CEMcaptain GAA610-M

Advanced emission gas monitoring system for marine applications

Measurement made easy

GAA610-M

Introduction

GAA610-M is a multi-component analyzer system continuously monitoring SO2/CO2 emissions of vessels.

Reducing maintenance hassles during ship operation has been the guiding principle for development. An increased uptime is provided with the GAA610-M by its robust and simple design as well as its innovative digital features allowing for tailoring services to your needs.

It is proven for use on board by all major classification societies and complies with Marpol Annex IV requirements and NOx Technical Code 2008.

ABB has the right gas analyzer to allow vessels to stay compliant with current and upcoming regulations.

Additional Information

Additional documentation on CEMcaptain GAA610-M is available for download free of charge at www.abb.com/analytical.
Alternatively simply scan this code:

Table of contents

1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the ship operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

⚠ DANGER

The signal word '**DANGER**' indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠ WARNING

The signal word '**WARNING**' indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠ CAUTION

The signal word '**CAUTION**' indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

NOTICE

The signal word *'NOTICE'* indicates possible material damage.

Note

'**Note**' indicates useful or important information about the product.

Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

… 1 Safety

Intended use

The CEMcaptain GAA610-M analyzer system is designed for continuous measurement of exhaust gases of marine diesel engines. Measurement components are CO_2 and SO_2 which are sampled downstream of the scrubber.

Any other use is not as specified. The specified use also includes taking note of this operating instruction.

Improper use

The following are considered to be instances of especially improper use of the device:

- For use as a climbing aid, for example for mounting purposes.
- For use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding/soldering on parts.
- Material removal, for example by spot drilling the housing.

The analyzer system must not be used to measure flammable gases or combustible gas/air or gas/oxygen mixtures.

The analyzer system must not be installed in hazardous locations.

Safety instructions

Requirements for safe operation
In order to operate in a safe and efficient manner the device should be properly handled and stored, correctly installed and set-up, properly operated and correctly maintained.

Personnel qualifications
Only persons familiar with the installation, set-up, operation and maintenance of comparable devices and certified as being capable of such work should work on the device.

Special information and precautions
These include:

- The content of this operating instruction,
- The safety information affixed to the device,
- The applicable safety precautions for installing and operating electrical devices,
- Safety precautions for working with gases, acids, condensates, etc.

National regulations
The regulations, standards and guidelines cited in this operator's manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the device is used in other countries.

Safety of the equipment and safe operation
The device was built and tested in accordance with EN 61010 Part 1 ‘Safety regulations for electrical measuring, control and laboratory equipment’ and it left the factory in perfect condition.

To maintain this condition and to assure safe operation, read and follow the safety instructions in this operating instruction as well as applicable type approval standards of classification societies.

Failure to do so can put persons at risk and can lead to device damage as well as damage to other systems and devices.

Working with hazardous gases
Some gas components whose concentration is measured with the analyzer system are hazardous to health.
For this reason, the sample gas must under no circumstances be allowed to escape uncontrolled from the sample gas path in either the measurement mode or when performing maintenance.

- The analyzer system must be checked for leaks regularly.
- The measured stack gas must be returned to the process or discharged in a suitable exhaust duct.
- Ensure adequate ventilation of the room in which the analyzer system is installed.
- The legal requirements for the maximum work place limit values of the measurement and test gases must be observed.

Protective lead connection
The protective lead (ground) should be attached to the protective lead connector before any other connection is made.

Risks of a disconnected protective lead
The device can be hazardous if the protective lead is interrupted inside or outside the device or if the protective lead is disconnected.

Risks involved in opening the covers
Current-bearing components can be exposed when the covers or parts are removed, even if this can be done without tools.
Current can be present at some connection points.

When safe operation can no longer be assured
If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:
- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

Risks involved in opening the gas paths
Do not open any gas paths in the analyzer system or in the integrated analyzers.
Doing so will damage gas path seal integrity.

If system-internal gas paths are opened, a seal integrity check must be performed with a leak detector (thermal conductivity) when the device is reassembled.

Notes on data safety

This product is designed to be connected to and to communicate information and data via a network interface.
It is operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be).
Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and / or theft of data or information.
ABB Ltd and its affiliates are not liable for damages and / or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and / or theft of data or information.

Services and ports on the Ethernet interface

Port	Description
22/tcp	Used only for software updates. No direct access to the device.
502/tcp	Used for Modbus/TCP. The device allows connection to any Modbus client. The port must be activated via ECT, the port is delivered in a deactivated state.
8100/tcp	Used for test and calibration software Optima TCT Light. Binary proprietary protocol. The port is deactivated. It can be activated for TCT access via a secure connection, and deactivated when the TCT access is terminated

Access authorizations
Access to the calibration and to the menus used to change the configuration of the instrument is restricted by password protection.
It is recommended that the factory-set passwords be changed by the operator, see **Password protection** on page 53.

… 1 Safety

Manufacturer's address

ABB Automation GmbH
Measurement & Analytics
Stierstädter Str. 5
60488 Frankfurt am Main
Germany
Tel: +49 69 7930-4666
Email: cga@de.abb.com

ABB Engineering (Shanghai) Ltd.
Measurement & Analytics
No. 4528, Kangxin Highway, Pudong New District
Shanghai, 201319,
P.R. China
Tel: +86(0) 21 6105 6666
Fax: +86(0) 21 6105 6677
Email: china.instrumentation@cn.abb.com

Service address

If the information in this Operating Instruction does not cover a particular situation, ABB Service will be pleased to supply additional information as required.
Please contact your local service representative.

For emergencies, please contact:

Contact Center
www.abb.com/contacts

2 Design and function

Measuring principle

The GAA610-M is based on ABB's proven NDIR (Non-Dispersive Infrared) measurement technology.

The analyzer module Uras26 allows for reliable measuring and monitoring of the limit values for SO_2 and CO_2 and reports the ratio as specified by the IMO (International Maritime Organization), and it can be employed for continuous monitoring of CO if required.

Device description

The GAA610-M is a multi-component analyzer system continuously providing real-time data of relevant pollutants like SO_2/CO_2 ratio.
It proves compliance of vessels to low emission limits of emission control areas (ECA zones) and global limits.
The measurement can be used to control the exhaust gas cleaning system on board, so called scrubber as well.

The GAA610-M is proven for use on board by all major classification societies and complies with Marpol Annex IV requirements and NO_x Technical Code2008.
Reducing maintenance hassles during ship operation has been the guiding principle for development. An increased uptime is provided with the GAA610-M by its robust and simple design as well as its innovative digital features allowing for tailored services according your needs.

The GAA610-M analyzer system extracts the sample gas from the exhaust gas stream.

The gas analyzer cannot process the sample without further treatment as e.g. an excessive dust content, temperature and dew point, excessive or insufficient pressure and interference components in the sample gas can affect the operating ability of the gas analyzer and distort the measurement result.

Therefore, additional devices, such as the sampling probe, the sample gas line, the sample gas cooler, pumps and filters ensure that the sample gas entry conditions of the connected gas analyzer are met, and a proper measurement result is obtained regardless of the process and the local conditions.

The sample handling system is specific for the applied measuring principle.

The GAA610-M analyzer system is a complete turn-key solution with the following components:

- Probe and filter unit for proper gas sampling
- Heated sample gas line for feeding the sample to the gas analyzer
- Sample conditioning components like sample gas cooler, filters and pump to ensure the gas conditions for reliable measurement results
- AO2020-Uras26 gas analyzer (Advance Optima – AO2000 series) for measuring SO_2 and CO_2

The sample conditioning components and the gas analyzer are integrated into the analyzer cabinet of the analyzer system.

Available options are:

- Air conditioning unit for operation at ambient temperature 5 to 55 °C (41 to 131 °F). Higher ambient temperature during operation on request.
- Dual sampling for simultaneous measurement at two different sampling locations (on request)

Type approvals

- DNV GL
- Lloyd's Register
- Bureau Veritas
- ABS Group
- Korean Register of Shipping (KR)
- ClassNK

… 2 Design and function

Measurement ranges

Sample components and measuring ranges

Sample component	Standard measuring ranges
CO_2	0 to 20 Vol.-%
SO_2	0 to 250 ppm
	0 to 500 ppm
SO_2/CO_2 ratio	Calculated
O_2 (option)	0 to 25 Vol.-%
CO (option)	0 to 500 ppm

Inputs and outputs

Analog output

The measured concentrations of CO_2 and SO_2 as well as the ratio SO_2/CO_2 are available as 4 to 20 mA signals for further use in the process control system.

Digital output

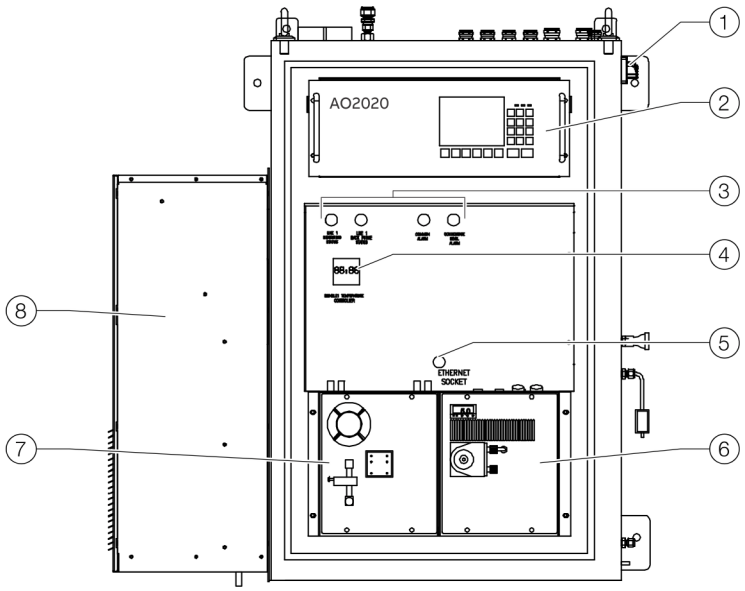
The following digital signals are provided for the process control system of the ship:

- System failure / common alarm
- Maintenance
- Maintenance Request
- SO_2 meas. range feeback

Further digital signals can be added

System structure

System cabinet



1. Main switch
2. Gas analyzer AO2020
3. Status indicators for measuring, back purge, general alarm, condensate level
4. Heated sample gas line temperature controller
5. Ethernet port
6. Sample Gas Cooler SCC-C
7. Sample Gas Feed Unit SCC-F
8. Cabinet air conditioner

Figure 1: GAA610-M system cabinet

Front Door

The front door can be opened without any risks.
Behind the front door is the front panel, the Sample Gas Feed Unit SCC-F and the Sample Gas Cooler SCC-C.

Front panel

On top is the NDIR gas analyzer AO2020-Uras26.
Below, on the left side of the status signal board, are signal lamps as indication of activity of measuring point and back-purging.
Directly below them is the temperature controller for the heated sample gas line.
In the middle of the status signal board are red LEDs for the Common Alarm and for the condensate level alarm.
Below the alarm signals is an ethernet socket for maintenance purpose.

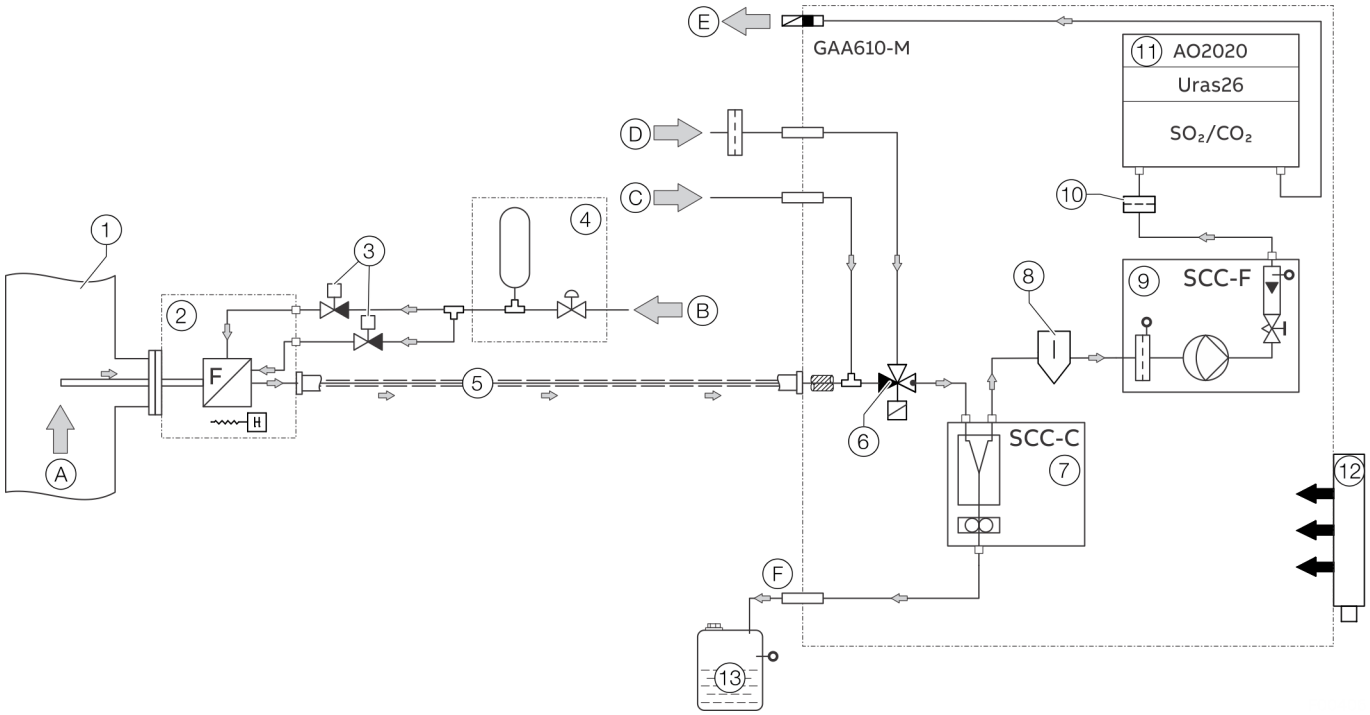
Cabinet interior

The cabinet contains the sample conditioning components, pump, valves, filters and gas analyzer.
It also contains the main switch, the power supply and the fuses for all components, as well as the connection terminals for analog and digital signals.

… 2 Design and function

… System structure

System schematic



- (A) Exhaust gas stream
- (B) Compressed instrument air inlet
- (C) Calibration gas inlet
- (D) Ambient air / zero gas inlet
- (E) Sample gas outlet
- (F) Condensate outlet
- (1) Exhaust pipe
- (2) Heated sample probe with probe tube and filter unit
- (3) Backpurging solenoid valves
- (4) Backpurging air panel
- (5) Heated sample gas line
- (6) Sample gas solenoid valve
- (7) Sample gas cooler SCC-C
- (8) Oil/Soot removal filter
- (9) Sample gas feed unit SCC-F
- (10) Aqua stop filter
- (11) AO2020 gas analyzer with Uras26
- (12) Cooling unit for analyzer cabinet
- (13) 10 l condensate bottle with condensate alarm switch

Figure 2: System schematic

Sample gas flow

The sample gas is extracted from the exhaust duct after the scrubber by a heated sample probe.
The heated sample gas line is the connection and supplying line between sample probe and analyzer cabinet. The probe and the sample gas line are heated to avoid condensation.
To clean the filters in the sample probe a back-purging system via the filter chamber can be integrated. The filters are cleaned with pressurized air every 12 hours cyclically or automatically when the flow is below the minimum value.

At the entrance of the analyzer cabinet there is a 3/2-way solenoid valve. The gas flow goes to the gas cooler and via filter, flow meter, pump and aqua stop filter to the gas analyzer.

See also **Piping diagram** on page 98.

Sample probe

The sample probe is connected gas tight to the process with a flange. The probe tube extracts the gas in the middle of the exhaust duct.

An external heated filter separates the dust from the sample gas. The Filter is heated by a self-limiting PTC heater to 180 °C (356 °F). The filter is equipped with a ceramic filter element.

To clean the filters in the sample probe a back purging system via the filter can be integrated.

Heated sample gas line
The heated sample gas line is directly connected to the filter at the probe. The core is a PTFE hose. The line is heated to 180 °C (356 °F).

The temperature is controlled with a Pt100 resistance thermometer and the power/temperature is adjusted with a temperature controller installed in the cabinet. In case of a deviation from the set value a message is generated and displayed on the AO2020-Display.

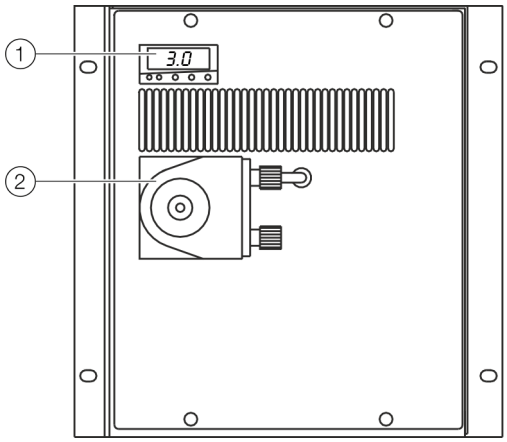
Temperature controller
A Temperature controller is used to control the temperature of the heated sample gas line.
An alarm signal is output as soon as the temperature drops below the minimum temperature limit.

Solenoid valve
A solenoid valve is installed to switch between measuring gas and ambient air during calibration and standby mode.

Aqua stop filter
The aqua stop filter is the final protection for the analyzer. The aqua stop filter holds back any humidity.

AO2020-Uras26 gas analyzer
The AO2020-Uras26 gas analyzer is integrated into the analyzer system for measuring CO_2 and SO_2.
The main components are an infrared source (lamp), a sample cell, a wavelength filter, and the infrared detector.
The sample gas is pumped into the sample cell, and the gas concentration is measured electro-optically by its absorption of a specific wavelength in the infrared wavelength range.

Sample Gas Cooler SCC-C



① Temperature controller ② Condensate pump

Figure 3: Sample Gas Cooler SCC-C

The sample gas cooler defines the water content of the sample at a certain dew point (typically 3 °C). Therefore, the temperature of the sample falls from approx. 180 °C to the set point of the sample gas cooler and condensation will occur. The condensate is removed with a hose pump and collected in a separate bottle.

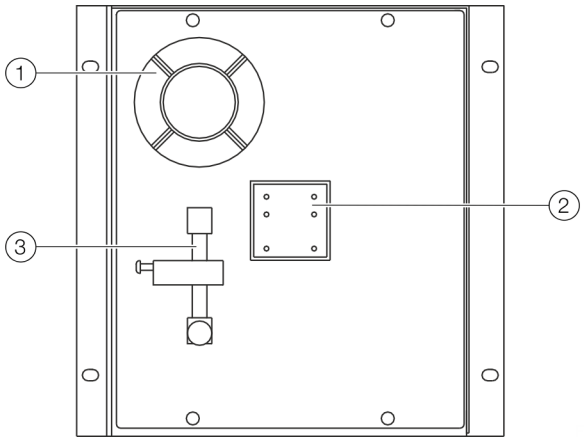
The sample gas cooler is controlled by the system and the following signals can be output:

- Condensate level:
  The level of the condensate collecting bottle is monitored and a signal will output (displayed via a red lamp on the front panel) when maintenance / emptying the bottle is required.
- Fault cooler:
  A status signal "fault cooler" is set if the cooler temperature is too high. The signal is also provided as "Failure" status signal.
- Failure alarm:
  If a failure of the cooler is detected, the feed pump is switched off and the system is set to system failure mode. The system failure mode is displayed on the panel and provided as a status signal.

… 2 Design and function

… System structure

Sample Gas Feed Unit SCC-F



① Condensate monitor
② LED display and reset switch for condensate and flow alarm
③ Flow monitor with needle valve

Figure 4: Sample Gas Feed Unit SCC-F

The sample gas feed unit sucks the sample from the exhaust gas and continuously feeds the gas analyzer with the sample gas. The pump is a diaphragm pump. If the pump fails a flow alarm occurs.

