applicable at the installation location.

Responsibility for dangerous substances

> **WARNING: Health risk through dangerous sample gas**
> ► The operator is responsible for safe handling of the sample gas.

Retention of documents

These Operating Instructions:

- ► Must be kept available for reference.
- ► Must be conveyed to new owners.

GM960

2 Product Description

Product identification
Functional principles
Characteristics
Variants

2.1 Features of the GM960

GM960 analyzes the basic measured values CO and/or COe (COe = CO-equivalent: → “GM960 Technical Information”) and O_2 simultaneously on up to 40 measuring points of the steam generator.

These measured values are collected to assess boiler wall corrosion.

- Protection against corrosion and related wall-wear through comprehensive monitoring of CO and O_2.
- Support for corrosion countermeasures as well as monitoring their effect.

2.1.1 Interfaces

- On the connection unit
  - RS232 socket with RS232/RS422 communication for configuration and service.
- On the master unit
  - Bus interfaces: Depending on project planning.

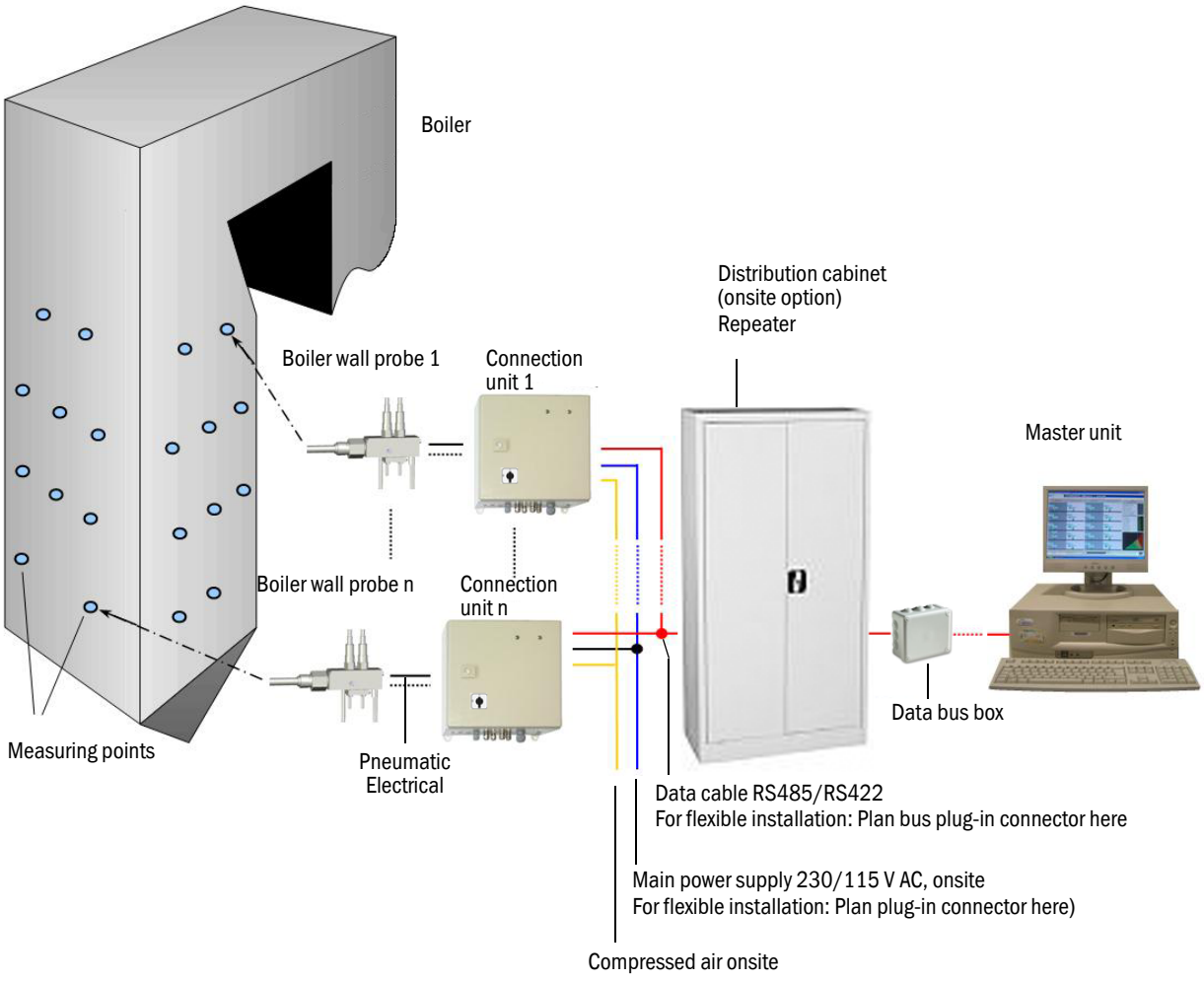
Further information on interfaces → “GM960 Technical Information”

2.1.2 System overview

The GM960 boiler monitor is made up of:

- Boiler wall probes (max. 40 in one master unit) (→ p. 14, §2.1.2.1).
- Connection units (each for 1 boiler wall probe) (→ p. 15, §2.1.2.2).
- Master unit (PC) with program MEPA-GM960 (→ p. 15, §2.1.2.3).
- Data bus box (data transfer from master unit via RS485/RS422 cable).
- Distribution cabinet (onsite).
- Optional repeater in distribution cabinet (signal amplification of RS485/RS422 signals).
- Optional for “flexible installation” (→ p. 15, §2.1.3): Plug-in connectors and bus plug-in connectors.