Flow control
The flow meters monitor the sample gas flow through the analyzer.
The following parameters are considered:

- Typical flow: 60 l/h
- Minimum flow level: 40 l/h
- Maximum flow level: 80 l/h
- Flow error: 10 l/h

If the flow violates a limit value an alarm is displayed on the front panel. In addition, the sample probe is automatically backpurged.

3 Product identification

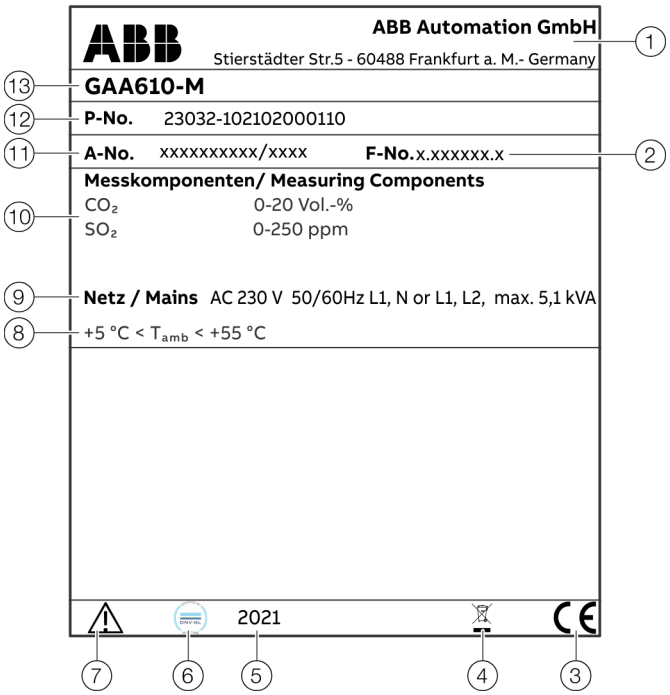
Name plate

Note
The name plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

Note

Products that are marked with the adjacent symbol may **not** be disposed of as unsorted municipal waste (domestic waste).
They should be disposed of through separate collection of electric and electronic devices.

The type plate is located at the top right of the right-hand side panel of the analyzer cabinet near the cable glands.



1. Manufacturer, address
2. Serial number
3. CE marking
4. Disposal marking
5. Manufacture date
6. Type approval marking
7. 'Observe operating instruction' symbol
8. Permissible ambient temperature range
9. Power supply
10. Measuring Components
11. Order number
12. Product configuration number
13. Model name

Figure 5: Name plate (example)

Plates and symbols

The following labels and symbols are attached to the analyzer system or to the individual components.

Label / Symbol	Meaning
	Consult documentation, i.e. consult this operating instruction.
	Risk of electric shock!
	Corrosive material!
	Hot surface! (Temperature > 60 °C)

Scope of delivery

Quantity	Description
Standard equipment	
1 ×	Analyzer cabinet
1 × set	System documentation
Additional items delivered per order	
1 ×	Gas sampling probe tube type 40 (unheated)
1 ×	Filter unit and 2-stage back-purging unit
1 ×	Sample gas line, heated
1 ×	Condensate collection bottle
1 ×	Wear parts set (optional)

4 Transport and storage

Safety instructions

⚠ CAUTION

Injury hazard due to heavy weight

Depending on the version, the gas analyzer cabinet weighs approx. 240 kg (529 lb)!

- A suitable lifting device (crane, block and tackle, lifting truck, etc.) is required for transport, setting upright and installation!
- Only use the handling lugs provided to connect any lift cables to the analyzer cabinet.

Inspection

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents.
All claims for damages must be submitted to the shipper without delay and before installation.

Transporting the device

Transporting the analyzer cabinet

NOTICE

Potential damage to the device!

Damage to the device due to improper transport.

- Use the handling lugs provided to connect any lift cables to the analyzer cabinet.
- The lift cable must be long enough to have an angle of at least 60° relative to the top of the cabinet when under tension. If this is not done the handling lugs can be bent or the analyzer cabinet can be warped.

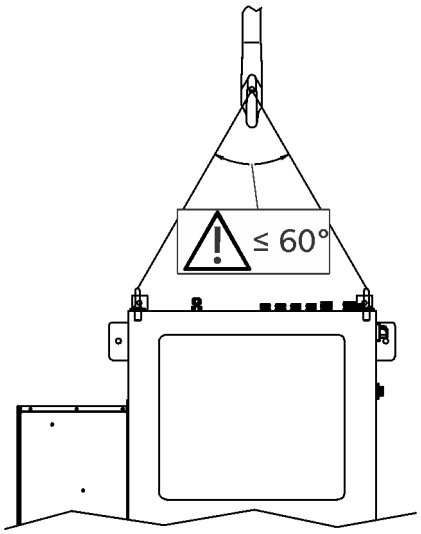


Figure 6: Lift-Up the analyzer cabinet

Note

It is strongly recommended that the analyzer cabinet is transported by a specialist firm, transported in a horizontal position!

Unpacking the analyzer cabinet

1. Lift out the analyzer cabinet from the shipping box.
2. Do not remove the plastic sheet in which the analyzer cabinet is wrapped. Unpacking a cold analyzer cabinet can lead to condensation.
3. Remove the plastic sheet only once the analyzer cabinet is at room temperature. This takes at least 24 hours.

Storing the device

Bear the following points in mind when storing devices:

- Store the device in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Avoid storing the device in direct sunlight.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

Ambient conditions

Ambient temperature during transport / storage

- 2 to 60 °C (35.6 to 140 °F);
- −20 to 70 °C (−4 to 158 °F) after draining and drying parts in contact with condensate.

Max. permissible humidity

Year-round average max. 75%, short-term max. 95%, occasional slight condensation is permitted.

Packaging

1. If the original packing material is no longer available, wrap the device in bubble foil or corrugated cardboard.
   When shipping overseas, also heat-seal the device air-tight in 0.2 mm thick polyethylene, including a desiccant (e.g. silica gel). The amount of desiccant used should be adequate for the package volume and the probable shipping time (at least 3 months).
2. Pack the device in an adequately large box lined with shock absorbent material (e.g. foam material). The thickness of the cushioning material should be adequate for the weight of the device and the mode of shipping. The box should also be lined with a double layer of bitumen paper for overseas shipping.
3. Mark the box ‘Fragile! Handle with care!’.

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see **Return form** on page 99) and include this with the device.
In accordance with the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Address for the return:
Contact Center
www.abb.com/contacts

5 Preparation for Installation

Safety instructions

⚠ CAUTION

Injury hazard due to heavy weight

Depending on the version, the gas analyzer cabinet weighs approx. 240 kg (529 lb)!

- A suitable lifting device (crane, block and tackle, lifting truck, etc.) is required for transport, setting upright and installation!
- Only use the handling lugs provided to connect any lift cables to the analyzer cabinet.

Note

- The system must be installed by ABB or by personnel trained by ABB.
- When installing the analyzer system, in addition to this operating instruction, comply with the information contained in the drawings set.
- If there is shipping damage which points to improper handling file a damage claim with the shipper (railway, mail or freight carrier) within seven days.
- Make sure the enclosed accessories are not lost.
- Keep the packaging material for future shipping needs.

Installation – Overview

1. Prepare the gas sampling probe installation site, see **Choosing the extraction point** on page 18.
2. Prepare the analyzer cabinet installation site, see **Requirements for the installation site** on page 18.
3. Install the gas sampling probe and filter unit, see **Probe tube and filter unit installation** on page 25.
4. Install the sample gas line, see **Sample gas line installation** on page 27.
5. Install the back-purging unit (if applicable), see **Back-purging unit installation** on page 29.
6. Install the analyzer cabinet, see **Analyzer cabinet installation** on page 30.
7. Install the instrument air and test gas supply (if applicable), see **Gas connections** on page 31.
8. Connect the gas lines to the analyzer cabinet, see **Connecting the gas lines** on page 32.
9. Connect the electrical leads to the analyzer cabinet, see **Electrical connections** on page 33.

Requirements for the installation site

⚠ DANGER

Risk of explosion

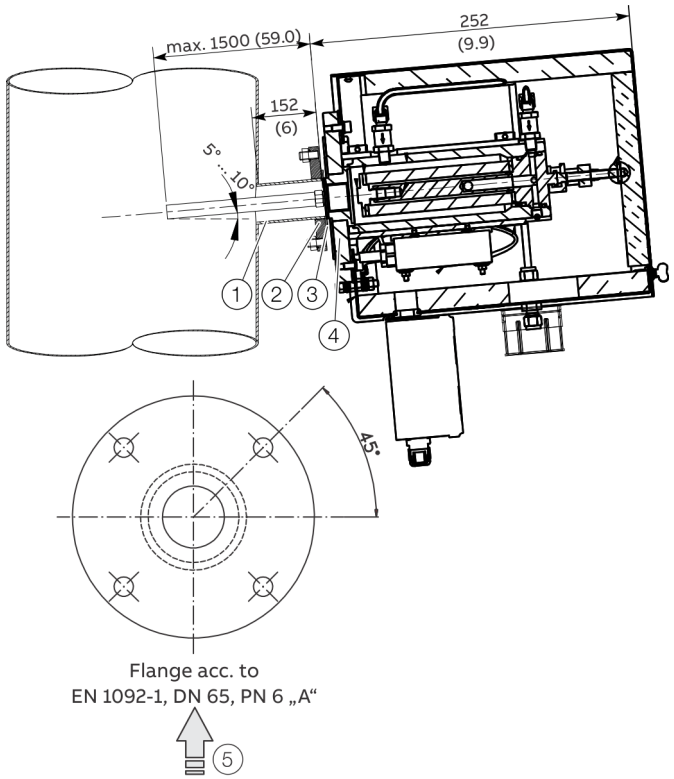
The analyzer system must not be installed in hazardous locations.

Choosing the extraction point

The extraction point must be suitable for extracting a representative specimen flow.

In case of emission monitoring of exhaust gases, the extraction point is specified in accordance with responsible technical inspection authority, e.g. classification society.

Wall tube installation



1 Wall tube
2 Wall tube mounting flange
3 Gasket
4 Sample probe tube flange
5 Flow direction

Figure 7: Wall tube installation, Dimensions in mm (inch)

Install the wall tube with mounting flange (DN 65, PN 6, facing type A to EN 1092-1; not supplied) at the extraction point in such a way that the sampling probe tube can be easily installed and removed.

The sampling probe tube must be easily accessible to allow maintenance work to be performed. Align the boreholes of the mounting flange in relation to the flow direction (5) of the process gas.

Short gas paths

The analyzer cabinet should be installed as close as possible to the sampling site. A short sample gas line results in short T_{90} times.

The sample gas line length is limited to 30 meters with 230 VAC power on account of pressure drop build-up in the line and the required electrical fusing.

The test gas cylinders should be installed as close as possible to the analyzer system. Test gas cylinders are only required for regular adjustment during operation if CEMS is **not** equipped with internal gas filled cells.

Protection from adverse ambient conditions

Protect the gas analyzer cabinet from the following influences:

- Water spray
- Contact with chemicals
- Strong sunlight and heat radiation
- Strong air currents
- Heavy dust load
- Corrosive atmospheres

Installation indoors

The analyzer system is intended for installation aboard a ship. Thereby, the installation location height is naturally limited to sea level.

The analyzer cabinet is only suitable for installation indoors. An air-conditioned room is recommended.

Dimensions and space requirement

Refer to **Dimensions** on page 21 in the drawings set.

Installation site stability

The installation site floor must be plane and the wall capable of supporting the cabinets weight.

Climatic Conditions

Ambient temperature

In operation: 5 to 55 °C* (41 to 131 °F)*

* Higher ambient temperature during operation on request.

Ambient temperature during transport / storage

- 2 to 60 °C (35.6 to 140 °F);
- −20 to 70 °C (−4 to 158 °F) after draining and drying parts in contact with condensate.

Max. permissible humidity

Year-round average max. 75%, short-term max. 95%, occasional slight condensation is permitted.

IP rating

IP 54

Vibration resistance in accordance with IEC 60068-2-6

Vibrations according the below tested conditions showed negligible influence on measurement value.

Test Fc:
±1.0 mm, 2^{+3}_{-0} Hz up to 13.2 Hz;
0.7 g at 13.2 Hz up to 100 Hz

Overvoltage category

II

Pollution degree

2

… 5 Preparation for Installation

Backpurging Unit

Design of the back-purging unit

The back-purging unit consists of a protective cabinet with shut-off valve, 6 bar pressure reduction valve, solenoid valves for back-purging, pressure regulator and 2 l compressed air receiver (pressure buffer tank) for effective pressure pulses also with lower airflow rate.

Distance to sampling probe

The distance between the back-purging unit and the sampling probe should be as short as possible and must not exceed 2 m (6.6 ft).

Protection from adverse ambient conditions

Protect the back-purging unit against:

- Water spray
- Contact with chemicals
- Strong sunlight and heat radiation
- Strong air currents
- Heavy dust load
- Corrosive atmospheres
- Vibration

Instrument air supply

Compressed air for back-purging

GAA610-M – Instrument air inlet conditions	
Quality	Oil free, dry with dew point < −20 °C (−4 °F)
Pressure	Min. 400 kPa (60 psig)
	Max. 600 kPa (90 psig)
Air consumption	< 0.2 Nm^3/day

NOTICE

Damage to the sample conditioning components

If the compressed air is not dry and clean, this will result in damage to the sample conditioning components (valves, filters, sample gas cooler, sample gas feed unit) as well as to the gas analyzer.

- Only use dry and clean compressed air.

Power supply

Power supply	
Terminals	**-X60**: L, N, PE or L1, L2, PE
Operating voltage	230 V AC, ±10 %
Frequency	50 / 60 Hz, ±3 Hz
External fuse	25 A
Power consumption	
System cabinet	500 w
Air conditioner	1600 W
Sampling probe	300 W
Heated sample gas line	Approx. 90 W/m

Sample gas inlet conditions

⚠ DANGER

Explosion hazard

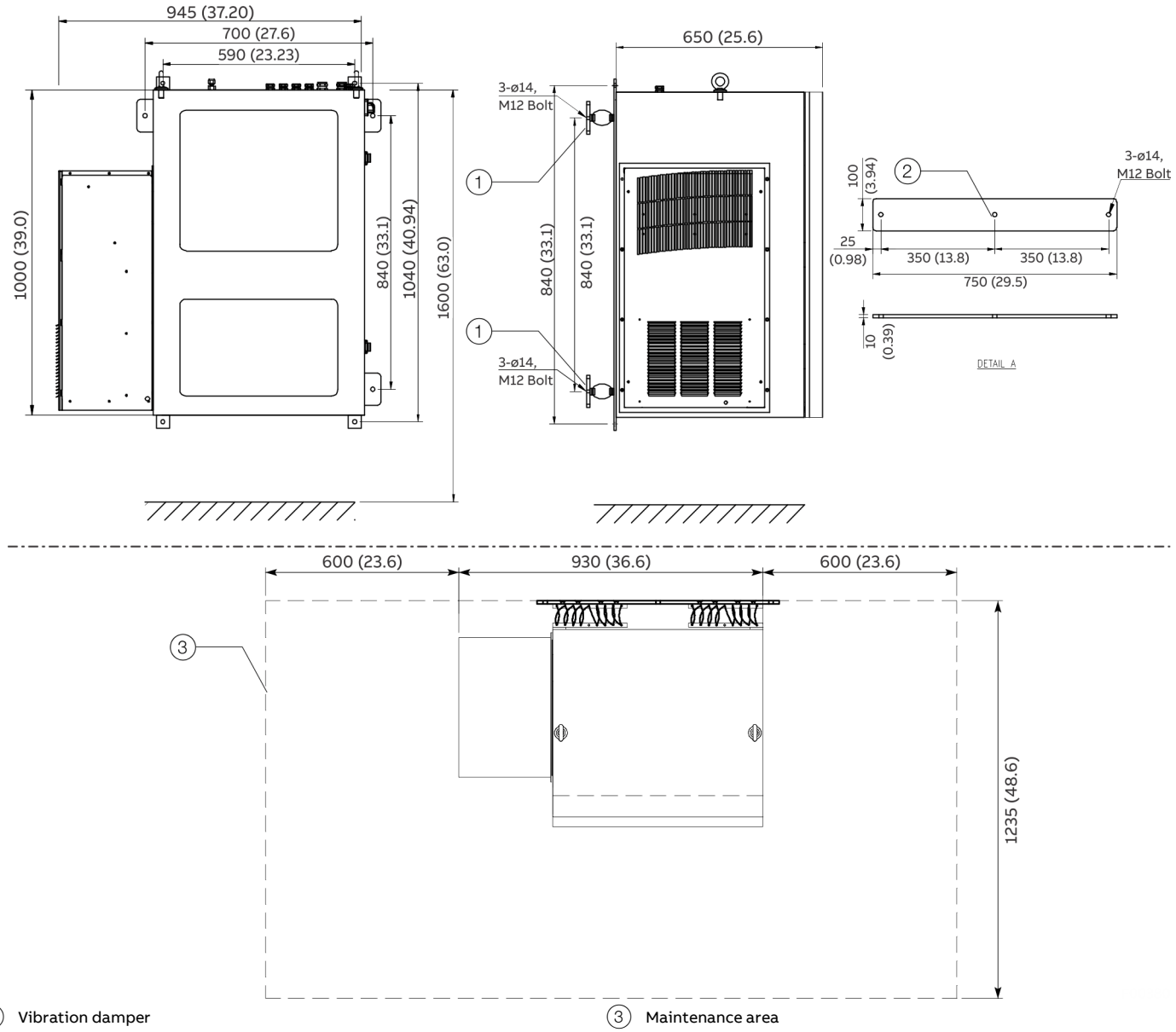
Explosion hazard when measuring ignitable gas / air or gas / oxygen mixtures

- The gas analyzer may not be used for the measurement of ignitable gas / air or gas / oxygen mixtures

GAA610-M – Sample gas inlet conditions	
Temperature	Max. 500 °C (932 °F)
Pressure	850 to 1100 hPa (0.85 to 1.1 bar), (12.3 to 16 psi)

Dimensions

Analyzer cabinet



① Vibration damper

② Mounting plate for vibration dampers

③ Maintenance area

Figure 8: Dimensions analyzer cabinet, mm (in)

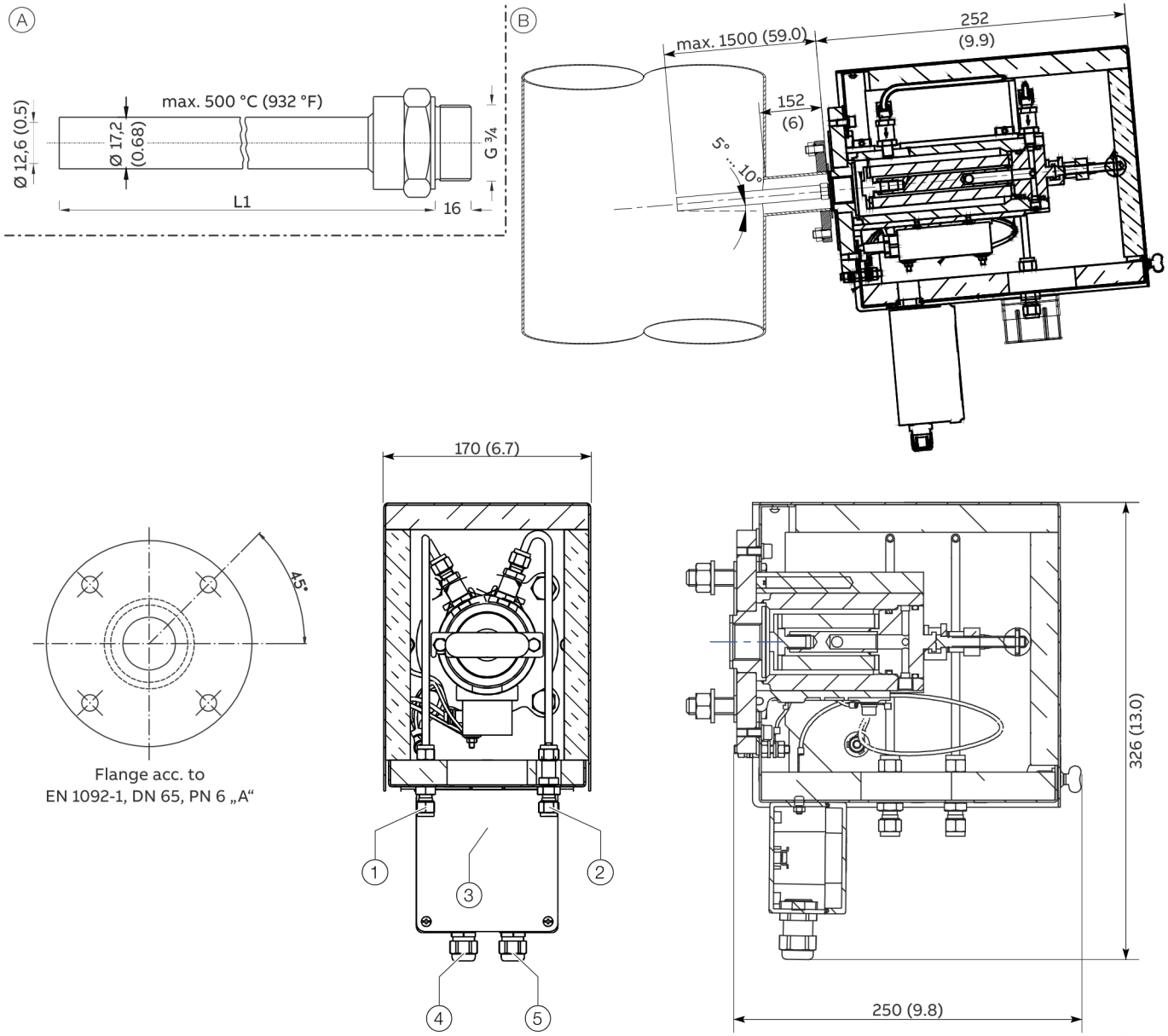
Weight of the individual system components

Component	Weight
Analyzer cabinet	240 kg (441 lb), depending on configuration
Probe tube type 40	8 kg (18 lb)
Filter unit, heated, with protective case	20 kg (44 lb)
Back Purging Unit	Approx. 5 kg (11 lb)
Heated sample gas line type TBL01-S	1 kg/m (2.2 lb/m)

… 5 Preparation for Installation

… Dimensions

Type 40 probe tube and filter unit



(A) Type 40 probe tube

(1) Backpurging air inlet from solenoid valve S0V2

(2) Backpurging air inlet from solenoid valve S0V1

(3) Sample gas outlet (heated sample gas line)

(B) Heated filter unit

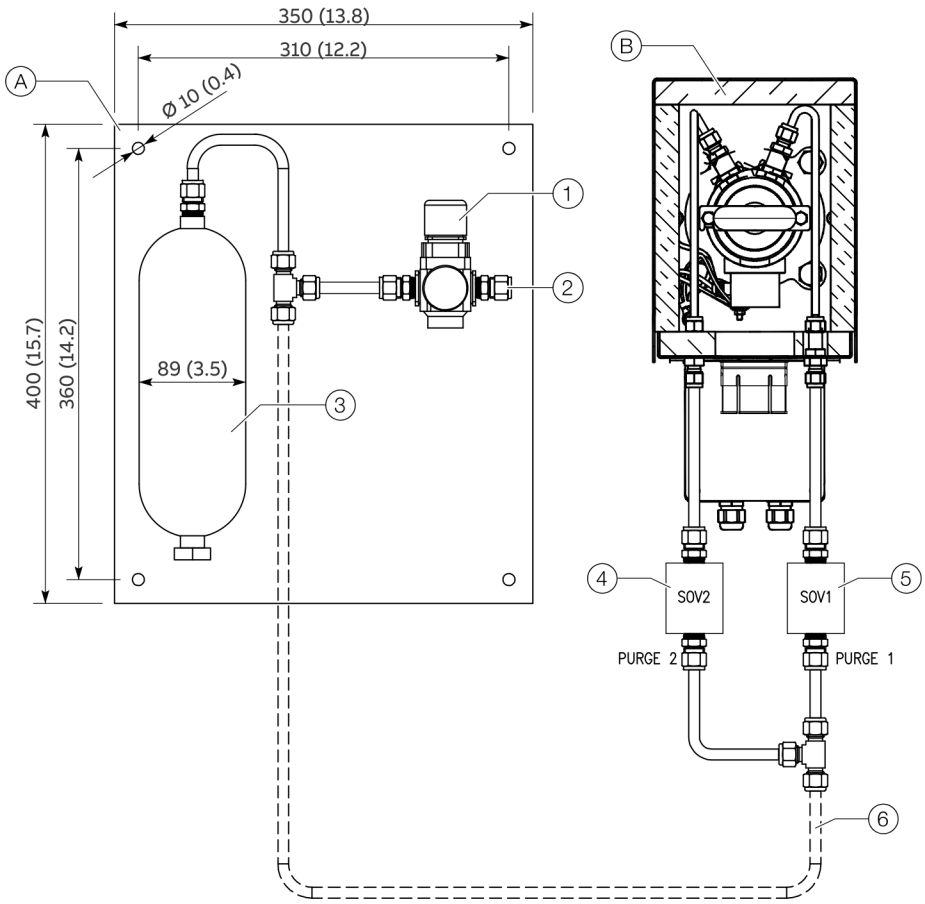
(4) Cable gland for heated filter unit power supply

(5) Cable gland for heated filter unit alarm signal

L1 500 mm (19.7 in) / 1000 mm (39.4 in)

Figure 9: Type 40 probe tube and filter unit

Backpurging Unit



(A) Backpurging panel

(1) Pressure regulator

(2) Instrument air inlet, 10 mm O.D. Tube fitting for stainless steel pipe

(3) Pressure buffer tank

(B) Filter unit

(4) Backpurging solenoid valve SOV2

(5) Backpurging solenoid valve SOV1

(6) Stainless steel pipe 10 mm O.D., to be intalled by customer

Figure 10: Backpurging panel

… 5 Preparation for Installation

Material required for installation

Note
The materials listed below are not included in the scope of delivery of the device, and must be provided by the customer.

Gas sampling

Wall tube with mounting flange
DN 65, PN 6, facing type A to EN 1092-1.

Gas lines

Gas line	Material
Sample gas (unheated line)	PTFE pipe 4/6×1 mm
Sample gas outlet	PTFE pipe 4/6×1 mm
Ambient air / Zero (N_2)	PTFE pipe 4/6×1 mm
Calibration gases 1, 2, 3	PTFE pipe 4/6×1 mm
Instrument air	Stainless steel pipe, 10 mm, via tube fitting
Condensate collecting bottle	PVC tube 4/6×1 mm

Mounting material

Screws and nuts to mount the analyzer cabinet on the wall.

A suitable lifting device (crane, block and tackle, lifting truck, etc.) and lifting gear are required for transport and installation of the analyzer cabinet.

For details regarding the size of the screws and nuts see the ‘Layout Plan’ in the drawings set.

Cable specification

Note
All cables entering the system must comply with the flammability class VW1, FT1 or EN60332-1-2/-2-2.

Power supply lines	
Analyzer cabinet supply	• 230 V AC, 50 / 60 Hz, Single Phase NON-UPS power supply; fuse (external) 25A • Cable Entry: M25 Cable gland for customer supply cable; • Cable Type: 3×10 mm^2 • Grounding cable: > 6 mm^2

Connecting cables between analyzer cabinet and sample handling components	
Sample probe power supply	• 230 V AC 50/60 Hz; • Cable Entry: M20 Cable gland for customer supply cable; • Cable Type: 3×2.5 mm^2
Probe Heater Alarm Signal	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×0.75 mm^2
Back-purge Unit Solenoid Valves (SOV1/SOV2)	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×1.5 mm^2

Signal lines (Connection between CEMS cabinet and scrubber system)	
Analogue Signals to DCS (only, if hardwired connection is required)	• Shielded cables for the analog outputs (current outputs) • Cable Entry: M25 Cable gland for customer supply cable • Cable Type: 6×1 mm^2
Digital Signals to DCS (only, if hardwired connection is required)	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×1 mm^2 (System failure) • Cable Type: 2×1 mm^2 (Maintenance) • Cable Type: 2×1 mm^2 (Maintenance Request) • Cable Type: 2×1 mm^2 (Measuring Range Feedback SO_2)
Modbus Signal to DCS	Cable Entry: M20 Cable gland for customer supply cable
Ethernet to DCS	Cable Entry: M20 Cable gland for customer supply cable

Note
Further signal lines might be needed, please check your specific wiring diagram.

6 Installation

Probe tube and filter unit installation

⚠ CAUTION

Injury hazard due to heavy weight

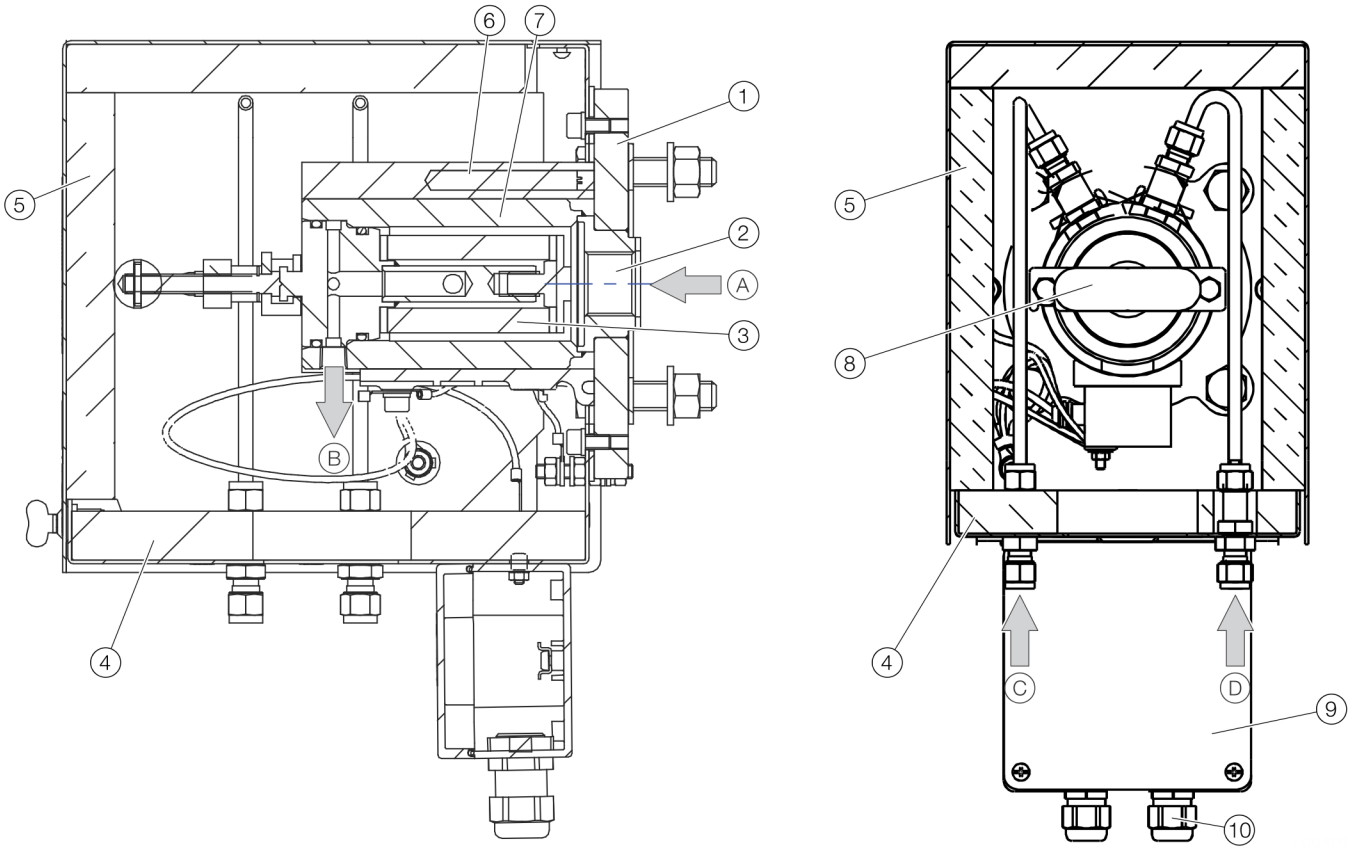
The weight of the probe tube with filter unit amounts to approx. 18 to 20 kg!

- Two persons are required for transportation and mounting!

Before the installation

- Observe the 'Piping plan' in the drawings set.
- Make sure that the wall tube is installed at the extraction point, see .

Filter unit overview



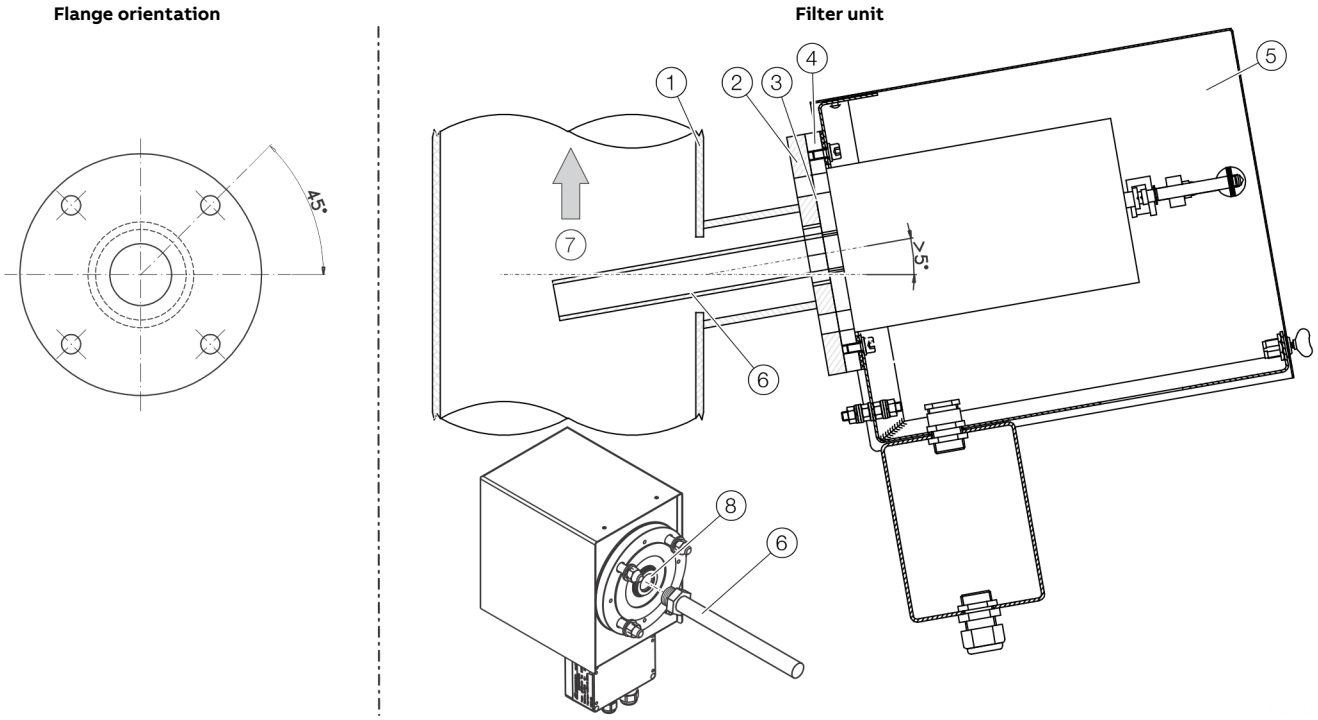
(A) Sample gas inlet
(B) Sample gas outlet
(C) Backpurging air inlet from solenoid valve S0V2
(D) Backpurging air inlet from solenoid valve S0V1
(1) Flange
(2) Internal thread connection for probe tube
(3) Filter element
(4) Housing with thermal Insulation
(5) Cover with thermal insulation
(6) Heater element
(7) Filter housing
(8) T-handle
(9) Terminal box for heater power supply and status contact
(10) Cable glands

Figure 11: Filter unit

… 6 Installation

… Probe tube and filter unit installation

Installation



1. Duct wall
2. Flange
3. Flange gasket
4. Probe flange
5. Filter Unit
6. Probe tube
7. Flow direction
8. Sample gas inlet

Figure 12: Filter unit installation

1. Screw the probe tube (6) into the sample gas inlet (8) of the filter unit.
2. Insert the pre-assembled probe tube with filter unit in the wall tube and screw the flange of the filter unit to the flange of the wall tube. Use the green seal from the accessories pack to seal the space between the flanges of wall tube and filter unit.
3. Mount the heating sleeve on the filter unit.
4. If applicable, install the compressed-air hoses between the filter unit and the back-purging unit.

Connection of the heated sample gas line

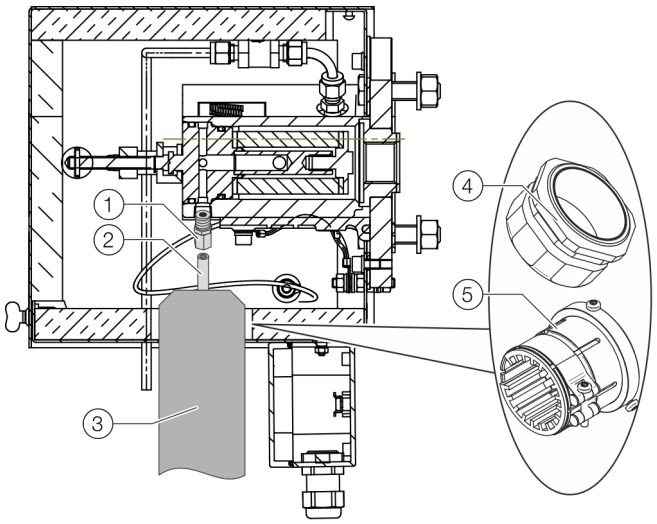


Figure 13: Connection of the heated sample gas line

Note
The heated sample line must be strain relieved and must not be hung on the fitting.

1. Mount ⅛“ NPT fitting (1) at the sample gas outlet of the filter unit.
2. Attach heated sample line (3) on probe enclosure with moveable PG 42 cable conduit (4) or mounting clamp (5).
3. Connect the line (2) with the fitting (1) gas-tight.

Sample gas line installation

Installing the sample gas line

- Observe the "Piping plan" in the drawings set.
- Connect the sample gas line to the filter unit/gas sampling probe.
- Route the sample gas line through the opening provided in the top of the cabinet.

Fundamentals for laying the sample gas line

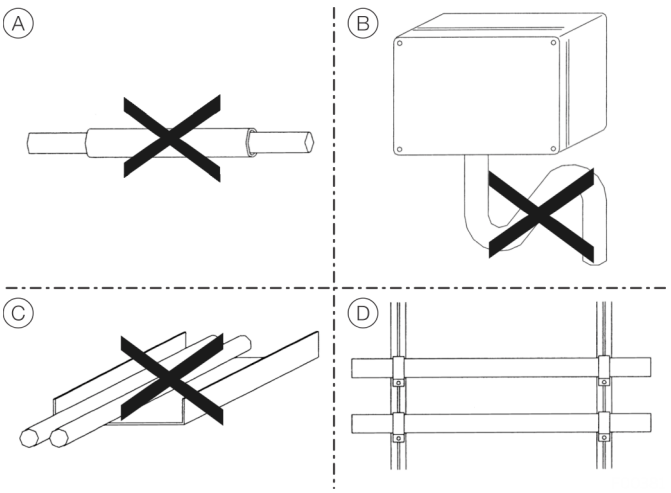


Figure 14: Laying the sample gas line

(A) Do not lay the heated sample gas line in a thermowell.
(B) When laying the sample gas line, avoid the formation of water locks, particularly at the sampling points.
(C) Do not lay the heated sample gas line in a cable tray together with other electrical or pneumatic lines, especially not in an enclosed cable tray.
(D) When laying the heated sample gas lines on exposed C-profiles with BBS cable clips: Do not overtighten the cable clips, in order to prevent damage to the sample gas line through crushing.