Fig. 1 System overview



2.1.2.1 Boiler wall probe

Fig. 2 Boiler wall probe fitted on a typical boiler wall

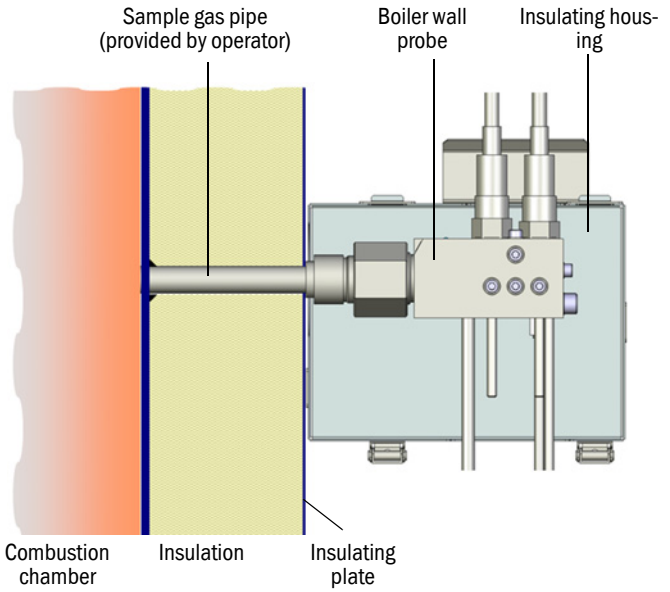
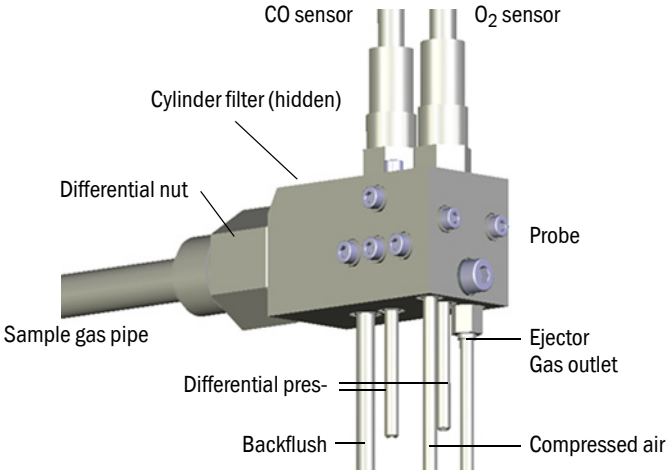


Fig. 3 Boiler wall probe (shown without insulation)



The probe is screwed to the sample gas pipe (present onsite).

The probe has two sensors:

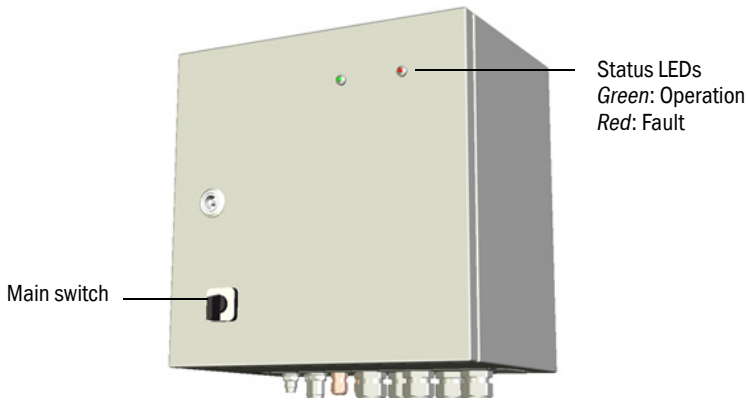
- CO
- O_2

The sample gas is suctioned out of the boiler by an ejector (powered with compressed air), passed through a cylinder filter, and transported to the sensors.

- Sample gas throughflow: Approx. 30 liter/ h (during operation). The sample gas escapes into the environment together with the ejector feed air (boiler house).

2.1.2.2 Connection unit

Fig. 4 Connection unit



The connection unit has the following functions:

- Raw data collection from the sensors.
- Communication to master unit.
- Compressed air supply to the ejector integrated in the probe.
- Sensor actuation and heating.
- Backflush valve actuation.
  Typical: 5 backflushes per hour, each lasting 2 seconds.
- Ejector valve actuation.
- RS232 interface.

2.1.2.3 Master unit (PC)

Software MEPA-GM960 runs on the master unit (PC) and is responsible for:

- GM960 process control and data recording
  The master unit cyclically requests the measured, status, and diagnosis values from the sample gas probes.
- Numeric and graphic presentation of measured values.
- Data storage (→ p. 20, § 3.2.3).
- Data communication
  All measured values can be passed to a higher-level system (application-specific).
  Connection to a data network (LAN) and access using an internet browser are supported (application-specific).

2.1.3 Flexible installation

The GM960 can be modified to accept additional measuring points than those that come with standard installation.

Modifications include: Providing power voltage, data bus cable and compressed air on the additional measuring points, and connecting and fitting these with plug-in connectors in a suitable manner.

This allows easy transfer of boiler wall probes and connection units to the prepared measuring points as required.

2.2 Measuring concept

At every measuring point on the boiler wall:

- Measured values CO and O_2 are analyzed
- Values CO CorrosionLevel and CO CorrosionLoad (load average value, load duration) are calculated.

Further information → p. 22, § 3.3.3

2.2.1 Qualitative trend statement

A qualitative trend statement is generated for each measuring point from the measured CO and O_2 values as well as subsequently from the CO CorrosionLevel (CO-CL).

The risk potential for possible wall corrosion (low, medium, high) is indicated by green, yellow, or red.

Further information → p. 22, § 3.3.3.1

2.2.2 CO CorrosionLoad

The CO CorrosionLoad expresses the CO load of the inner boiler wall at the measuring point over a long period of time and serves as an indicator for possible damage to the boiler wall through corrosive wear.

Further information → p. 22, § 3.3.3.2

GM960

3 Operation/Operating

Access
Operation
Status messages

3.1

Switching on

1 Close all connection units.

2 Switch the main switches (→ p. 15, Fig. 4) of all connection units.

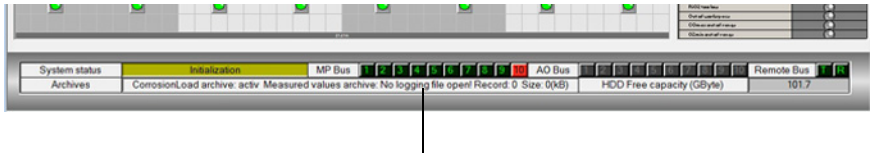
3 Switch the master unit (PC) on.
A Windows user interface is displayed.