… 6 Installation

… Sample gas line installation

Procedures for laying the sample gas line

Laying in ducts or shafts

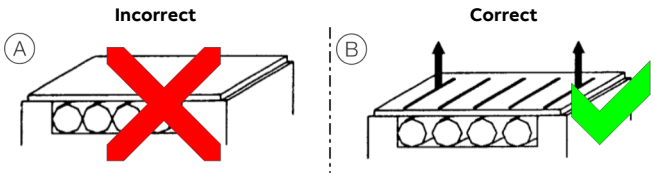


Figure 15: Laying in ducts or shafts

Ⓐ Do not lay the heated sample gas lines directly side-by-side in an enclosed duct or shaft. This results in heat accumulation.

Ⓑ Ensure that the hoses do not touch. Maintain a distance of 25 mm. Provide adequate ventilation. Heat can be conducted away as a result.

Soiling the heated sample gas line

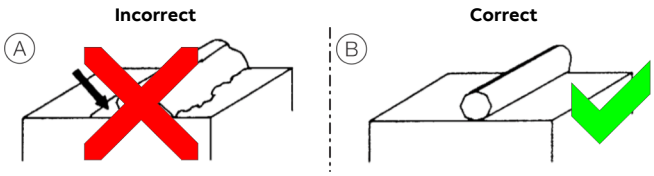


Figure 16: Soiling

Ⓐ Prevent powdery substances, adhesives or other thermally insulating materials from soiling the heated sample gas line. Otherwise, over\-heating will occur at these points.

Ⓑ If soiling occurs, clean the materials and remedy the cause. Heat can be conducted away again as a result.

Wrapping the heated sample gas line

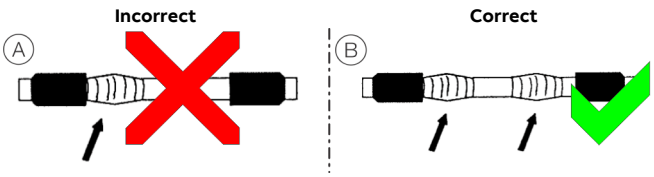


Figure 17: Wrapping

Ⓐ Avoid heat accumulation through wrapping the heated sample gas line with other materials, otherwise the sample gas line will overheat at these points. Do not cover the area near the temperature sensor, otherwise the rest of the sample gas line will cool down.

Ⓑ Do not wrap the sample gas line. Ensure that the area near the temperature sensor is exposed.
This results in error-free temperature measurement.

Wall break-through

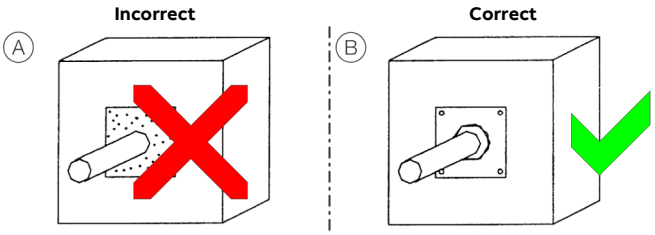


Figure 18: Wall break-through

Ⓐ Do not lay the heated sample gas line in a wall break-through which is subsequently sealed with a sealing compound under any circumstances. The sample gas line will be destroyed by overheating in this case!

Ⓑ When laying the heated sample gas line through a wall break-through, use bulkhead plates with conduit thread cable glands, in order to provide adequate cooling of the sample gas line.

Laying several heated sample gas lines

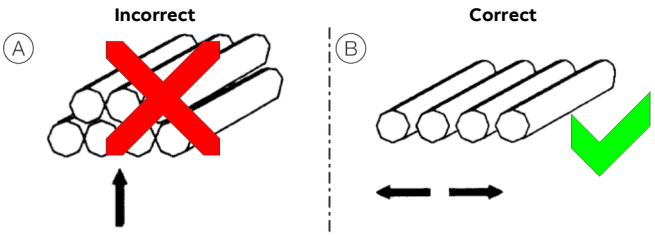


Figure 19: Bundling several gas lines

Ⓐ Avoid bundling or laying several heated sample gas lines, so that they touch each other. This results in overheating at the contact points.

Ⓑ Lay several heated sample gas lines separately with a distance of at least 2.5 cm and provide adequate ventilation. Heat can be conducted away as a result.

Mounting brackets

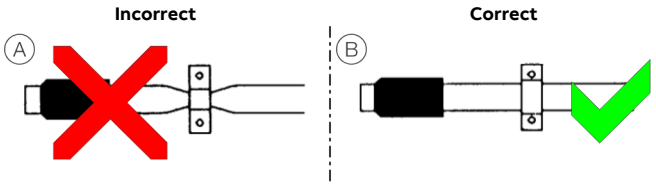


Figure 20: Mounting brackets

(A) Do not squeeze the heat insulation in mounting brackets tightly together, so that the outer braiding is pressed on to the heat conductor. If you disregard this, damage to the protective braiding and the heated sample gas line may occur.

(B) Tighten the BBS cable clips sufficiently but not excessively, in order to prevent damage to the protective braiding and the heated sample gas line.

Permissible values for laying the sample gas line

Characteristic	Permissible value
Type	Heated, Type TBL01-S, regulated heating, 180 °C, heating power 90 W/m (TBL01-S); approx. 100 W/m if other is used
Maximum line length	230 V AC: max. 30 m
Minimum bending radius	300 mm
Maximum clip distance	1.2 m with horizontal laying 3.5 m with vertical laying
Lowest laying temperature	–10 °C
Temperature of the sheathing	max. 60 °C

Back-purging unit installation

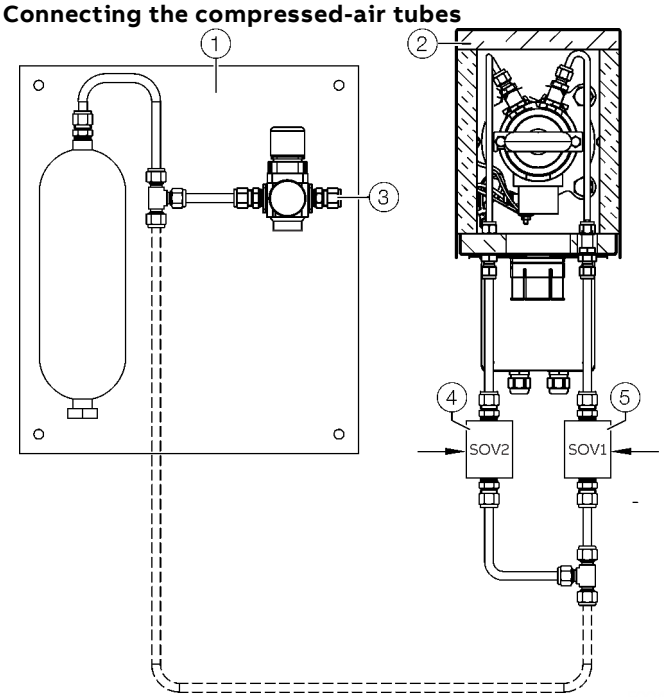
Before the installation

Observe the 'Piping plan' in the drawings set.

Installation site

The distance between the back-purging unit and the sampling probe should be as short as possible and must not exceed 2 m (6.6 ft).

Connecting the compressed-air tubes



(1) Back-purging panel
(2) Filter unit
(3) Instrument air inlet
(4) Solenoid valve SOV2
(5) Solenoid valve SOV2

Figure 21: Connecting the back purging unit

1. Mount the solenoid valves on the filter unit as illustrated.
2. Connect the compressed-air pipes for purge air and control air to the respective ports at the filter unit.
3. Connect the electrical cables of the solenoid valves to the corresponding terminal strip in the analyzer cabinet. For details see the wiring diagram or **Terminal assignment – Analyzer cabinet** on page 35.

… 6 Installation

Analyzer cabinet installation

⚠ CAUTION

Injury hazard due to heavy weight

Depending on the version, the gas analyzer cabinet weighs approx. 240 kg (529 lb)!

- A suitable lifting device (crane, block and tackle, lifting truck, etc.) is required for transport, setting upright and installation!
- Only use the handling lugs provided to connect any lift cables to the analyzer cabinet.

Transporting the analyzer cabinet

NOTICE

Potential damage to the device!

Damage to the device due to improper transport.

- Use the handling lugs provided to connect any lift cables to the analyzer cabinet.
- The lift cable must be long enough to have an angle of at least 60° relative to the top of the cabinet when under tension. If this is not done the handling lugs can be bent or the analyzer cabinet can be warped.

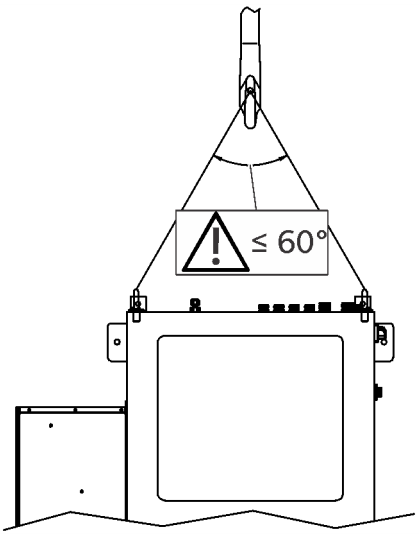


Figure 22: Lift-Up the analyzer cabinet

Note

It is strongly recommended that the analyzer cabinet is transported by a specialist firm, transported in a horizontal position!

Unpacking the analyzer cabinet

1. Lift out the analyzer cabinet from the shipping box.
2. Do not remove the plastic sheet in which the analyzer cabinet is wrapped. Unpacking a cold analyzer cabinet can lead to condensation.
3. Remove the plastic sheet only once the analyzer cabinet is at room temperature. This takes at least 24 hours.

Mounting the analyzer cabinet

- Observe the installation site requirements.
- The loading capacity of the wall must be high enough to bear the weight of the analyzer cabinet.
- Follow the 'Layout plan' in the drawings set.
- The vibration dampers are ready pre-installed. For easy installation, the upper and lower vibration dampers are each connected to a mounting plate. See also **Dimensions** on page 21.

1. Mount the cabinet with the vibration dampers on the wall and fix it to the screw holes provided on the mounting plate using M12 Bolts.
2. Tighten all screws of the analyzer cabinet.
3. Ground the analyzer cabinet by means of the grounding bolt (grounding cable ≥ 6 mm^2/≥ AWG 10).

Connecting the condensate water drain of the cabinet air conditioner

NOTICE

Damage to the cabinet air conditioner

Damage to the cabinet air conditioner due to incorrect connection of the condensate drain and overflow of the condensate pan.

- When connecting the condensate water drain port (**TP10**) of the analyzer cabinet air conditioner, observe the following points:

- When routing the drain tube, caution should be taken to keep it from kinking or being elevated above the exit point of the air conditioner.
- The drain tube must be on a continuous downward slope. A slight elevation of the tube could result in secondary trap.

7 Gas connections

Position and design of the gas connections

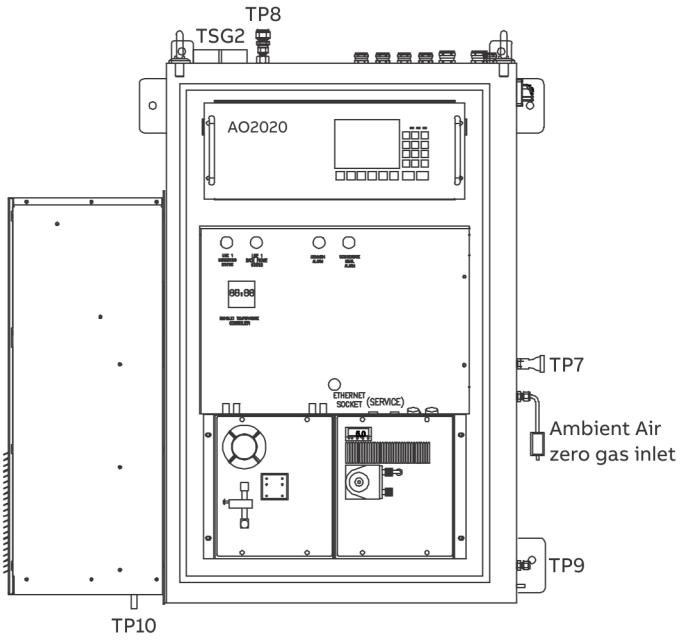


Figure 23: Gas connections GAA610-M

Pos.	Connection	Additional Information	Design
TSG2	Sample gas inlet	For heated sample gas line TBL01 with outer diameter of 48 mm	Tube fitting 4/6 × 1 mm
TP7	Calibration gas inlet	—	Tube fitting for PTFE pipe 4/6 × 1 mm
TP8	Sample gas outlet / Analyzer cabinet ATM vent	Vent out room safety area	Tube fitting for PTFE pipe 10/12 × 1 mm
TP9	Condensate water drain port	—	Tube fitting DN 6 / 4 mm, PVDF
TP10	Condensate water drain port	From air condition	10 mm tube
—	Instrument air inlet	Located at the backpurging panel, see **Backpurging Unit** on page 23	10 mm O.D. Tube fitting for stainless steel pipe or compressed-air hose (plus pressure gauge and shut-off valve)

… 7 Gas connections

Connecting the gas lines

Connecting the heated sample gas line

Connect the heated sample gas line as shown in system schematic **Figure 2** on page 12:

1. Lead the heated sample gas line through the **TSG2** inlet into the analyzer cabinet.
2. Mount the heated sample gas line in the holding clamp.
3. Connect the PTFE hose of the heated sample gas line to the sample gas valve.
4. Insulate the PTFE hose of the heated sample gas line to the sample gas valve with the insulation supplied.
5. Insulate the PTFE hose from the sample gas valve to the SCC-C with the insulation supplied.

Calibration gas

Connect the gas lines according to the piping plan.

Connecting the condensate bottle

The Condensate bottle is connected to the sample gas cooler and must be emptied when alarm of level switch is displayed.

Connecting the sample gas outlet

Observe the following points when connecting the exhaust air pipe:

- The measured stack gas must be returned to the process or discharged in a suitable exhaust duct.
- Use PTFE or stainless steel as the material for the exhaust air line.
- Install the exhaust air line at a gradient, leading away from the gas analyzer.
- At a maximum of 30 cm after the exhaust air outlet, the exhaust air pipe must have an inside diameter of ≥ 10 mm!
  If the exhaust air pipe is very long, its inside diameter must be much larger than 10 mm, otherwise you might have problems with pressure control in the gas analyzer.
- Do not install any throttle sections or shut-off valves in the exhaust air line!

Note

Dispose of corrosive, toxic or combustion exhaust gases according to the regulations!

8 Electrical connections

Safety instructions

⚠ WARNING

Risk of injury due to live parts.
Improper work on the electrical connections can result in electric shock.

- Connect the device only with the power supply switched off.
- Observe the applicable standards and regulations for the electrical connection.

The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.

The electrical connection information in this manual must be observed; otherwise, the IP rating may be adversely affected. Ground the measurement system according to requirements.

Protective lead connection

The protective lead (ground) should be attached to the protective lead connector before any other connection is made.

Risks of a disconnected protective lead

The device can be hazardous if the protective lead is interrupted inside or outside the device or if the protective lead is disconnected.

Notes

- Lay the signal lines separate from the power supply lines. Carefully plan the combination of signal lines in cables.
- The analyzer system must be hardwired!
- When installing the electrical connections, comply with the information contained in the drawings set. The connection drawings in this chapter are only examples.

Cable specification

Note
All cables entering the system must comply with the flammability class VW1, FT1 or EN60332-1-2/-2-2.

Power supply lines	
Analyzer cabinet supply	• 230 V AC, 50 / 60 Hz, Single Phase NON-UPS power supply; fuse (external) 25A • Cable Entry: M25 Cable gland for customer supply cable; • Cable Type: 3×10 mm^2 • Grounding cable: > 6 mm^2

Connecting cables between analyzer cabinet and sample handling components	
Sample probe power supply	• 230 V AC 50/60 Hz; • Cable Entry: M20 Cable gland for customer supply cable; • Cable Type: 3×2.5 mm^2
Probe Heater Alarm Signal	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×0.75 mm^2
Back-purge Unit Solenoid Valves (SOV1/SOV2)	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×1.5 mm^2

Signal lines (Connection between CEMS cabinet and scrubber system)	
Analogue Signals to DCS (only, if hardwired connection is required)	• Shielded cables for the analog outputs (current outputs) • Cable Entry: M25 Cable gland for customer supply cable • Cable Type: 6×1 mm^2
Digital Signals to DCS (only, if hardwired connection is required)	• Cable Entry: M20 Cable gland for customer supply cable • Cable Type: 2×1 mm^2 (System failure) • Cable Type: 2×1 mm^2 (Maintenance) • Cable Type: 2×1 mm^2 (Maintenance Request) • Cable Type: 2×1 mm^2 (Measuring Range Feedback SO_2)
Modbus Signal to DCS	Cable Entry: M20 Cable gland for customer supply cable
Ethernet to DCS	Cable Entry: M20 Cable gland for customer supply cable

Note
Further signal lines might be needed, please check your specific wiring diagram.