4 Start the program MEPA-GM960:

The Start screen is displayed (→ p. 21, Fig. 8).

5 The fields → Fig. 5 must blink green when communication with the connection units is active.

Fig. 5 Communication with connection units



RS485 communication with the connection units:
These displays must blink green.
If not: → p. 33, § 6.2.1

If a connection unit does not respond, the request will be resent in 20 seconds.
This means the corresponding display will not blink for 20 seconds.

3.2 Operating state / status messages

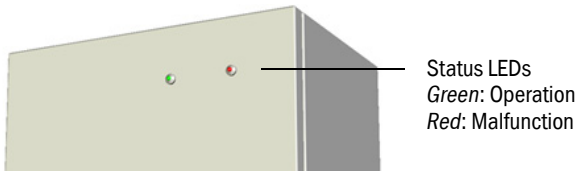
Operating state	Indicated by	Remark
Trouble-free operation	LED on connection unit is *green*.	---
	No malfunction messages (→ p. 21, Fig. 8)	Warning message can be active: → p. 30, § 6.2
Warning	LED on connection unit is *green*. and warning field active (→ p. 21, Fig. 8)	GMS960 working reliably but operating conditions must be checked: → p. 30, § 6.1
Malfunction	LED on connection unit is *red*.	→ p. 30, § 6.1
	Malfunction messages in program (→ p. 21, Fig. 8)	→ p. 30, § 6.1
	No LED on connection unit on	Error function exists → p. 30, § 6.1

Further information on operation as well as warning and malfunction messages:

► MEPA-GM960 program (→ p. 21, Fig. 8, → p. 30, Fig. 10)

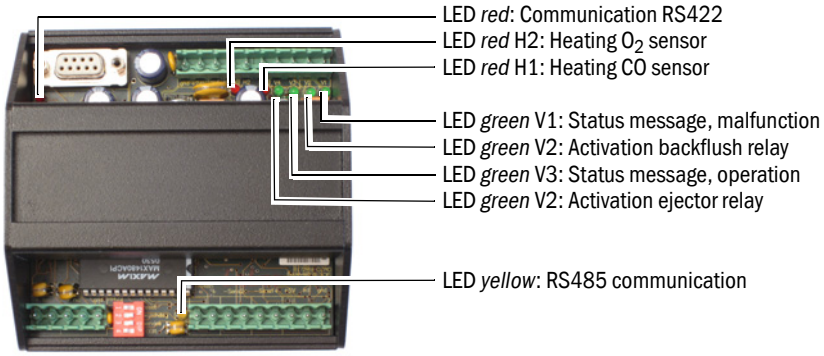
3.2.1 LEDs on the outside of the connection unit

Fig. 6 LEDs on the outside of the connection unit



3.2.2 LEDs in the connection unit

Fig. 7 LEDs in the connection unit (ZrO_2 module)



- The *yellow* LED lights cyclically: The master unit sends request and receives responses. Depending on the number of measuring points as well as the request/response cycle duration, the request/response interval on the respective measuring point is 1 s ... 120 s.

3.2.3 Data storage

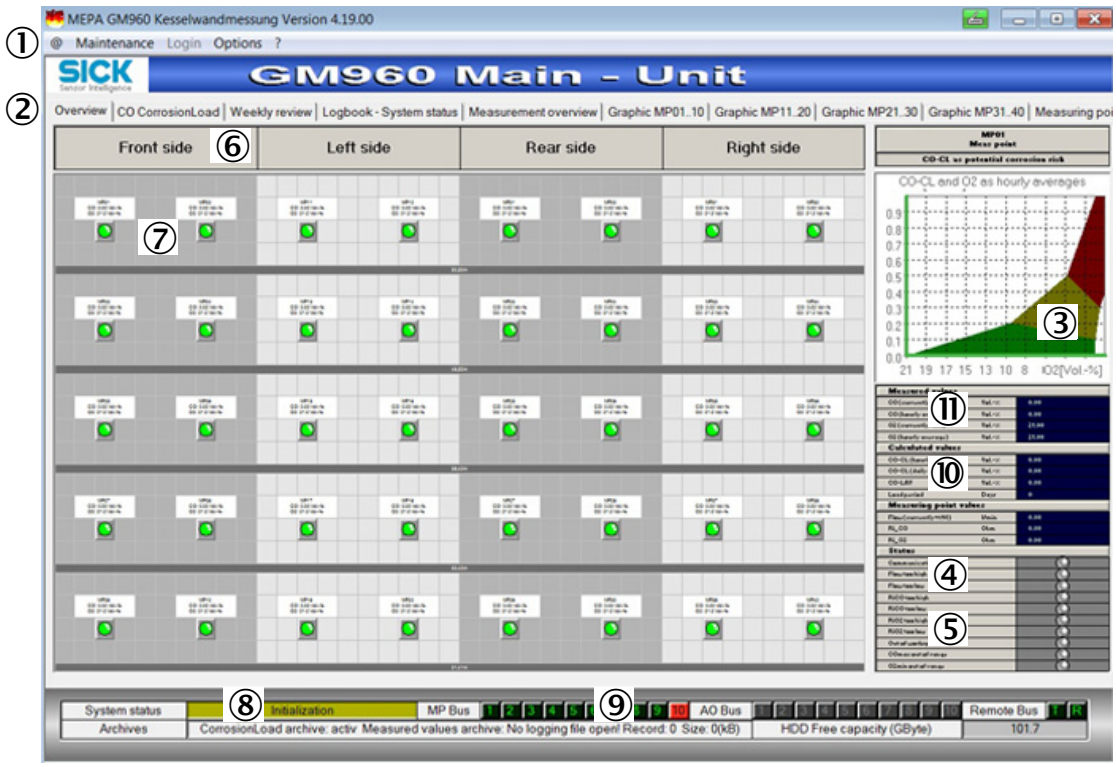
- The “CO CorrosionLevel” measured values are stored in a ring buffer as hourly average values.
  - Storage time: 7 days
  - Filename: “GM960_WeeklyArchive.csv“.
    This file can be downloaded as a .csv file into Excel.
- The “CO CorrosionLoad” measured values are stored continuously as daily average values.
  - Filename: “GM960_LongTermArchive.csv”.
    This file can be downloaded as a .csv file into Excel.
- Base measured values (sensor voltages and physically measured values) are stored in a data logger.
  - Filename : *.blg files
    These data can be read by MEPAGM960 and shown in graphic form: Register menu “History”.
    This menu serves to write the measured values to an ASCII file.
    The data logger is configured in program menu “Settings/Archive settings”.