… 8 Electrical connections

Cable glands

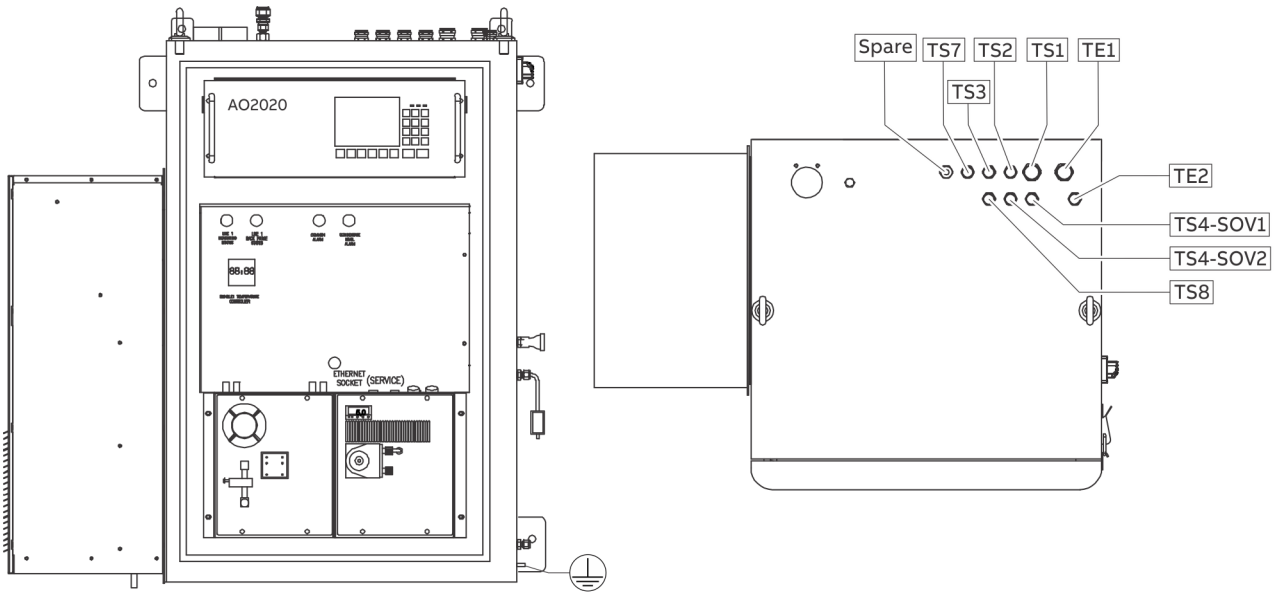
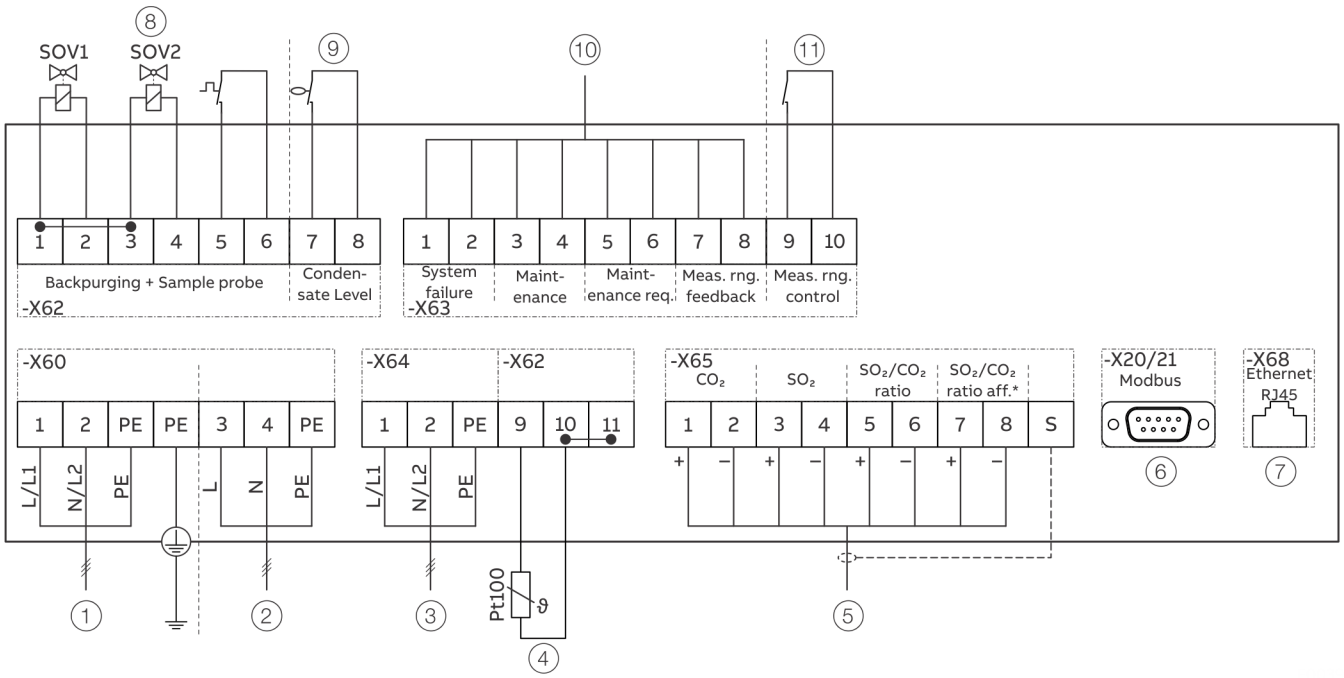


Figure 24: Location of the cable Glands

Pos.	Cable Gland	Usage
TE1	M25	Power supply
TE2	M20	Sample probe heater power supply
TS1	M25	Analogue signals to DCS
TS2	M20	Digital signals to/from DCS
TS3	M20	Modbus cable to DCS
TS4-SOV1	M20	Backpurge unit SOV1 power supply
TS4-SOV2	M20	Backpurge unit SOV2 power supply
TS7	M20	Condensate bottle level alarm switch
TS8	M20	Sample probe heater alarm signal
⏚	–	Ground bolt for ground wire

Terminal assignment – Analyzer cabinet



1. Power supply
2. Power output for heated sample gas probe
3. Power output for heated sample gas line TBL01
4. Pt100 temperature sensor from heated sample gas line TBL01
5. Analogue outputs 4 to 20 mA
6. Modbus® interface
7. Ethernet interface
8. I/O for sample probe and backpurging
9. Digital input for condensate bottle level monitoring
10. Digital outputs
11. Digital input for SO_2 measuring range control

* SO_2/CO_2 ratio aff.: Ratio calculation of SO_2/CO_2 to ensure plausible values on zero level. Signal is to be used for operation.

Figure 25: Electrical conections –Overview

… 8 Electrical connections

… Terminal assignment – Analyzer cabinet

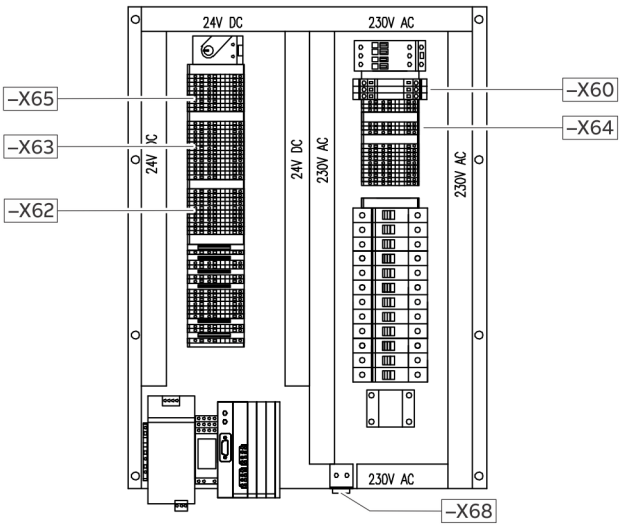


Figure 26: Location of the terminal strips on the back plate of the analyzer cabinet

Terminal	Description
–X60	Main power supply and power out for heated sample gas probe
–X64	Power out for heated sample gas line
–X65	Analogue outputs

Terminal	Description
–X63	Digital outputs / System status signals
–X62	Backpurging, Condensat level, Pt100 Sample gas line
-X68	Ethernet port

Electrical Data

Power supply	
Terminals	**-X60**: L, N, PE or L1, L2, PE
Operating voltage	230 V AC, ±10 %
Frequency	50 / 60 Hz, ±3 Hz
External fuse	25 A
Power consumption	
System cabinet	500 w
Air conditioner	1600 W
Sampling probe	300 W
Heated sample gas line	Approx. 90 W/m

Heated sample gas line		
Terminals	Power supply:	**-X64** – 1, 2, PE
	Three-Wire Pt100:	**-X62** – 9, 10, 11
	Two-Wire Pt100	**-X62** – 9, 10, Bridge between 10+11
Power supply output		230 V AC
Maximum output current		12 A
Maximum output power		2.7 kW
Internal fuse protection		RCD 16 A, 30 mA

Sample gas probe & heated filter unit		
Terminals	Power supply:	**-X60** – 3, 4, PE
	Probe heater alarm:	**-X62** – 5, 6
Power supply output		230 V AC
Maximum output current		1.3 A
Maximum output power		300 W
Internal fuse protection		6 A

Backpurging unit		
Terminals	Valve 1:	**-X62** – 1, 2
	Valve 2:	**-X62** – 3, 4
Power supply output		24 V DC
Maximum output current		1 A
Internal fuse protection		2 A slow blow

Current outputs		
Terminals	CO_2, 0 to 20 %	**-X65** – 1+, 2–
	SO_2, 0 to 250 ppm:	**-X65** – 3+, 4–
	SO_2/CO_2 ratio, 0 to 250	**-X65** – 5+, 6–
	—	**-X65** – 7+, 8–
	Shield	**-X65** – S
Current output		4 to 20 mA
Maximum load		750 Ω
Resolution		16 bit
Design	Joint minus pin, electrically isolated, randomly groundable	

Digital inputs / outputs		
Terminals	DO – System failure	**-X63** – 1, 2
	DO – Maintenance	**-X63** – 3, 4
	DO – Maintenance request	**-X63** – 5, 6
	DO – Measuring range feedback SO_2	**-X63** – 7, 8
	DI – Measuring range request	**-X63** – 9, 10
	Shield	**-X65** – S
Digital outputs (DO)	Potential-free contacts (powerless status opened, fail safe), max. 30 V DC, max. current 1 A,	
Digital inputs (DI)	Optoelectronic coupler with internal power supply 24 V DC, Control with floating contacts, with external voltage 12 to 24 V DC or with open collector drivers PNP or NPN	

… 8 Electrical connections

… Terminal assignment – Analyzer cabinet

Connecting the electrical leads

- Observe the cable specifications, see **Cable specification** on page 33
- Observe the 'Interface plan' in the drawings set.
- When routing the electrical lines, follow all applicable national safety regulations for the installation and operation of electrical devices.
- Follow all regulations and standards for electrical installations on board of ships and observe the local conditions.

Connecting the signal leads

- Route the signal leads separately from the power supply lines.
- Locate the analog and digital signal lines separately from each other.
- Carefully plan the arrangement of signal leads in the cables as well as the use of openings for cable connectors.
- Connect the signal leads to the terminal strips.
- Cable shielding should be connected according to local regulations. Differences in potential and signal interference must be taken into consideration.

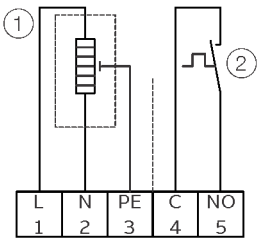
Connecting the power supply

Note

An easily accessible mains isolator must be installed near the analyzer cabinet in order to be able to completely disconnect the latter from the power supply.
Mark the mains isolator in such a way that assignment to the device to be separated can be clearly identified.

- Observe the power supply requirements.
- Before connecting the power supply, make sure the analyzer system operating voltage is set to match the line voltage.
- The protective lead connector and protective lead should be connected before any other connection is made. The analyzer system can be hazardous if the protective lead is interrupted inside or outside the system or if the protective lead is disconnected.
- Connect
  - the input wiring of the analyzer cabinet, see **Terminal assignment – Analyzer cabinet** on page 35.
  - the input wiring of the heated sample components (temperature-resistant as needed)
  - the input wiring of the back-purging unit (solenoid valves) to the terminal strips.

Terminal assignment – Sample gas probe



① Heater sample gas probe ② Status contact

Figure 27: Electrical connection spample gas probe

Electrical data

Power supply	115 to 230 V AC
Power consumption	approx. 300 VA
Heater element	PTC self limited
IP-Protection	IP 65
Operating temperature	approx. 180°C
Low temperature threshold	150 °C

Electrical connection

- Observe the cable specifications.
- Observe the 'Interface plan' in the drawings set.
- When routing the electrical lines, follow all applicable national safety regulations for the installation and operation of electrical devices.
- Follow all regulations and standards for electrical installations on board of ships and observe the local conditions.
- Connect the input wiring of the heated sample components (temperature-resistant as needed).

Digital communication

Modbus® communication

Transmission of measured values and status signals as well as analog input, digital input and digital output signals to host systems, e.g. standard Windows applications via M-DDE server.

Modbus slave protocol in the RTU (Remote Terminal Unit) mode via the RS485 interface.

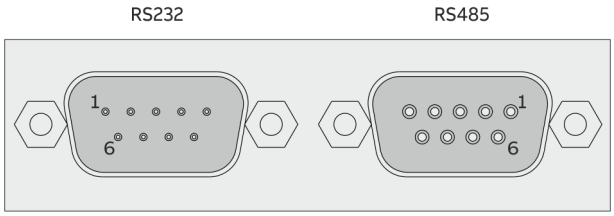


Figure 28: Modbus module

RS232 Interface

Version: 9-pin sub-D male connector

Pin	Signal
2	RxD
3	TxD
5	GND

RS485 interface

Version: 9-pin sub-D female connector

Pin	Signal
2	RTxD-
3	RTxD+
5	GND

Ethernet communication

Transmission of measured values and status signals as well as analog input, digital input and digital output signals to host systems, via Modbus/TCP.

Version: RJ45 connector, EIA/TIA 568B standard

Pin	Signal	Colour
1	Rx+	Orange/White
2	Rx–	Orange
3	TX+	Green/White
6	TX–	Green

9 Gas sampling with automatic back-purging

General

Filter plugging
During operation of the analyzer system the dust which is contained in the sample gas will accumulate in the probe filter of the gas sampling system. This is uncritical if dust concentration is low and only requires a cleaning of the filter periodically in longer time intervals.

But if the dust concentration is high, the dust accumulation in the filter will cause an increasing pressure loss, and the gas feed of the sample gas pump decreases and also the sample gas flow, and finally the filter is blocked in an extreme case.

Pump suction increase
At first this effect can be compensated by occasional adjustment of the sample gas flow, which increases the suction of the sample gas pump.

The pump is strong enough, but if the fouling continues, the needed suction for keeping up the required gas flow will increase to such a high value, that several unfavorable effects will emerge and can finally be accepted no longer.

Filter cleaning
If the suction exceeds a limit of about 300 mbar (accordingly the absolute pressure falls below 700 mbar), the sampling system filter has to be cleaned.

The filter units can be cleaned automatically by a back-purging procedure with compressed air. This procedure is controlled by the GAA610-M.

Components for back-purging

To carry out the automatic back-purging of the filter unit, components are integrated in the analyzer system as follows:

- The back-purging air panel with 6 bar pressure reduction valve, pressure regulator and 2 l buffer tank for effective pressure pulses also with lower airflow rate
- Two solenoid valves (SOV1, SOV2)
- The gas sample probe with filter unit
- The GAA610-M control program.

Control of the back-purging procedure
The back-purging procedure is integrated into the GAA610-M control program of the analyzer system.

The manual handling is carried out with the pushbutton ‘Back-Flush’ on the analyzer system’s front plate.

Start of the back-purging procedure

The start of the back-purging procedure can be carried out:

- Controlled by time
- Controlled by event. If the sample gas flow is too low, a back-purge cycle is automatically started.
- Manually controlled.

Start controlled by time
After a cycle time has run down, the back-purging procedure will start automatically. A cycle time of 12 hours is factory-set.

Start controlled by event
A flow fault during normal measuring operation will start the automatic back-purging procedure.

After back-purging was started by event, the procedure will run only once.
If the procedure is finished (waiting time 30 s) and the starting event (flow fault) is still active, the back-purging procedure will not start again, even not controlled by time, and a status message will be generated. However, the back-purging procedure can be started manually after 30 minutes.

Manually controlled start
The manual start of back-purging procedure can be executed locally by pushing the ‘Back-Flush’ pushbutton on the analyzer system’s front plate.

Filter unit backpurging sequence

Step	Duration	Function	Sample gas valve –Y60	Probe tube backpurging valve –Y61	Filter backpurging valve –Y62	Display	Status signal
1.	12 h*	Measuring	Sample gas	Closed	Closed	Measure	off
2.	2 s	Switch over	Ambient air	Closed	Closed	Probe purging	Maintenance
3.	8 s	Back-purging probe filter	Ambient air	Closed	Open (pulsed)	Probe purging	Maintenance
4.	12 s	Back-purging probe tube	Ambient air	Open (pulsed)	Closed	Probe purging	Maintenance
5.	90 s**	Post-purging	Sample gas	Closed	Closed	Probe purging	Maintenance
6.	12 h*	Measuring	Sample gas	Closed	Closed	Measure	off

* Cycle time factory-set to 12 hours, can be adjusted.

** Post-purging time factory-set to 90 s

Switch over

At first the sample gas valve **–Y60** is switched over to position 'Calibrate zero / Ambient Air'. This separates the sample gas conditioning system and the analyzer system from the sampling system and protects it against the back-purging pressure.

At the same time the status 'Maintenance mode' is activated and all analog outputs and limits are set on hold.

- The display reports 'Probe purging'.
- The Modbus signal 'Sample line1 in purging' is set to '1'.
- The Modbus signal 'Line 1 in operation' is set to '0'.
- The lamp 'Line1 Measuring Status' is off.

Back-purging probe filter

The back-purging procedure continues with the back-purging of the probe filter. To increase the cleaning effect, the compressed air is applied not continuously but by two 2 s pressure impulses alternating with a 2 s interval each.

Back-purging probe tube

After this the probe tube is purged back in the same way with two pressure impulses. A single pressure impulse of 4 s is followed, to blow out the remaining dust from the tube.

Post-purging period

The calibration valve switch back to position 'Measure' will not finish the back-purging procedure, because first the actual sample gas must flow through the pneumatic system to purge it, and the analyzer must adjust to the new actual measuring value. A purge time of 90 s is factory-set.

End of the back-purging procedure

The back-purging procedure is not finished until the purge time has expired. Now the analog outputs and limits are set free again and they will take over the actual values. The message 'Purge back active' in the display as well as the status signal 'Maintenance mode' will vanish.

… 9 Gas sampling with automatic back-purging

Cycle time

Cycle time duration

The cycle time is given as the time interval between two automatic starts of the back-purging procedure. The higher the dust concentration in the sample gas and the higher the sample gas flow, the shorter this time interval must be set, to avoid a blocking of the gas sampling probe filter.

Cycle time factory setting

The parameter 'Cycle time' is factory-set to 12 h.

Optimum cycle time setting

The cycle time should not be adjusted shorter than needed, because during the back-purging procedure (approx.18 s) and especially during the post-purge time (factory-set to 90 s) no measurement can be made. The optimum time will have to be found out by operational experience.

Cycle time minimum value

The cycle time should not be below a lower limit.
The back-purging procedure with cold compressed air causes a cooling of the heated probe filter, and the filter temperature regulation needs some time to correct this temperature decrease.
As the filter heating regulation is a rather slow control loop, this time will be relatively long. Therefore, the cycle time should not fall below approx. 60 min.

Event-controlled start of the back-purging procedure by filter plugging

Should despite the time controlled back-purging a probe filter blocking occur caused by temporary larger amounts of dust, with the result of a sample gas flow decrease beneath the admissible limit, an additional back-purging procedure is started as a result, and the probe filter is purged free in between.

Adjustment of the cycle time

To adjust the cycle time the parameters of the AO2020 program must be changed. Please contact ABB service.

Post-purge time

Post-purge time duration

The post-purge time at the end of the back-purging procedure must be such, that the complete pneumatic system is flushed with the actual sample gas and the analyzer gets time to take over the actual measuring value again.

The needed post-purge time depends on the respective layout of the system (i.e. the length of the sample gas line) and will have to be adjusted individually. A post-purge time of 90 s is factory-set.

Guide for the post-purge time

A guide for the needed post-purge time is given in the table below. Please add the times for the pneumatic system, the analyzer and the sample gas line.

Response time (3 x T_{90}, approx.)	
Pneumatic system without sample gas line	27 s
plus analyzer Uras26	20 s
plus for each 10 m sample gas line I.D. = 4 mm	5 s
plus filter unit with probe tube 40, length = 1 m	45 s

Example

For an analyzer system with filter unit and 15 m sample gas line at 60 l/h sample gas flow the post-purge time is calculated as follows:

Post-purge time = 27 s + 20 s + 1.5 x 5 s + 45 s = 99.5 s

Adjustment of the post-purge time

To adjust the post-purge time the parameters of the AO2020 must be changed. Please contact ABB service.

10 Commissioning and operation

Safety instructions

NOTICE

Damage to the analyzer system!
Damage to the analyzer system and its components due to improper commissioning.

- The analyzer system must stand in its operating position for about 24 hours prior to start-up.
- Before activating the power supply check once again that the analyzer system operating voltage is set to match the line voltage.