3.3 Program MEPA-GM960

1 Start the program in Windows Explorer.

2 The Start screen is displayed.

Fig. 8 Start screen



1	Program menu	2	Register menu	3	Real-time values → p. 22, § 3.3.3
4	Malfunction messages → p. 30, § 6.1	5	Warnings → p. 30, § 6.1	6	Location of the boiler wall probes (as example)
7	Status of the boiler wall probes	8	Operating state	9	Communication → p. 18, Fig. 5
10	Calculated values	11	Raw values CO, O_2		

MEPA-GM960 program description:
► Program menu: *?/Help*.

3.3.1 Help menu

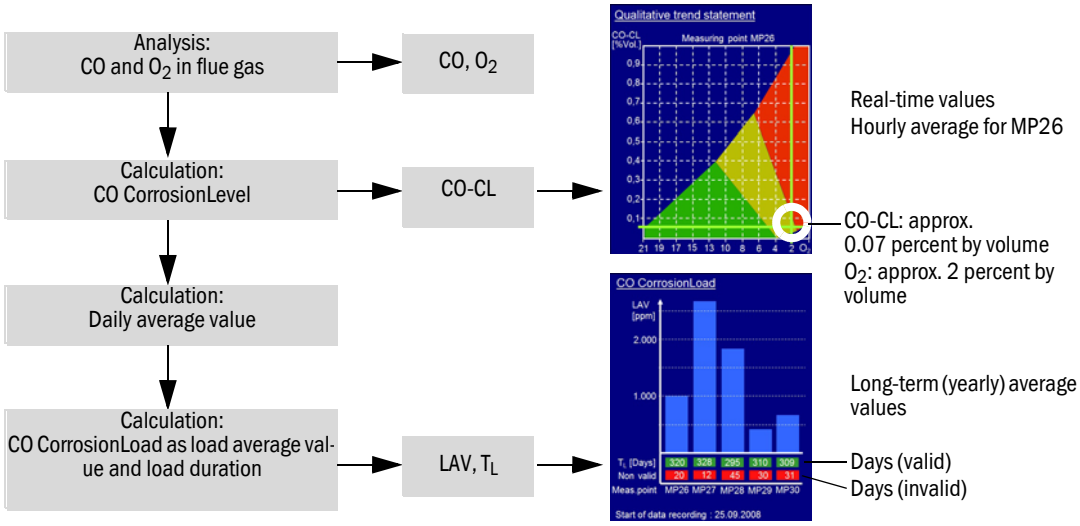
Help menu
► Program menu: *?/Help*

3.3.2 Password

► Program menu: *Measuring point diagnosis/Parameter*

3.3.3 Measuring concept - representations

Fig. 9 Graphic representation of measured values



3.3.3.1 The qualitative trend statement

A qualitative trend statement is generated for each measuring point from the measured CO and O_2 values as well as subsequently from the CO CorrosionLevel (CO-CL).

The risk potential for possible wall corrosion (low, medium, high) is displayed in *green*, *yellow,* or *red* (→ Fig. 9).

Even though the rolling average value is determined over one hour, the O_2 value, CO content, and CO CorrosionLevel are to be considered as the real-time values for the GM960 boiler wall monitor, where these values serve to check and adjust the boiler and combustion air by setting the wall atmosphere.

Example → Fig. 9 “Real-time values” using measuring point MP26 as an example:

- CO-CN value: Approx. 700 ppm (0.07 percent by volume).
- O_2 value: Approx. 2 percent by volume.
- The measured value cursors cross in the *yellow* field:
  The boiler wall is being subjected to a medium corrosive CO load at Measuring Point MP26 at this point in time.

3.3.3.2 The CO CorrosionLoad

The CO CorrosionLoad expresses the CO load of the inner boiler wall at Measuring Point MPxx over a long period of time and serves as indicator for possible damage to the boiler wall through corrosive wear.→ Fig. 9

Example → Fig. 9:

- CO CorrosionLoads from 5 measuring points (5 bars)
- As an example, the statement for measuring point MP26 is:
  - MP26 was subject to an average CO load of 1000 ppm over a period of 320 days.
  - It was not possible to create a valid daily average on 20 days of the overall measurement period.

3.3.4 Changing parameters

The parameters can be viewed and/or modified from either the master unit or a laptop on any one of the measuring points via the RS232 interface of the ZrO_2 module.

Tools required
Optional laptop with MEPA-GM960
Optional RS232 cable or serial USB/RS232 adapter (with cable)

Required steps:

1 Select the measuring point to be examined in register menu "*Measuring point diagnosis/configuration*" and scroll to the desired parameter in the parameter list.

2 Change the parameter.

3 To store the changed parameter: Click on a different white or blue field in the parameter list with the cursor.

GM960

4 Maintenance

4.1 Maintenance by operator

CAUTION: Device damage through incorrect or missing grounding
During installation and maintenance work, it must be ensured that the protective grounding to the devices and/or lines involved is effective in accordance with EN 61010-1.