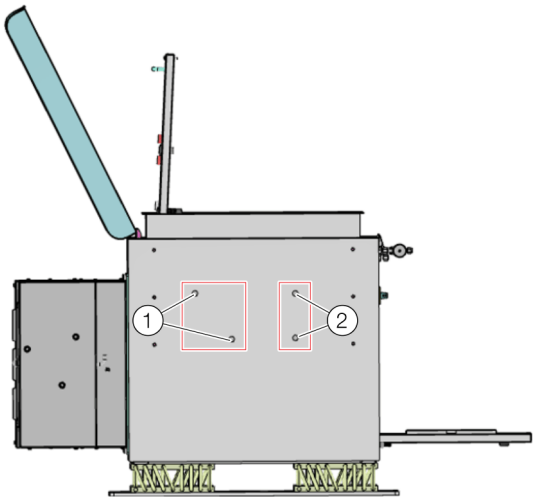
Note
Initial startup of the analyzer system should be performed by trained personnel of the manufacturer or the supplier. ABB recommends having the startup done by ABB personnel.

When safe operation can no longer be assured
If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:

- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

Transportation restraints removal



① Sample Gas Feed Unit SCC-F transportation restraints
② Sample Gas Cooler SCC-C transportation restraints

Figure 29: Position of transportation restraints (Bottom view of analyzer cabinet)

Sample Gas Feed Unit SCC-F
Diaphragm Pumps transportation restraints:
Using a Ph2 crosshead screwdriver, remove the two M6×25 screws ① through the holes in the base plate from the diaphragm pumps base plate.

Note
Retain the screws in case the unit needs to be transported again in the future.

Sample Gas Cooler SCC-C
Compressor transportation restraints:
Using an offset Ph2 crosshead screwdriver, loose the two screws ② counter-clockwise through the holes in the base plate to the point at which the compressor housing is in contact with the base plate (noticeable resistance).

… 10 Commissioning and operation

Analyzer cabinet air conditioner

NOTICE

Damage to the air conditioner
Damage to the air conditioner due to incorrect commissioning.

- Do not attempt to operate the air conditioner while it is horizontal or on its side, back or front. The refrigeration compressor is filled with lubricating oil. This will cause permanent damage to the air conditioner and also voids the warranty.

If the air conditioner has been in a horizontal position, be certain it is placed in an upright, vertical or mounting position for a minimum of 5 minutes before operating.

Overload protection
The compressor is provided with automatic reset thermal overload protection. This thermo-switch is located and mounted inside the plastic enclosure clipped to the compressor.
The switch operates when the compressor overheats due to clogged or dirty inlet air filter or if ambient air temperatures exceed nameplate rating or if enclosure dissipated heat loads exceed the rated capacity of the air conditioner.

The thermal overload switch will actuate and stop compressor operation. The blowers will continue to operate, and the compressor will restart after it has cooled to within the thermal overload cut-in temperature setting.

Principles of operation
If electrical power to the air conditioner is interrupted and reapplied immediately, (within 3 to 5 seconds), the compressor may not restart due to the high back pressure of the compressor. It takes a minimum of one (1) minute after shutdown for the compressor suction and discharge pressures to equalize in order for the air conditioner to restart.
Operating the air conditioner below the minimum ambient temperature or above the maximum ambient temperatures indicated on the nameplate voids all warranties.

The moisture that the enclosure air can contain is limited. If moisture flows from the drain tube continuously this can only mean that ambient air is entering the enclosure. Be aware that frequent opening of the enclosure's door admits humid air, which the air conditioner must then dehumidify.

Start-up

Prior to start-up
Check analyzer system seal integrity.

Power supply activation
1. Make sure that all fuse switches are deactivated.
2. Turn on the analyzer system power supply with the main switch.
3. Activate the fuse switches of the individual modules one after the other.

Function check
The following events will occur after the power supply is turned on:
1. The three 'Power', 'Maint' and 'Error' LEDs light up.
2. The different booting phases are displayed on the screen. Also, the software version is displayed.
3. After a brief time, the screen switches to measurement mode.
4. The **STATUS MESSAGE** softkey appears on the screen. This indicates the possibility of a temperature or flow problem during the warm-up phase.
   - By pressing the soft key, the user can recall the status message summary and view status message details.

Date and time check
A correct date and time setting are required for a proper operation of functions such as automatic calibration and time / date logging of error messages.
1. Select the date / time menu item:
   'MENU / Configure / System / Date / Time'
2. Check and, if necessary, correct the date and time according to time on board.
3. The analyzer system is factory-set to the GMT+1 time zone.

Warm-up phase

The warm-up time for the system is approx. 2 to 4 hours.

The warm-up phase can take longer if the analyzer system was not brought to room temperature before the power supply was activated.

Note
During the warm-up phase measurement values can be outside the ranges specified in the data sheet.

End of the warm-up phase
The warm-up phase is over when the temperature and flow status messages are gone and the measured value drift is acceptable. The latter depends on the size of the measurement range.

Readiness, sample gas supply
At the end of the warm-up phase the analyzer system is ready for operation and automatically activates the sample gas supply.

Calibration
Calibration should only be started after the warm-up phase.

11 Operation

General

The AO2000 series gas analyzers have several user interfaces:

- The local operation user interface is the display and control unit on the gas analyzer ('local HMI').
- The remote operation user interface is a PC running the 'AO-HMI' software ('remote HMI'). For detailed information on remote operation, see the 'AO-HMI' technical bulletin.

Note
The user interface is designated using the acronym 'HMI', which stands for 'human machine interface'.

HMI priority
A gas analyzer (or more accurately an analyzer module) can only be operated via one HMI.

The password hierarchy controls which HMI has or retains priority for operation (refer to the following table).

As a rule, the HMI with the level n+1 password has priority over an HMI with the level n password. An exception is the local HMI with level n password which has priority over a remote HMI with a level n password.

1st user:	2nd user:	
	Remote HMI receives …	**Local HMI receives …**
Remote HMI level n	Priority with level n+1	Priority with level n
Local HMI level n	Priority with level n+1	—

Note
If a second user with an HMI receives priority over another HMI, all first user input not confirmed with the **'ENTER'** key is lost and processes in progress (e.g. calibration) will be stopped.

Specifics for manual calibration
Manual calibration runs at level 0, thus no password is needed.

It is protected in the following manner from being stopped by another HMI.

On entering the **Calibrate** menu the level 1 password is automatically assigned.
Therefore, any other HMI must at least enter a level 2 password in order to assume priority for operation. In this event the calibration run would be stopped.

Access lock
Independent of the user interface priority adjustment it is possible to completely lock the access to the operation of the gas analyzer from a certain user interface (HMI).

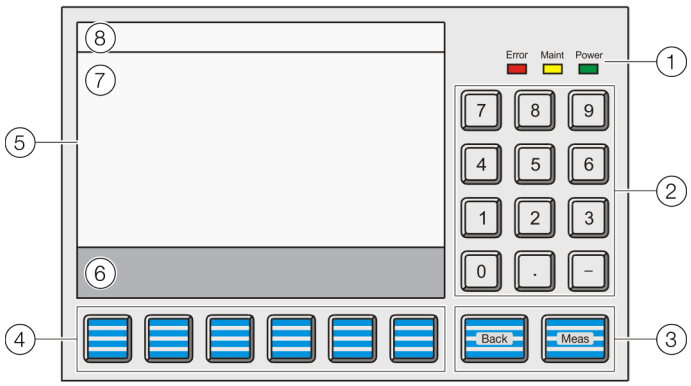
This lock is effected by configuration of the function block 'Access lock'.
The Technical Information 'Function Blocks – Descriptions and configuration' contains complete information on the individual function blocks.

Access denied
When a user tries to operate the gas analyzer via a locked HMI, the following text is displayed after pressing the **'MENU'** key:

ACCESS DENIED !
The operation of the analyzer unit is not permitted at this time.
Cancel: <BACK>

Access lock via password protection
As an alternative to the above-described complete access lock it is possible to inhibit entering the main menu and thus switching to the menu mode via password protection, see **Password protection** on page 53.

LCD indicator



1 Status LED's
2 Numeric Keypad
3 Cancel Keys
4 Softkeys
5 LCD display
6 Softkey Line
7 Information Field
8 Menu Line

Figure 30: LCD indicator

The LCD indicator is located on the front face of the system housing.

Menu levels of the LCD indicator

The LCD indicator operating modes have no effect on measurement operations, i.e. gas analyzer measurement functions continue while in menu mode.

Measurement mode

In the measurement mode the LCD display shows the actual process values.

Menu mode

In menu mode the LCD display shows the menu or individual menu items or parameters with the applicable values, as well as operator prompts.

LCD display

The backlit graphics has a 320 x 240-pixel resolution.
The screen is divided into three panels:

- Menu line
- Information field
- Softkey line

The menu line

The menu line appears at the upper edge of the screen. A line separates it from the information field.
It shows the current menu path and thus allows the operator to see where the system is in the menu tree. Additionally it shows the name of the analyzer being processed.

The information field in measurement mode

In the measurement mode the information field shows the following information for each sample component in the analyzer modules installed in the gas analyzer:

- Values in numeric form and as a bar graph
- The physical unit for the measured value
- The measurement component designation
- The measurement range lower and upper limit values on the horizontal bar graph
- The analyzer type
- The analyzer name

Values from up to six sample components can be displayed simultaneously.

It is user-configurable which measurement values are shown on the screen and at which positions on the screen the measurement values are displayed.

… 11 Operation

… LCD indicator

In addition, the user can configure display elements that allow to:

- Enter values, see Chapter '**Configuration'** in the operating instruction OI/AO2000.
- Actuate keys, see Chapter '**Configuration'** in the operating instruction OI/AO2000.

Note
For further information about the screen in the measurement mode refer to Chapter '**Configuration'** in the operating instruction OI/AO2000.

The information field in menu mode
In menu mode the information field contains the menu or individual menu items or parameters with the applicable values, as well as operator prompts.

The softkey line
The softkey line appears at the lower edge of the screen. Its gray background distinguishes it from the information field.

The softkeys are further explained in **Softkeys** on page 49.

Display of status messages
The softkey line also displays messages from the gas analyzer. The blinking message display in the softkey line has the following functions:

- It prompts for the '**STATUS MESSAGE**' key to be pressed whenever a status message is pending.
- It shows that a password is active.
- It shows that the gas analyzer is being controlled from a remote HMI.
- It shows that an automatic calibration process is running in the gas analyzer.

Display of status messages
When a status message is generated by the 'Message insert' function block its short text is displayed on the message display as configured in the function block.

The Technical Information 'Function Blocks – Descriptions and configuration' contains complete information on the individual function blocks.

Status LEDs
The three LEDs next to the screen show the user the gas analyzer's status.

Status LED	Description
Power 	The green 'Power' LED lights when the power supply is on.
Maint 	The yellow 'Maint' LED lights when the 'Maintenance request' status signal is active. The 'STATUS MESSAGE' softkey appears on the screen at the same time.
Error 	The red 'Error' LED lights when the 'Failure' status signal or the overall status signal is active. The 'STATUS MESSAGE' softkey appears on the screen at the same time.

Note
For detailed information on status messages and status signals refer to **Diagnosis / Troubleshooting** on page 58.

Numeric keypad

The numeric keypad is located to the right of the screen, under the status LED's.

Numerical entry

Numerical values can be entered directly with the numeric keys '0 to 9', the decimal point key '.' and the minus sign '–'.

Examples:

Test gas concentration, Date and time, Air pressure, Password

Note

Any digits displayed cannot be overwritten directly. They must be deleted with the '**BACKSPACE**' or '**CLEAR**' key before new digits can be entered.

Entering text with the numeric keypad

The numeric keypad is also used to enter texts, such as sample component or user names.

Refer to **Entering text** on page 50.

Cancel keys

The '**Back**' and '**Meas**' buttons located under the numeric keypad are designated as cancel keys.

Button	Description
	The '**Back**' key allows the operator to cancel a function or menu item and return to the previous menu level. Only entries confirmed with the '**ENTER** softkey are stored; unconfirmed items are not accepted. The '**Back**' button also allows the operator to clear gas analyzer help text and messages.
	The '**Meas** button allows the operator to cancel a function or menu item and to return to the measured value display in measurement mode. Only entries confirmed with the '**ENTER** softkey are stored; unconfirmed items are not accepted.

Note

The gas analyzer automatically reverts to the measurement mode to display values if the operator has not pressed a key in menu mode in the last five minutes ('time out').

Softkeys

The six buttons under the screen and the softkey line at the lower edge of the screen are known as softkeys.

A softkey is the combination of the button and its designation in the softkey line.

A softkey does not have any set function, but is assigned a function for a given situation as shown in the softkey line of the screen.

Pressing a softkey is the equivalent of pressing the button assigned to the function; this process is illustrated by the quasi-three-dimensional softkey representation on the screen.

Softkeys are also called buttons in this operating instruction.

Softkeys in Measurement Mode

In measurement mode, the softkey line contains the '**MENU**' and '**>>**' softkeys.

The '**STATUS MESSAGE**' softkey also appears if an error occurs.

Softkey	Description
	The '**MENU**' button is used to call up the main menu and switch to menu mode when in measurement mode.
	The ;**>>**' button allows the operator to scroll to the next display page. This button only allows forward scrolling. The 'Back' button is used for backward scrolling.
	The '**STATUS MESSAGE**' button is displayed in measurement mode if the 'Failure' or 'Maintenace Req.' status is pending. This button allows the operator to call up the status message summary and view the status messages. The user can also call up a detailed display for any message in the log. **Note** For detailed information on the possible status messages and status signals, see **Diagnosis / Troubleshooting** on page 58.

… 11 Operation

… LCD indicator

The Softkeys in Menu Mode
In menu mode, a series of softkeys appears on the softkey line, whose labeling and therefore function change based on the situation.
Their descriptions and functions depend on the specific situation.

Softkey	Description
 	The operator uses the arrow keys to move the selection cursor up or down, e.g. in menus or lists to choose vertically arranged (menu) items. The menu item selected is reversed, i.e. appearing as bright characters on a dark background.
 	The operator uses the arrow keys to move the selection cursor left or right, e.g. into or out of a submenu or to select (menu) items arranged next to each other. The menu item selected is reversed, i.e. appearing as bright characters on a dark background.
	The operator can use the '**BACKSPACE**' button to delete characters to the left of the cursor (as on a PC keyboard).
	The operator can use the '**CLEAR**' button to delete all characters in a selected field.
	The operator can use the '**ENTER**' button to call up menu items for editing, trigger functions, confirm inputs, e.g. parameterization. The '**ENTER**' button is always at the right margin of the softkey line.
	The operator can use the '**HELP**' button to access context-sensitive help. The screen will then show a help message explaining the menu item selected. The operator can use the '**Back**' button to clear the help text.

Presentation of entries in this Operating Instruction
In this operating instruction, entries to be made by the operator will not be identified by key symbols but by the following type styles (these are examples only):

Press cancel keys:	**'Back', 'Meas'**
Press softkeys:	**„MENU", „HELP", „ENTER", „BACKSPACE"**
Select menu items:	„Calibration Data", „Configure"
Enter numbers:	**'0'** to **'9'**

Entering text
When text, such as sample components or user names, needs to be entered an 'image' of the numeric keypad appears on the screen.

The following characters are shown using a total of four pages:
- Letters A to Z and a to z
- Special characters * ( ) % & : < > / and spaces
- Digits 0 to 9

Each character is accessed using the button in the corresponding position on the numeric keypad. Examples:

Letters:	A	L	t	Blank or space character
Button:	7	-	2	9

An input line appears at the lower edge of the screen for new text to be entered or existing text to be modified.

Text is entered and modified in two ways:
- The operator enters text in input mode.
- The operator modifies already entered text in edit mode.

Softkeys in input mode
The softkeys in the input mode have the following functions:

Button	Description
 	The '**PREV PAGE**' and '**NEXT PAGE**' buttons allow the operator to move to the previous or next keypad page.
	The '**CAPS**' button allows the operator to switch between uppercase and lowercase letters.
	The '**EDIT**' key allows the operator to switch into edit mode.

Softkeys in Edit Mode
The softkeys in the edit mode have the following functions:

Button	Description
 	The two arrow keys allow the operator to move the cursor left and right in the entry line.
	The operator can use the '**BACKSPACE**' button to delete characters to the left of the cursor (as on a PC keyboard).
	The '**INPUT**' button allows the operator to switch to entry mode.

Selecting and changing parameters

Value Input

Numeric and alphanumeric parameter values can be entered directly via the keyboard using the value input.

Numbers on the keyboard are assigned to the individual parameters; the assignment is specified above the respective parameter (e.g.: ‘Press key <4>’).

The parameter is called up for editing by pressing the assigned number key.

Example

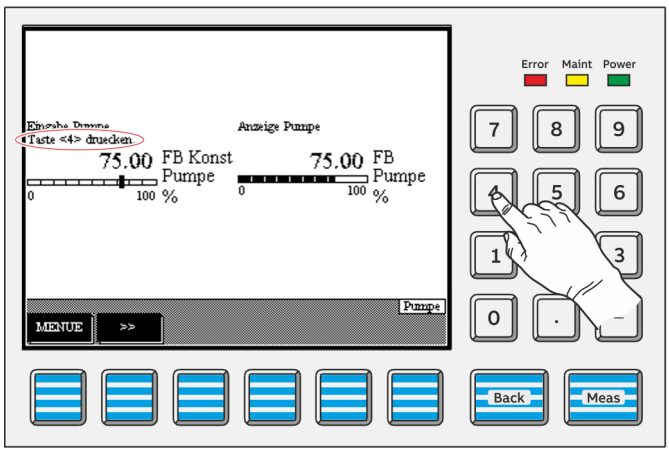


Figure 31: Select parameters (Example)

1. Press the ‘**4**’ button to call up the parameter for editing.

- The LCD display will now display an entry field to change the parameter value.

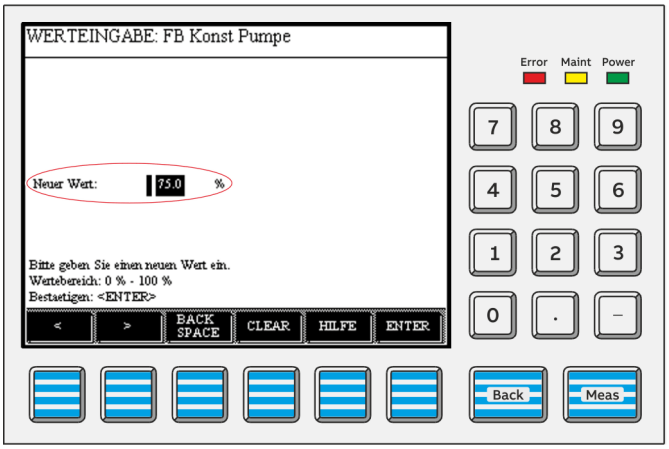


Figure 32: Change parameter value (Example)

2. Enter the new value using the numeric keypad and then press the **'ENTER'** to accept it.

Setup

The value input can be configured individually on the user pages, for detailed information, see Chapter '**Configuration**' in the operating instruction OI/AO2000.

… 11 Operation

… Selecting and changing parameters

Key Entry

Using the key entry, preset parameter values can be selected directly using the softkeys.

Numbers on the keyboard are assigned to the individual parameters; the assignment is specified above the respective parameter (e.g.: 'Press key <4>').

The parameter is called up for editing by pressing the assigned number key.

Example

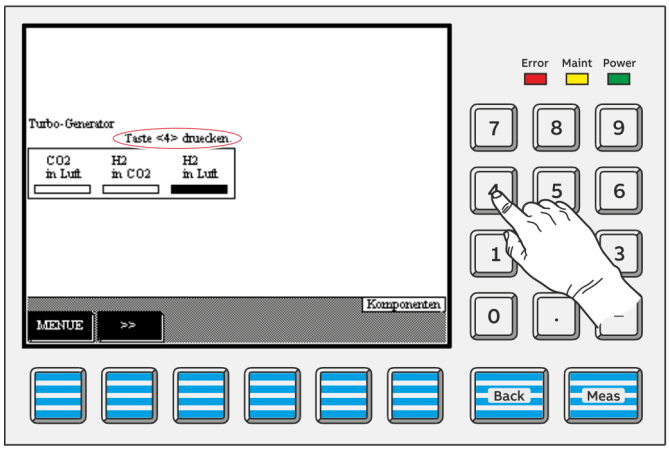


Figure 33: Select parameters

1. Press the '4' button to call up the parameter for editing.

- The LCD display now shows the softkeys for selecting the parameters for changing the parameter value.

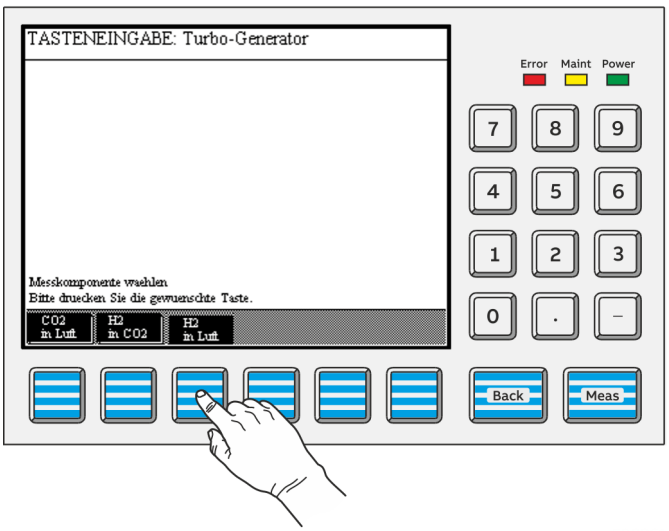


Figure 34: Select parameter value

2. Select the new value using the corresponding softkey.

Setup

The key entry can be configured individually on the user pages, for detailed information, see Chapter '**Configuration'** in the operating instruction OI/AO2000.

Password protection

Password protection consists of three elements:

- Password level,
- User group and
- Password.

Password Level

Each menu item is assigned a password level. Password levels are numbered with 0, 1, 2 and 3.

Menu items are assigned to different password levels in order to assure that specific menu items can only be changed by authorized users.

User Group

The definition of a user group is that every user that belongs to it has access entitlement at certain password levels, i.e. can make changes to the menu items at these levels.
Some user groups are set-up at the factory.
A user group can be made up of one or more users.

Password

NOTICE

Damage to the configuration of the gas analyzer.
After entering the password for password level 3, you can access all of the function block applications!

- Make sure that changes in password level 3 are only made by appropriately trained personnel.

Note

The 'Function Blocks – Descriptions and Configuration' Technical Information contains complete information on the 'Function Block' concept as well as detailed descriptions of the individual function blocks.

Every user group set-up in the system has a password. The password consists of six digits which can be entered via the numeric keypad.

… 11 Operation

… Password protection

Factory setting
Passwords are pre-assigned for the factory-set user groups.

User Group	Access to password levels	Password
Every user	0	None
Maintenance team	0, 1	471100
Specialist team	0, 1, 2	081500
Function block specialist	0, 1, 2, 3	325465

Viewing Menu Items
All users can view all menu items, regardless of password level, without entering a password.

Changing Menu Items
All users can make changes to password level 0 menu items without entering a password.
Password level 1, 2 and 3 menu items can only be changed if the user belongs to the group authorized for that level and after the user's password has been entered.

Note
Entering the main menu and thus switching to the menu mode can be password protected, refer to **Access lock** on page 46.

Change Privilege
After entering the password the user is authorized to change any menu items on all password levels accessible at the user's level.

Duration of the change privilege
The change privilege remains in place until

- either the gas analyzer automatically switches to measuring mode if the user does not actuate a button for about five minutes (‘time-out’),
- or the user presses the **‘MEAS’** key twice in a row.

If the user presses the **‘MEAS’** key only once to switch back to measuring mode, the change privilege initially remains in place. This is signaled by the flashing ‘Password active’ message display.

In this way, the user does not need to enter the password again before changing the menu items when switching back to menu mode within the following approx. five minutes.

Note
The change privilege therefore refers to the time-limited authorization to make changes to the menu items.
By contrast, the access right designates the principle authorization defined by per configuration to make changes to the menu items at certain password levels.

Change password
Refer to Chapter ‘**Configuration’** in the operating instruction OI/AO2000.

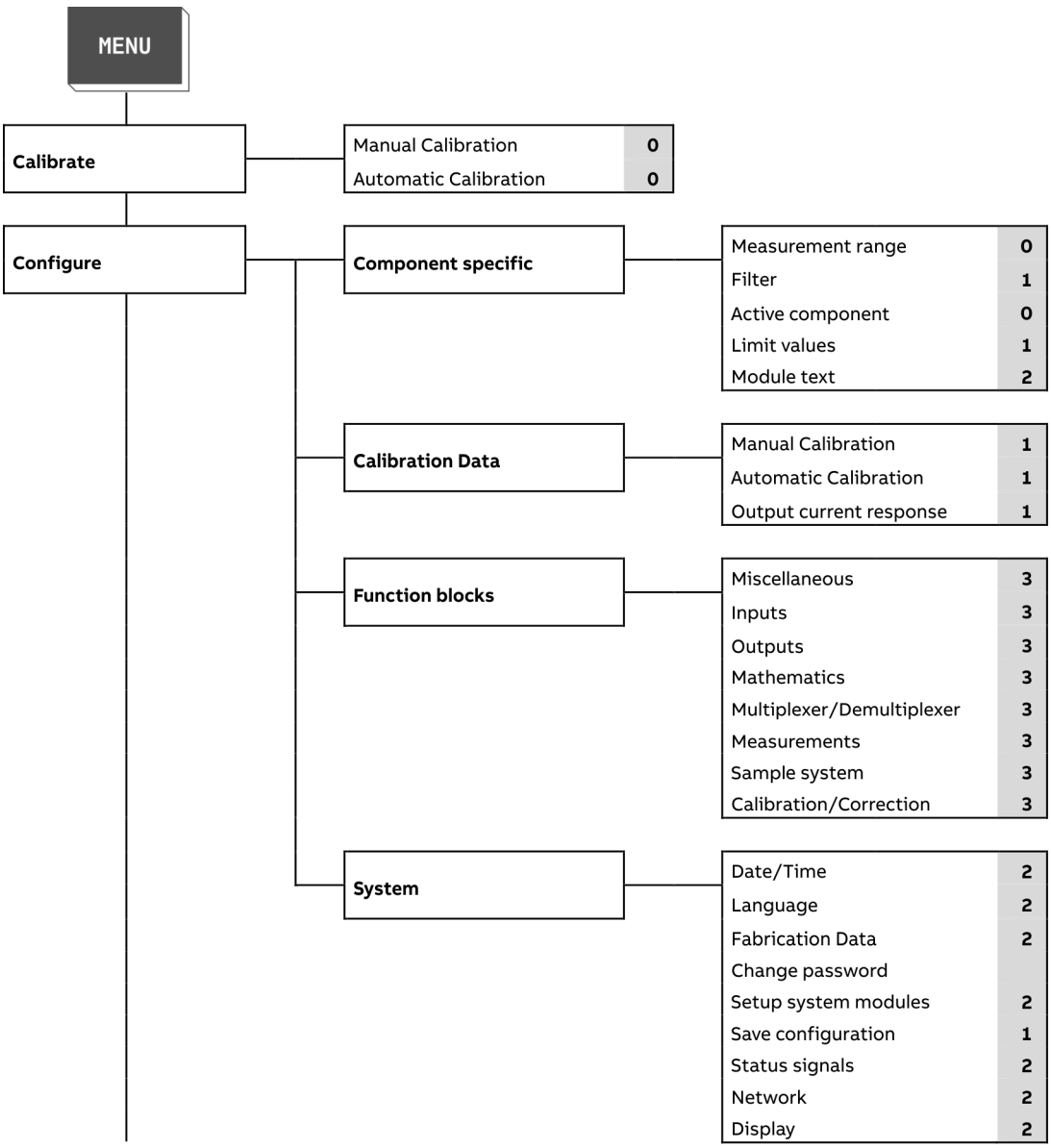
Menu structure

Note
For a detailed description of the individual parameters and menus, please refer to the chapter **'Configuration'** in the operating instruction OI/AO2000.

For reasons of brevity only the top-level parameters and functions are shown; the menu branches more extensively at most menu items, e.g. into the various measurement components or into the selection and adjustment of values.

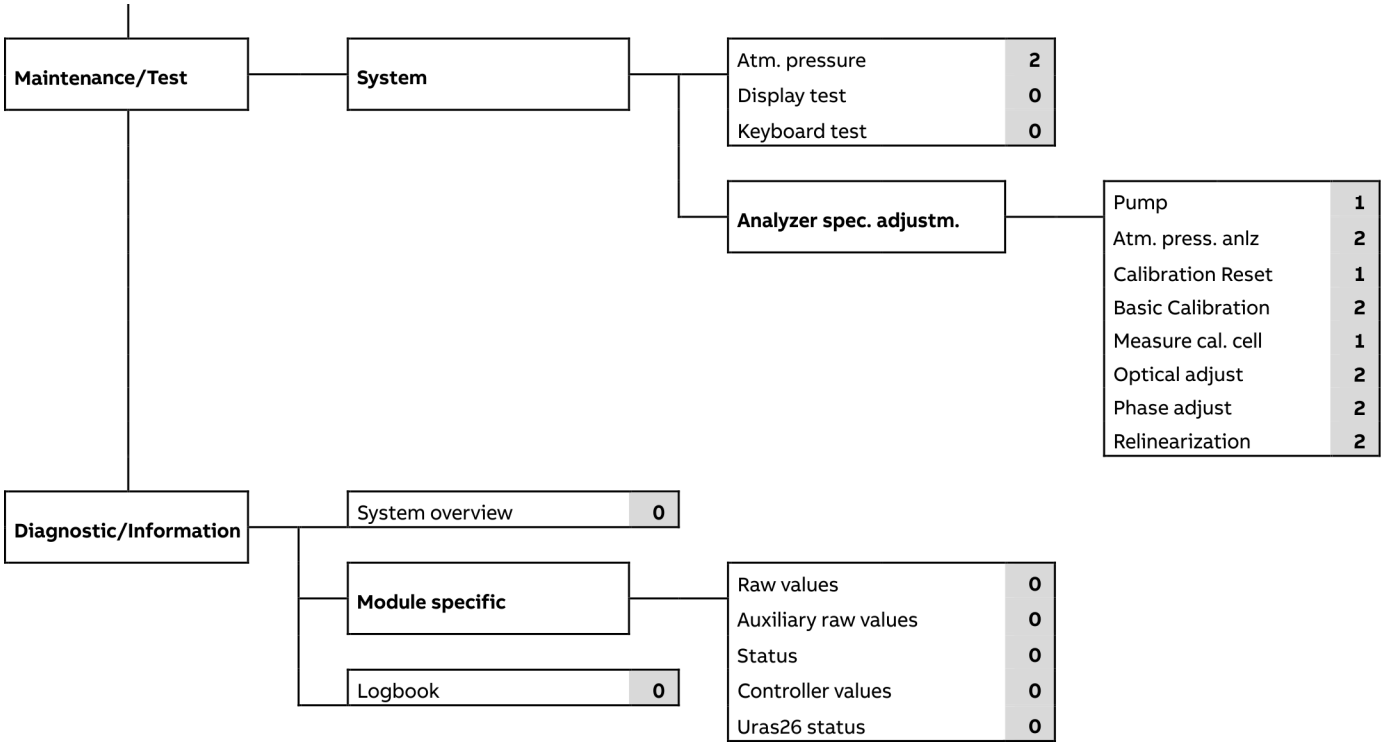
Password levels
For each menu item its password level (**0**, **1**, **2**, **3**) is shown in the table.
For some menu items, individual sub-menu items are on a higher password level. These apply especially to those sub-menu items which allow access to function block applications.

Note
The 'Change password' menu item is not assigned to a specific password level. In order to change a password the old password of this password level must be entered.



… 11 Operation

… Menu structure



Basic Setup

Setting the time zone, date and time

Menu path

'MENU / Configure / System / Date/Time'

Procedure

Parameter	Explanation
Timezone	The time zone can be selected either from the GMT (Greenwich Mean Time) values or from the continent/country/city list.
Date	Date must be entered in month/day/year format. Enter year with 4 digits.
Time	Time must be entered in hour: minute:second format. Enter seconds, too.

Definitions

- GMT = Greenwich Mean Time
- CET = Central European Time = GMT + 1 hour
- CEST = Central European Daylight-saving Time = GMT + 2 hours

Daylight-saving time

The gas analyzer is automatically set to daylight-saving time.

Note

This applies only when the time zone has been selected from the continent/country/city list and not from the GMT values list.

Condition as delivered

The gas analyzer is factory-set to the **GMT**+1 time zone.

Accept the time settings

Press the softkey **SET TIME** to accept the modified time settings.

Selecting user interface language

Menu path

'MENU / Configure / System / Language'

Language selection

Two user interface languages are factory-configured (per order) in the gas analyzer.

In the menu item **Language** the user can switch between these two languages.

Other languages

Other user interface languages can be loaded into the gas analyzer using the SMT Software Migration Tool.
SMT can be found on the USB stick which is delivered with the gas analyzer.

These language pairs are available:

English – German
English – French
English – Italian
English – Dutch
English – Spanish
English – Brazilian
English – Polish
German – Dutch

12 Diagnosis / Troubleshooting

Safety instructions

⚠ WARNING

Risk of injury

Risk of injury due to improperly performed error correction. The remedial measures described in this chapter require special knowledge and may require work to be done on the gas analyzer while it is open and under voltage!

- Work on the gas analyzer may only be performed by qualified and specially trained personnel!

The Dynamic QR Code

Application

Dynamic QR Code is a unique feature for displaying dynamically generated QR codes on the gas analyzer display.
The QR code displayed contains static system information as well as dynamically generated information regarding system configuration and the status of the gas analyzer.

Static data for the identification of the device includes, for example:

- Manufacturing number
- Production date
- Software version
- Serial numbers of the analyzer modules and assemblies that have been installed

Dynamic data for diagnostic purposes in the case of a fault include, for example:

- Status Messages
- Measured values
- Temperature, pressure and flow-rate values
- Drift values
- Analyzer-specific values

In combination with mobile devices (smartphone, tablet, etc.), Dynamic QR Code represents an innovative communication path for the user, enabling improved, case-specific assistance from the ABB service team.

This helps to shorten response times in the event of a fault, thereby increasing the availability of your gas analyzers.

Dynamic QR Code is compatible with both the ABB app “my Installed Base” and standard QR Code scanner apps

Handling

The QR code is accessed in the Diagnostic Menu of the gas analyzer and indicated on the display.

The QR Code Scanner App installed in the mobile device scans the QR Code that is displayed. The text information that is then displayed on the mobile device is sent to the local service contact specified in the “Measurement Care” contract, by email or other means of transmission.

Alternatively, it is possible to take a photograph of the displayed QR code and send the photograph to the service contact.

Dynamic QR-Code Accessing

Menu Path

‘Menu/Diagnosis/Information/QR Code display’

Procedure

1. Select system overview or the required analyzer module.
2. Access the QR code by pressing **ENTER**.
3. Scan QR code.
4. Return to the menu selection by clicking on **Back**.

Recommended QR code scanner apps

ABB recommends using the following QR code scanner apps (available free of charge for iOS and Android devices):

“my Installed Base" from ABB

iOS App Store	Google Play

”QR Scanner” from Kaspersky

iOS App Store	Google Play

Status messages

Information available as digital output

- System Failure
- Maintenance
- Maintenance Request
- Meas. Range Feedback SO_2
- SO_2 Range CTRL

Information displayed on the analyzer system

- Maintenance Mode
- Watchdog signal error (Communication error)
- Back-purging active
- Calibration active
- Condensate level alarm
- Cooler temperature limit
- Flow alarm min./max.

Possible status messages

Legend for the "status messages" table

Status Signals	
No.	The status message number appears in the menu line display
Text	Full text of the status message is shown in the detailed display
S	**x** = Status message sets the overall status
A	**x** = Status message sets the "Error" individual status
W	**x** = Status message sets the "Maintenance Request" individual status
F	**x** = Status message sets the "Maintenance Mode" individual status
Reaction/Comment	Explanations and corrective measures in case of status messages

“Status messages” table

No.	Text	S	A	W	F	Reaction/Remark
Run time error						
1–21	Runtime error 1 to Runtime error 21					Notify Service if these messages occur repeatedly.
System controller						
101	System controller shut down at					For information, shows date and time
102	System controller starts up at					For information, shows date and time as well as warm or cold start
103	Install Module:					For information
104	Remove Module:					For information
105	Reactivate Module:					For information
106	A user installed module:					For information
107	A user removed module:					For information
108	A user replaced module:					For information
109	A password is active! To delete, press the <MEAS> key on the measurement value display.					For information on Password Protection see ‘Password protection’ section; not logged. See **Password protection** on page 53.
110	System booting.					Not logged
111	This system is currently under remote control					Not logged
112	Display/control unit synchronizing with analyzer. Please wait.					Not logged
113	The system time was changed from -> to:					Not logged
114	The system is saving the changed parameters. Please wait.					

… 12 Diagnosis / Troubleshooting

… Possible status messages

No.	Text	S	A	W	F	Reaction/Remark
116	The Profibus Module is mounted on the wrong slot! The Profibus interface is therefore not working. Please remount the Profibus Module on slot X20/X21.	x	x			See message text
117	The configuration backup was saved.					
118	The configuration backup was loaded. The system has been restarted.					
119	The system configuration could not be loaded! This system therefore contains no configuration now. Please enter menu: Configure/System/Save Save configuration to load your backup configuration. Or use SMT to re-install your configuration.	x	x			See message text
System bus						
201	The selected system bus module could not be found.	x	x			Check plug connections and terminating resistors on the system bus. Make sure the system bus module serial number is correctly entered: 'MENU / Diagnostic/Information / System overview'
203	The selected system bus module does not exist.	x	x			Check plug connections and terminating resistors on the system bus.
208	The system bus was not able to transfer data into the database.	x	x			The system bus module software version is not compatible with that of the system controller; update the system controller software.
209	The system bus connection to this module is interrupted.	x	x			Check the system bus connection to the indicated system bus module. Check the power supply system of the indicated system bus module.
210	The system bus module configuration has changed.	x	x			For information; the configuration data are automatically updated
211	The system bus module has no more on-board memory.	x	x			Check the system bus module configuration: 'MENU / Diagnostic/Information / System overview'
214	The system is currently maintained with Optima SMT.					
215	The analyzer module has an internal communication error!	x	x			Notify Service.
216	The analyzer module has an internal program error!	x	x			Notify Service.
250	The selected analyzer module could not be found!	x	x			Check the connectors and cabling.
251	The connection to the analyzer has been lost!	x	x			Check the connectors and cabling.
252	The EEPROM data of the analyzer is faulty!	x	x			Check the configuration with TCT.
253	Communication with the analyzer is faulty!	x	x			Check the connectors and cabling.
254	The boot program of the analyzer is defective! Notify Service!	x	x			Notify Service.
255	The program of the analyzer is defective! Notify Service!	x	x			Notify Service.