Maintenance work for trained technicians is described in “GM960 Technical Information”.

Work	Interval	Remark
Clean the cylinder filter	Depending on measuring point conditions	To be performed by a trained technician.
Check the sample gas flow	Depending on sample gas conditions. Weekly - monthly.	Check the measured values flow rate on the master unit. If < 0.3 l/min: Adjust the flow rate. To be performed by a trained technician.
Check the CO and O_2 characteristic curves	Recommendation: 3 months	To be performed by a trained technician.

GM960

5 Shutdown

Preparation

Shutdown procedure

5.1 Shutdown

Connection unit

► Switch the connection units off with the main switch.

> On connection units with just 1 solenoid valve fitted, the compressed air supply to the ejector must be interrupted by closing the throttle valve (turn the adjusting screw clockwise to the stop).

Boiler wall probes and connection units can remain fitted on the measuring points when the shutdown is only for a limited time.

Master unit

1 Activate button "*Stop the current measuring period*" in program menu "*Settings/ Archive settings*"..

2 Terminate MEPA-GM960.

3 Shut the master unit (PC) down.

5.2 Disposal

► The device can easily be dismantled into its components for disposal at appropriate raw material recycling facilities.

> Observe the relevant local regulations for the disposal of industrial waste.

> The following subassemblies contain substances that may have to be disposed of separately:
> - *Electronics*: Capacitors, rechargeable batteries, batteries.
> - *Display*: Display liquid
> - *Cylinder filter*: Cylinder filters may be contaminated with pollutants.

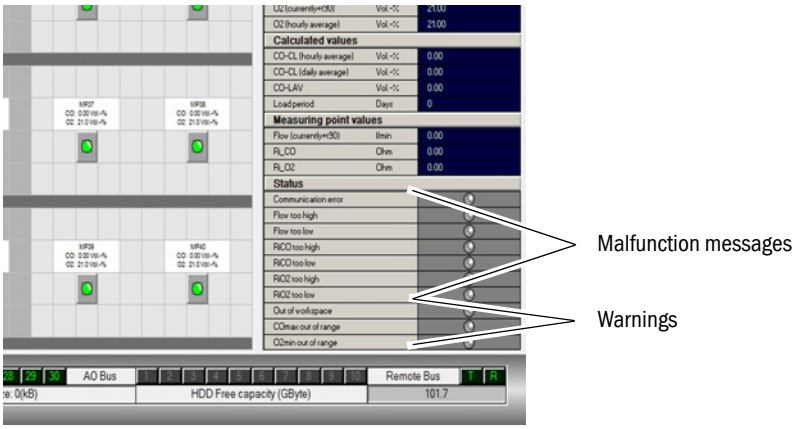
GM960

6 Clearing Malfunctions

General malfunctions
Malfunction messages
Display messages

6.1 Status messages (MEPA-GM960)

Fig. 10 Status message on Start screen



6.2 Status messages - list

Tasks that should be performed by trained personnel are described in “GM960 Technical Information”.

Status message	Possible causes	Troubleshooting
Communication error	Main switch on CU [1] X switched off	Switch main switch on
	Main power supply 230/115 VAC not present on CU X	Switch power voltage 230/115 VAC on
	Power supply unit on CU X defective	Replace the power supply unit on CU X. Contact SICK Customer Service to schedule technical services.
	ZrO_2 module in CU X defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
	Cable break in the RS485 bus signal line	Contact SICK Customer Service to schedule technical services.
	Screw terminal on the terminal points of the RS485 bus signal line loose	Check and tighten the screw terminal connections.
	Polarity of both wires A and B of the RS485 bus is swapped	Check the wiring. Contact SICK Customer Service to schedule technical services.

Flow too high	Too much compressed air on the ejector	Reduce the compressed air by turning the handwheel of the throttle valve; turn the handwheel to the right = less compressed air. To be performed by a trained technician.
	Differential pressure nozzle is contaminated.	Clean the differential pressure nozzle. To be performed by a trained technician.
	Differential pressure hosing leaking	Find and repair the leak
	One of the two differential pressure hoses is clogged.	Clean the differential pressure hoses
	Coefficient or zero point parameter of the differential pressure sensor is incorrect	Check the coefficients and zero point and correct as necessary. To be performed by a trained technician.
	“Flow Limit High” parameter set too low	Increase the “Flow Limit High” parameter
	Differential pressure sensor defective	Replace the differential pressure sensor. Contact SICK Customer Service to schedule technical services.
	ZrO_2 module defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
Flow too low	Not enough compressed air on the ejector	Increase the compressed air by turning the hand-wheel of the throttle valve; turn the handwheel to the left = more compressed air. Have this setting made by trained personnel.
	Cylinder filter is contaminated	Replace or clean the cylinder filter. To be performed by a trained technician.
	Measuring tube is clogged	Clean the measuring tube or tap free.
	Differential pressure nozzle is contaminated.	Clean the differential pressure nozzle. To be performed by a trained technician.
	Ejector is contaminated	Clean the ejector. To be performed by a trained technician.
	Differential pressure hosing leaking	Find and repair the leak
	One of the two differential pressure hoses is clogged.	Clean the differential pressure hoses
	Coefficient or zero point parameter of the differential pressure sensor is incorrect	Check the coefficients and zero point and correct as necessary. To be performed by a trained technician.
	'Flow Limit low' parameter set too high	Reduce the 'Flow Limit Low' parameter. To be performed by a trained technician.
	Differential pressure sensor defective	Replace the differential pressure sensor. Contact SICK Customer Service to schedule technical services.
	ZrO_2 module defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
RCO too high RO_2 too high	'RiXX Nominal' parameter set too high	Change parameter “RiXX Nominal” (→ p. 23, §3.3.4) and check all following parameters
	'RiXX Limit High' parameter set too low	Change parameter “RiXX Limit High” → p. 23, §3.3.4
	Heating interval set too low	Increase parameter “Heating interval” (max. 180) → p. 23, §3.3.4
	Coefficient or zero point parameter of the sensor is incorrect	To be performed by a trained technician.
	ZrO_2 module defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
	Sensor heating element defective	To be performed by a trained technician.

RCO too low RO_2 too low	Parameter “RiXX Nominal” set too low	Change parameter “RiXX Nominal” → p. 23, §3.3.4. Further information → “GM960 Technical Information”
	Parameter “RiXX Limit Low” set too high	Change parameter “RiXX Limit Low” → p. 23, §3.3.4
	Heating interval set too low	Increase parameter “Heating interval” (max. 180) → p. 23, §3.3.4
	Coefficient or zero point parameter of the sensor is incorrect	To be performed by a trained technician. Further information → “GM960 Technical Information”
	ZrO_2 module defective	Contact SICK Customer Service to schedule technical services.
	Sensor heating element defective	Check the sensor. Further information → “GM960 Technical Information”
Out of workspace	One of the two sensors is most likely displaying an incorrect measured value	Check the status messages of the gas sensors.
	Parameters of the workspace polygons are not set correctly	Check the parameters of the workspace polygons and change as necessary.
COmax exceeded	The limit value set for CO has been exceeded	If desired: Change the limit value in register menu “*Settings/ Global settings*”
O_2min underflown	The limit value set for O_2 has been underflown	If desired: Change the limit value in register menu “*Settings/ Global settings*”

[1] CU = connection unit

6.2.1 General malfunctions

Tasks that should be performed by trained personnel are described in “GM960 Technical Information”.

Symptom	Possible causes	Troubleshooting
Both LEDs of the connection unit are off	Main switch on the CU [1] switched off	Switch the main switch on the CU on
	Main power supply 230/115 VAC not present	Switch power voltage 230/115 VAC on
	Defective power supply unit	Replace the power supply unit
	ZrO_2 module defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
	No RS485 communication to the master unit	Check communication (p. 18, §3.1 and p. 19, §3.2.2)
Red LED of the connection unit on	Connection error to measuring point X	→ p. 30, §6.2
	Flow too low	
	RiCO or RiO2 too high	
	RiCO or RiO2 too low	
Condensation in the measuring chamber or connected hoses	Measuring chamber not heated due to defective sensors	Replace the sensors Contact SICK Customer Service to schedule technical services.
	Measuring chamber not heated due to cable break	Tighten the screw terminal connection. Replace the sensor cable. Contact SICK Customer Service to schedule technical services.
	Sensor heating switched off	Switch sensor heating on (“parameter”, → p. 23, §3.3.4)
Communication fields do not light at all	No measuring point set to “active”	Set measuring points “active” (in register menu)
	The PC cannot poll the selected COM port	Select a different COM port in MEPA-GM960 or edit it in the Windows settings.
The communication fields first light green and then red	Main switch on CU X switched off	Switch main switch on
	Main power supply 230/115 VAC not present on CU	Switch power voltage 230/115 VAC on
	Power supply unit on CU defective	Replace the power supply unit Contact SICK Customer Service to schedule technical services.
	ZrO_2 module in CU defective	Replace the ZrO_2 module. Contact SICK Customer Service to schedule technical services.
	Cable break in the RS485 bus signal line	Check communication (p. 18, §3.1 and p. 19, §3.2.2)
	Screw terminal on the terminal points of the RS485 bus signal line loose	Tighten the screw terminal connection.
	Polarity of both wires A and B of the RS485 bus is swapped	Check the wiring. Contact SICK Customer Service to schedule technical services.

[1] CU = connection unit

GM960

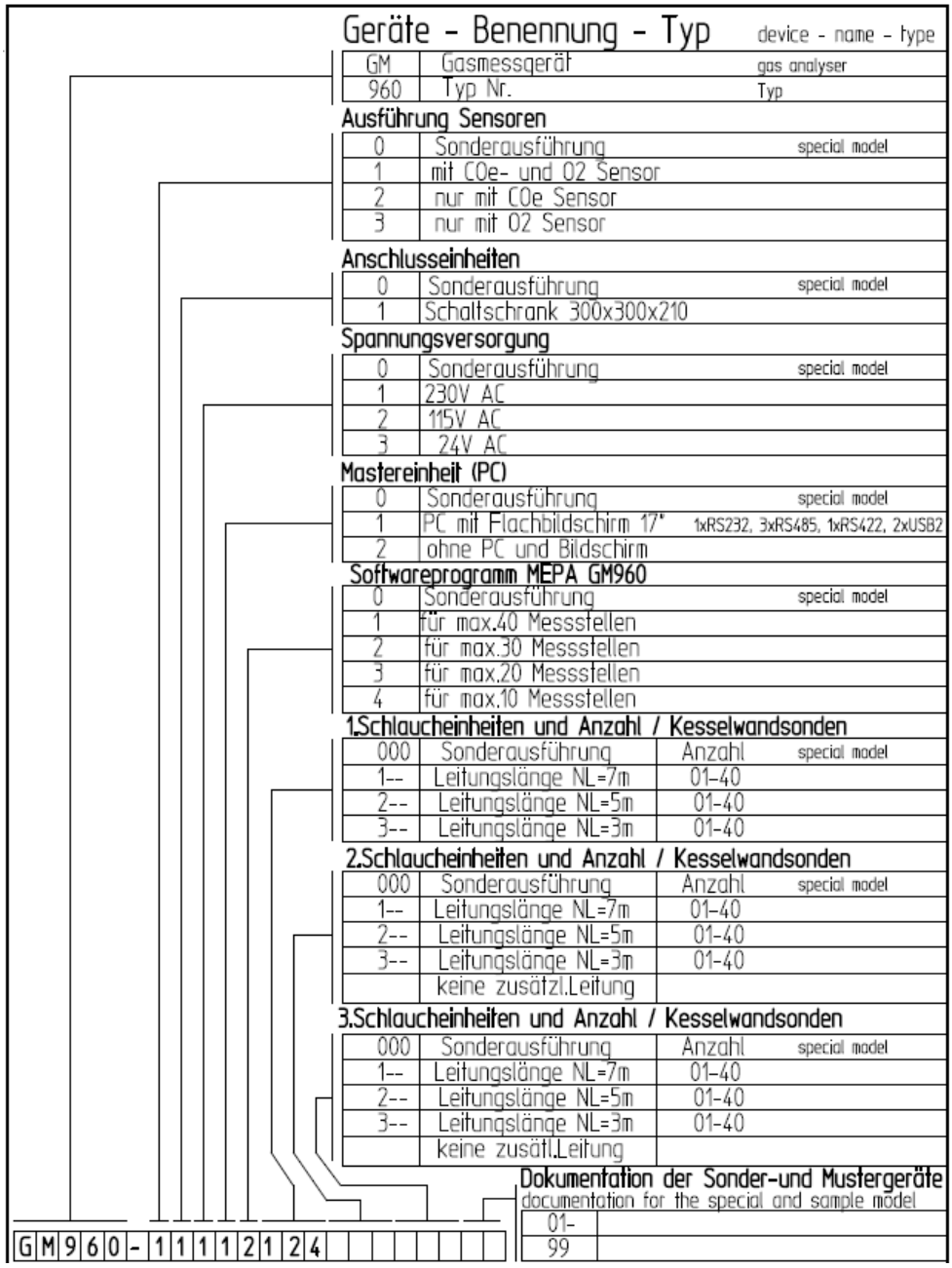
7 Specifications

Approval
Technical Data

7.1

Conformities and approvals

Declaration of Conformity EC Directive 2006/95/EC: LVD (Low Voltage Directive) is applicable for the following device variants identified by the key codes shown:



Geräte - Benennung - Typ		device - name - type
GM	Gasmessgerät	gas analyser
960	Typ Nr.	Typ
Ausführung Sensoren		
0	Sonderausführung	special model
1	mit COe- und O2 Sensor	
2	nur mit COe Sensor	
3	nur mit O2 Sensor	
Anschlusseinheiten		
0	Sonderausführung	special model
1	Schaltschrank 300x300x210	
Spannungsversorgung		
0	Sonderausführung	special model
1	230V AC	
2	115V AC	
3	24V AC	
Mastereinheit (PC)		
0	Sonderausführung	special model
1	PC mit Flachbildschirm 17"	1xRS232, 3xRS485, 1xRS422, 2xUSB2
2	ohne PC und Bildschirm	
Softwareprogramm MEPA GM960		
0	Sonderausführung	special model
1	für max.40 Messstellen	
2	für max.30 Messstellen	
3	für max.20 Messstellen	
4	für max.10 Messstellen	
1.Schlaucheinheiten und Anzahl / Kesselwandsonden		
000	Sonderausführung	Anzahl special model
1--	Leitungslänge NL=7m	01-40
2--	Leitungslänge NL=5m	01-40
3--	Leitungslänge NL=3m	01-40
2.Schlaucheinheiten und Anzahl / Kesselwandsonden		
000	Sonderausführung	Anzahl special model
1--	Leitungslänge NL=7m	01-40
2--	Leitungslänge NL=5m	01-40
3--	Leitungslänge NL=3m	01-40
	keine zusätzl.Leitung	
3.Schlaucheinheiten und Anzahl / Kesselwandsonden		
000	Sonderausführung	Anzahl special model
1--	Leitungslänge NL=7m	01-40
2--	Leitungslänge NL=5m	01-40
3--	Leitungslänge NL=3m	01-40
	keine zusätl.Leitung	

Dokumentation der Sonder-und Mustergeräte documentation for the special and sample model	
01-	
99	

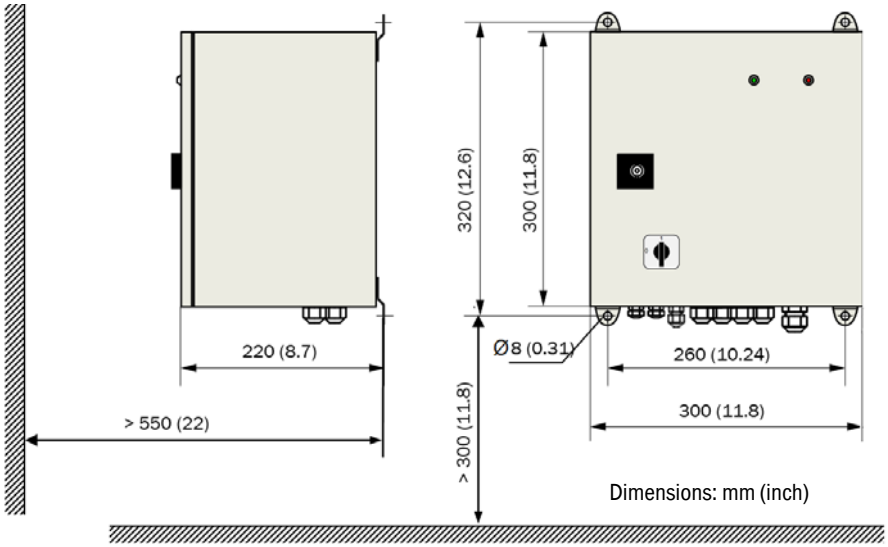
GM960-1111212124

- EC Directive 2004/108/EC: EMC (Electromagnetic Compatibility)
- EG 2006/95/EC: Low Voltage Directive
- EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326-1: Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

7.2 Technical data

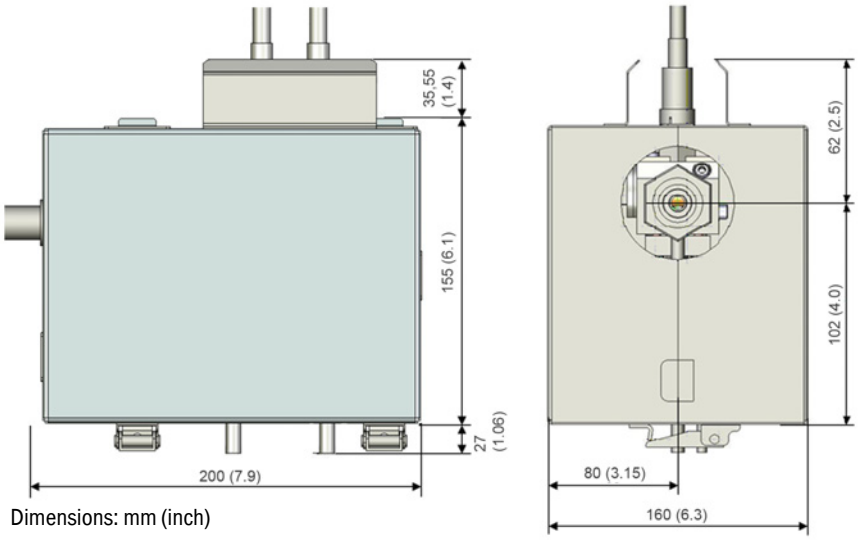
7.2.1 Dimensions, connection unit

Fig. 11 Dimensions, connection unit



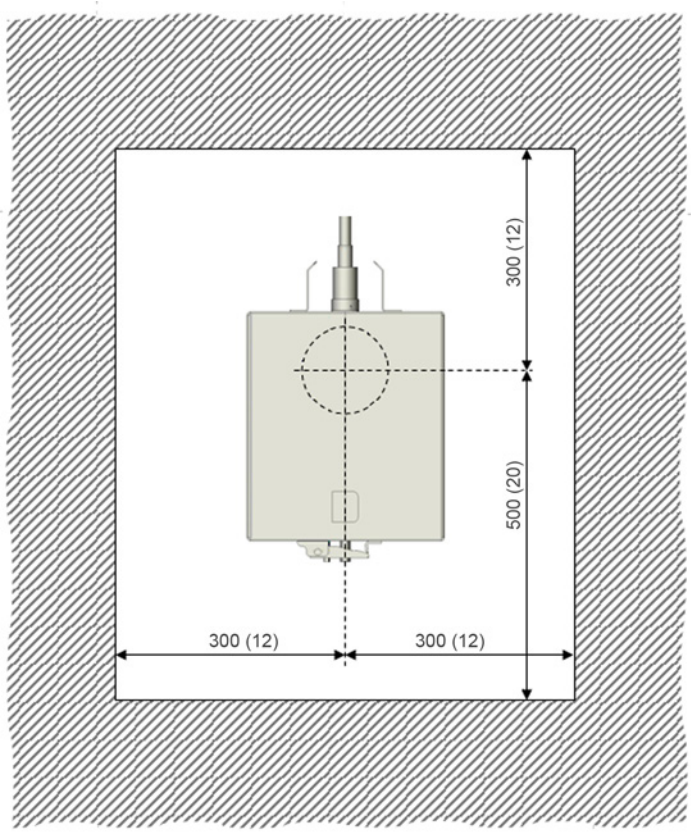
7.2.2 Boiler wall probe dimensions and clearances

Fig. 12 Boiler wall probe dimensions



Dimensions: mm (inch)

Fig. 13 Boiler wall probe clearances



7.2.3 Operating data

Measured value recording	
CO concentration	0 ... 1.0 percent by volume (values > 1 percent by volume to 10 percent by volume are also displayed)
O_2 concentration	1 ... 10 percent by volume (values < 1 percent by volume and > 10 percent by volume are also displayed)
CO CorrosionLevel	.. is the CO average value weighted with O_2
CO CorrosionLoad	.. is a cumulative value representing the CO corrosion load over a longer time period
Number of measuring points	Variable up to maximum 40 (more on request)

Interfaces	
Master unit screen	Representation of all values in numeric and/or graphic form
RS232	Data interface via MODBUS ASCII
RS232	RS232 plug with RS232/RS422 communication for configuration and service on connection unit.
HTML files[1]	To represent measured value overviews on a LAN PC with, for example, MS Internet Explorer
Analog output [1]	4 ... 20 mA , output of CO and O_2 values through external D/A module
Digital output [1]	Output status messages through external Digital modules

[1] Depending on project planning

Ambient conditions for boiler wall probe and connection unit	
Ambient temperature	-10 ... +50 °C (14 ... 120 °F)
Storage temperature	-20 ... +50 °C (-4 ... 120 °F)
Relative humidity	Max. 80% Short-time surface moisture condensation allowed while the device is in operation.
IP classification	Connection unit: IP54

Mechanical installation	
Weight – Connection unit: – Boiler wall probe:	 Approx. 10.5 kg (23 lb) Approx. 5.5 kg (12 lb)
Internal boiler pressure	-5 ... 10 kPa (-50 ... +100 mbar)
Sample gas pipes	Recommended: 3/8" (outer diameter 17.1 mm, wall thickness 3.2 mm)
Sample gas sampling	Approx. 30 liter/h a.c.[1] per measuring point

[1] in operation

Compressed air supply	
Quality	DIN-ISO 8573-1
Oil content	Class 4 (5 mg/m^3)
Particles	Class 5 (max. 40 µm, max. 10 mg/m^3)
Water	Class 5 (max. 8 g/m^3, at +3 °C (37 °F))
Input pressure	250 ... 600 kPa (2.5 ... 6 bar) overpressure
Consumption per measuring point[1]	Approx. 3 Nm^3/h

[1] Ejector and backflushing. Backflushing: 5 backflushes / hour, each 2 seconds long

Electrical installation	
Supply voltage	230 V / 115 V, 50 .. 60 Hz
Power connection	120 VA per connection unit
Data cable RS485/422	4x2x0.5 mm^2 leads twisted in pairs Surge impedance: 100 Ohm Loop resistance: ≤ 100 Ohm For example: Li2YCY(TP)

Emissions	
Exhaust gas	Sample gas approx. 30 liter/h per boiler wall probe Emitted in boiler house

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