No.	Text	S	A	W	F	Reaction/Remark
Analyzer modules						
300	No new measured values from the analog/digital converter.	x	x			Notify Service.
301	The measured value exceeds the range of the analog/digital converter.	x	x			Check the sample gas concentration. Notify Service.
302	Offset drift exceeds half the permissible range.			x		Check analyzer module and sample preparation.
303	Offset drift exceeds permissible range.	x	x			Permissible range: 150 % of smallest installed measurement range; 50% of physical measurement range for Uras26. Notify service when drift exceeds these values
304	Amplification drift exceeds half the permissible range.			x		Manually calibrate the indicated detector at zero and end point. Check analyzer module and sample preparation.
305	Amplification drift exceeds the permissible range.	x	x			Permissible range: 50 % the the detector sensitivity. Notify Service when drift exceeds this value.
306	The offset drift between two calibrations exceeds the permissible range.			x		These messages are generated by automatic calibration. Check calibration for plausibility. Fix possible cause of implausibility. Manually calibrate the indicated detector at zero (No. 306) and end point (No. 307). Permissible range: 15 % of the smallest installed measuring range; 6 % of the smallest installed measuring range for measurements on plants subject to approval and pursuant to the 27th and 30th BImSchV (Federal Regulation on Immissions)
307	The amplification drift between two calibrations exceeds the permissible range.			x		
308	A computational error occurred during the calculation of the measured value.	x	x			Notify Service.
309	The temperature regulator is defective.			x		See the status message from the applicable temperature detector
310	Temperature correction was turned off for this component because the temperature measured value is invalid.			x		See the status message from the applicable temperature detector
311	The pressure regulator is defective.	x	x			See the status message from the applicable pressure detector
312	The pressure correction turned off for this component because of invalid measured pressure value.			x		See the status message from the applicable pressure detector
313	Cross-sensitivity correction is impossible for this component because the correction value is invalid.			x		See the status message from the applicable correction detector
314	Carrier gas correction is impossible for this component because the correction value is invalid.			x		See the status message from the applicable correction detector
Auxiliary detector						
315	No new measured values from the analog/digital converter.			x		Notify Service.
316	The measured value exceeds the range of the analog/digital converter.			x		Notify Service.
317	A computational error occurred during calculation of the measurement value.			x		Notify Service.

… 12 Diagnosis / Troubleshooting

… Possible status messages

No.	Text	S	A	W	F	Reaction/Remark
Uras						
318	No new measured values from the analog/digital converter.	x	x			Notify Service.
Temperature regulator						
324	Temperature is above or below upper and/or lower limit value 1.			x		Status messages during the warm-up phase. If the Status messages appear following the warm-up phase: Check whether the permissible ambient temperature range (see **Climatic Conditions** on page 19) is being maintained. Check the analyzer module thermal link and replace if necessary.
325	Temperature is above or below upper and/or lower limit value 2.			x		
Pressure regulator						
326	No new measured values from the analog/digital converter.	x	x			Notify Service.
327	The measured value exceeds the range of the analog/digital converter.	x	x			Notify Service.
328	A calculation error occurred during calculation of the measurement value.	x	x			Notify Service.
I/O devices						
332	Auxiliary voltage failure on I/O board.	x	x			Defective I/O board. Replace the board.
333	Unavailable I/O type configured.	x	x			Correct the configuration with the test and calibration software.
334	No new measured values from the analog/digital converter.	x	x			Defective I/O board. Replace the board.
335	The measured value exceeds the range of the analog/digital converter.	x	x			Check signals at analog inputs. If OK, check the configuration and calibration of the analog inputs.
336	A calculation error occurred during calculation of the measurement value.	x	x			Check the configuration and calibration of the analog inputs and outputs.
337	Broken analog output line	x	x			Check the analog output lines.
338	Line break in the digital input (moisture sensor).	x	x			Check moisture sensor in the system cooler.
339	Line break or short circuit in the analog input.	x	x			Check system cooler temperature.
340	Analog input value exceeds upper or lower limit value 1.			x		Check system cooler temperature.
341	Analog input value exceeds upper or lower limit value 2.			x		Check system cooler temperature.

No.	Text	S	A	W	F	Reaction/Remark
Flow monitor (pneumatic module)						
342	The flow rate undershoots limit value 1			x		Check sample preparation. Alarm value 1 = 25 % of MRS.
343	Flow rate undershoots limit value 2.	x	x			Check sample preparation. Alarm value 2 = 10 % of MRS. Automatic calibration is interrupted and disabled
Measured value						
344	Measured value overshoots measuring range value.					Measured value > +130 % of MRS, not logged
345	Measured value undershoots the measurement value range.					Measured value < −100 % of MRS, not logged
Uras						
378	The chopper wheel is blocked.	x	x			Notify Service.
379	Chopper wheel speed not OK.	x	x			Notify Service.
380	IR source element or electronics defective.	x	x			Notify Service.
381	High voltage in the preamplifier defective.	x	x			Notify Service.
382	Meas. value is influenced by shock.	x	x			
Flow controller						
398	No new measured values from the analog/digital converter.	x	x			Notify Service.
399	The measured value overshoots the range of the analog/digital converter.	x	x			Check the sample gas concentration. Check connectors in the gas analyzer. Notify Service.
400	A calculation error occurred during calculation of the measurement value.	x	x			Notify Service.
401	The flow rate exceeds upper or lower limit value 1.			x		Check sample gas path. Notify Service.
402	The flow rate exceeds upper or lower limit 2.	x	x			Check sample gas path. Notify Service.
403	The flow regulator controlled variable is out of the valid range.	x	x			Notify Service.
Calibration						
500	System bus communication faulty.					
501	Requested function is not available on the system module.					Check the analyzer module software version and perform an update if needed.
502	A system error occurred in the system module concerned.					The calibration is interrupted. Notify Service.
503	Amplification error during calibration. Calibration impossible.			x		The calibration is interrupted. Span gas concentration too low – check.
507	A combination of the following errors occurred: Half Drift Limit, Drift Limit, Amplification or Delta Drift.					

… 12 Diagnosis / Troubleshooting

… Possible status messages

No.	Text	S	A	W	F	Reaction/Remark
Calibration (continuation)						
508	Unknown error number. Check software versions.					Message during the automatic calibration. Check analyzer module and system controller software versions.
509	Automatic calibration started.					For information
510	Automatic calibration ended.					For information
511	Automatic calibration interrupted externally.					For information
512	Automatic calibration in progress.				x	For information; not logged
513	System bus communication faulty during automatic calibration.					
514	External calibration started.					For information
515	External calibration ended.					For information
516	External calibration in progress				x	For information; not logged
517	Device being serviced.				x	For information, e.g. during manual calibration, not logged
518	The calibration could not be performed, because the measured value is not stable.					
519	Preamplifier overflow error: Calibration could not be performed because of preamplifier override.					
520	Initial zero calibration started.					For information
521	Initial zero calibration ended.					For information
522	Initial zero calibration interrupted.					For information
523	Initial zero calibration incomplete. System bus communication fault during calibration.					For information
524	Initial zero calibration started.				x	For information; not logged
525	Linearization impossible: Linearization did not produce a valid result. Measurement					See message text
526	Linearization impossible: Linearization could not be performed, i.e. the characteristic is linear.					See message text
527	Initial calibration for component:					For information
528	Autocalibration not started, i.e. manual calibration was running.					For information
529	Calibration was stopped because no raw measured values were recorded.	x		x		
530	Calibration stopped because the pressure switch did not detect any calibration gas.	x		x		
531	Automatic validation started.					For information
532	Automatic validation ended.					For information
533	Automatic validation externally interrupted.					For information
534	Automatic validation in progress.				x	For information; not logged
535	Automatic validation successful for:					
536	Automatic validation out of limits for:					
537	Automatic validation out of limits for:			x		

No.	Text	S	A	W	F	Reaction/Remark
User-Configured Messages						
800	An external error occurred during:	x	x			Default texts for the Message Generator function block are supplemented with the full text defined during function block configuration.
801	A user-defined error occurred during:	x	x			
802	A user-defined maintenance request occurred during			x		
803	A user-defined maintenance mode event occurred during:				x	
Miscellaneous Messages						
1000	This function block has an error:	x	x			Is supplemented with a reference to the function block type.
1001	Condensate penetration.					Overall message for guiding reaction to condensate penetration; not logged
1002	Flow rate too high at this point!	x	x			Currently not used
1003	Flow rate too low at this point!	x	x			Currently not used
System Cooler						
1100	Cooler temperature too high.	x	x			Sample gas feed module pump is automatically turned off. Check the system cooler and sample gas preparation system.
1101	Cooler temperature too low.	x	x			
1102	Condensate penetration in cooler.	x	x			
1103	Flow rate too low in cooler.			x		Check the system cooler and sample gas preparation system.
1104	Cooler condensate level too high.			x		
1105	Cooler condensate level too high.			x		Empty the condensate bottle.
1106	Cooler reagent level too low.			x		Fill the reagent container.

… 12 Diagnosis / Troubleshooting

SCC-C – Sample gas cooler problems

Problem	Cause	Remedy
Condensate in the Sample Gas Outlet	Ambient temperature < 5 °C	• Heat the downstream assemblies.
	Sample gas cooler overloaded	• Ensure sample gas inlet and operating specifications are followed. See **Sample gas inlet conditions** on page 20.
Cooler not running	Defective peristaltic pump	• Replace the peristaltic pump.
Status-LED blinks with high temperature Sample Gas Flow blocked	Defective pump hose	• Replace hose, see **SCC-C – Replace peristaltic pump hose** on page 84.
	Cooling performance inadequate although sample gas cooler not overloaded	• Provide adequate cooling air flow. • The fan should operate. • Clean condenser fins, see **SCC-C – Clean condenser fins** on page 85.
	Compressor motor breaker tripped	• Eliminate the thermal overload caused by the sample gas flow or excessive ambient temperature. • Clean condenser fins, see **SCC-C – Clean condenser fins** on page 85. • Ensure sample gas inlet conditions and operating specifications are followed. See **Sample gas inlet conditions** on page 20. • Allow the compressor to cool before the next run.
	Sample gas paths contaminated	• Contamination can result from the failure to remove dust or sublimates. Ensure dust is removed before the sample gas enters the sample gas cooler; eliminate sublimates prior to this point. • Clean the sample gas lines and cooling system; consider the effects of corrosion and reduced service life when using chemical cleaners and flush with an inert gas in order to avoid any cleaning agent influence on measurement results.
Inaccurate Temperature Indication	Defective temperature controller	• Replace temperature controller.
Condensate in gas outlet Defective Sample Gas Cooler	Refrigerant escaping	• Send the sample gas cooler to the service department for service.
	Power supply disconnected	• Reconnect the sample gas cooler power supply.
	Defective motor breaker or winding, i.e. the compressor motor is not running	• Measure the electrical resistance of the motor winding (guide value is approx. 40 Ω). • If the difference is considerable (with measuring circuit open or short-circuited), then the motor breaker should be replaced. • If the motor winding is defective, send the sample gas cooler to the service department for repair.
Condensate in the Sample Gas Outlet	Ambient temperature < 5 °C	• Heat the downstream assemblies.
Display toggles between temperature and error message Error 1	Sample gas cooler overloaded	• Ensure sample gas inlet conditions and operating specifications are followed. See **Sample gas inlet conditions** on page 20.
Display toggles between temperature and error message Error 2	Defective peristaltic pump	• Exchange the SCC-C unit or consult service contact.

SCC-F – Sample gas feed unit problems

Problem	Cause	Remedy
Sample Gas Feed Unit not working	Power supply interrupted	Reconnect the power supply.
	Fuse blown	Replace fuse (2 A T).
	Pump motor blocked	Replace SCC-F unit or consult service contact.
	Defective pump	Replace SCC-F unit or consult service contact.
	Defective diaphragm	Replace diaphragm (trained personnel only) see **SCC-F – Replacing the diaphragm and valve plates** on page 86, or consult service contact.
Drops of Condensate in the Condensate Monitor or Flow Monitor (Liquid Alarm)	Condensate being produced by the gas analyzer system Fluid from the process penetrating Condensate collecting bottle full	• Check operability of the upstream condensate separation device and rectify cause. • Empty, clean and dry the upstream sample gas pipe and sample gas conditioning units. • Empty, clean and dry the condensate monitor. • Replace filter diaphragm. • Press reset switch on the front panel to deactivate the condensate lock.

AO2020 Gas analyzer problems

Problem	Cause	Remedy
Blinking Measurement Value Readout	Measured signal violates measurement range limits	**Note** Measurement value > +130% MRS or measurement value < –100% MRS. Additionally, status messages 344 or 345 are generated.
Blinking --E-- in Measurement Value Readout	Problem in measured signal processing	• View status messages. • Identify cause and repair.
Blinking --E-- in mA Value Readout	Problem in output current circuit	Identify cause (e.g. line break) and repair.
Power Supply Fuse Failure (only for Limas21 power supply)	Wrong voltage setting on power supply	• Use the proper voltage setting • Change the fuse (G fuse element per EN 60127-2, 4 A rating, slow-blow for 115 VAC and 230 VAC).
	Power supply defect	Contact Service.
Flow Problem	External gas lines or filters dirty, plugged or leaking	• Disconnect the gas analyzer from the gas preparation system. • Blow out the gas lines with compressed air or clear them mechanically. • Change the filter elements and packings. • Check gas line seal integrity.
	Gas analyzer gas paths crimped or leaking	• Disconnect the gas analyzer from the gas preparation system. • Check the analyzer module gas lines and the gas module lines for crimping or loose connections. • Check the integrity of the analyzer module gas paths and (if applicable) of the lines to the gas module.
Temperature Problem	Gas analyzer still in warm-up phase	The duration of the warm-up phase depends on which analyzer module is installed in the system. Uras26: Approx. 30 minutes without, approx. 2 hours with thermostat
	Excessive air movement	• Reduce the flow of air around the gas analyzer. • Install shielding against drafts.
	Ambient temperature outside of permissible range	• Protect the gas analyzer from cold and heat sources such as the sun, ovens and vats. • Maintain the permissible ambient temperature range:

… 12 Diagnosis / Troubleshooting

AO2020-Uras26 problems

Problem	Cause	Remedy
Temperature Problem	Faulty temperature sensor or heater connections	Check the connecting lines and plugs. Check the line seating in the insulated jackets.
	Defective thermal link	Check thermal link continuity and replace if necessary.
Unstable Readings	Vibration	• Take measures to reduce vibration. Permissible vibration levels: for analyzer max. 0.04 mm at 5 to 55 Hz, 0.5 g at 55 to 150 Hz; when installed in cabinet max. 0.01 m/s2 at 0.1 to 200 Hz.
	Gas path leakage	Check the integrity of the analyzer module gas paths and (if applicable) of the lines to the gas module.
	Loss of sensitivity	Check the sensitivity variation: • Indication < 75%: The “Maintenance request” status signal appears. The detector involved will need to be changed soon. • Indication < 50%: The “Failure” status signal appears. Replace the detector involved.
	Uneven emitter modulation	• Remove the emitter. **CAUTION** The emitter temperature is approx. 60 °C in the thermostat version of the Uras26! • Replace the AO2020 unit or consult service contact. • Have the emitter and modulator assembly checked by the service department.

Analyzer cabinet problems

Problem	Cause	Solution
Flow to analyzer not constant / too low	Solenoid valve plugged	Untie sampling line on both ends of the solenoid valve and carefully clean the valve from both sides with compressed air
End piece of sampling probe black / plugged	Accumulation of hydrocarbons	Untie sampling line from solenoid valve before cleaning the complete line with compressed air from the top of the stack to the black / plugged end
Humidity in one of the filter elements	Gas cooler malfunctioning	Check function of the gas cooler. If not working, see above "Sample gas cooler problems"
Gas flow to analyzer disrupted	Water trap closed after contact with condensate	Replace the water trap
"Temperature Alarm" in status signal board blinking red	Heating in sampling probe or sampling line damaged	Pt100 broken, needs to be replaced by service personnel
	Temperature controller defective	Temperature controller needs to be replaced by service personnel

Analyzer cabinet air conditioner problems

Problem	Cause	Remedy
Unit won't cool	• Clogged fins on coil(s) • Dirty filter	• Clean fins and filter, see **Cleaning and changing the inlet air filter** on page 83.
	• Blowers not running • Compressor not running • Compressor runs, but has bad valves • Loss of refrigerant	• Check air conditioner.
Compressor tries to start but won't run	• Low line voltage at start. Should be ±10 % of rated voltage. • Compressor motor stuck • Bad contactor • Bad overload switch • Bad run/start capacitor	• Check air conditioner.
Unit blows breakers	• Undersized breaker/fuse or not time delayed • Short in system	• Check air conditioner.
Getting water in enclosure	• Drain plugged • Drain tube kinked	• Check condensate drain.
	• Enclosure not sealed (allowing humidity in) • Mounting gasket damaged	• Check gasket between air conditioner and analyzer cabinet.

... 12 Diagnosis / Troubleshooting

Notify Service

Who should you contact for further help?
Please contact your local service representative. For emergencies, please contact:

To find your local ABB contact visit:
www.abb.com/contacts

For more information visit:
www.abb.com/measurement

Before you notify Service ...
Before contacting the service department regarding a malfunction or a status message, please check whether there is, in fact, a fault in the sense that the gas analyzer is not complying with the metrological data (refer to data sheet).

If the Service Dept. has been informed ...
If the Service department has been informed due to an error or a status message, please provide the following data:

- The production number (P-No.) of the system housing where the malfunctioning or faulty component is installed – the production number is located on the name plate of the system housing as well as in the analyzer data sheet;
- the software version of the system controller and the system modules – the software version is located in the menu:
  'MENU / Diagnostic/Information / System overview'
- an exact description of the problem or status as well as the status message number.

That way, the service staff will be able to quickly help you.
Please also have the analyzer data sheet ready – it contains important information that will help the Service staff find the cause of the malfunction.

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see **Return form** on page 99) and include this with the device.
In accordance with the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Address for the return:
Contact Center
www.abb.com/contacts

13 Maintenance

Safety instructions

⚠ WARNING

Risk of injury

Risk of injury due to maintenance work being carried out incorrectly.

The work described in this chapter require special knowledge and may require work to be done on the gas analyzer while it is open and under voltage!

- Maintenance work on the gas analyzer should be performed by qualified and specially trained personnel only !

⚠ WARNING

Risk of injury due to harmful gases

Some of the gases measured with the analyzer system are harmful to health.

Therefore, the sample gas must not escape from the gas path during normal operation and maintenance works.

- A seal integrity check of the analyzer system has to be performed at regular intervals.

⚠ CAUTION

Risk of injury due to corrosive condensates

Condensates are often corrosive.

- When working with corrosive reagents note the hazard information and safety precautions contained in the applicable material safety data sheets.
- Neutralize condensates and follow the prescribed measures for disposal.

… 13 Maintenance

Maintenance plan

The maintenance work described must be carried out at the specified maintenance intervals, pursuant to the maintenance schedule.

Note
Prior to performing any maintenance works on the analyzer system be sure to activate the 'Maintenance Mode' on the 'Control Panel' screen thus setting the 'Maintenance Mode' status signal.
Be sure to reset this setting after finishing the maintenance work.

Maintenance work	Interval				Further information
	Daily	Weekly	Every 6 months	Every 12 months	
Visual inspection of the analyzer cabinet.	X				See Page 73
Check status of LEDs for error signals.	X				
Zero-point calibration with ambient air	X				See Page 74
Automatic calibration:					See Page 74
Zero-point calibration with ambient air and end-point calibration with calibration cells.		X			
Cleaning of ceramic filter from the sampling probe.		X	X		See Page 79
Replace the oil/soot filter (if applicable)			X		See Page 81
Clean/replace the air condition filter				X*	See Page 83
Replacing the hose at the hose pump from the sample gas cooler SCC-C			X		See Page 84
Clean the condenser fins from the sample gas cooler SCC-C				X	See Page 85
Replacing the diaphragm and valve plates of the sample gas feed unit SCC-F				X	See Page 86
Replace the aqua stop filter				X	See Page 82
Seal integrity check				X	See Page 78
Adjustment of calibration cells with test gas				X	See Page 74
Change of ambient air filter				X*	See Page 82

* Depending on the environmental conditions.

Spare parts

Description	Demand for one year	Order number
Air filter for analyzer cabinet air conditioner	1×	3KXG839230U0100
Spare Parts kit for heated sample probe	1×	3KXG839231U0100
Spare Parts kit for Oil/Soot removal filter	1×	3KXG839196U0100
Flexible tube set for sample gas cooler SCC-C	2×	90P1007
Spare parts set for sample gas feed unit SCC-F	1x	8018551
Aqua stop filter	1x	8018512
Ambient air filter (Zero gas filter)	1x	768322

Spare parts information

Spare parts information can be found on the Internet using the address www.online.abb.com.

Analyzer cabinet – Visual inspection

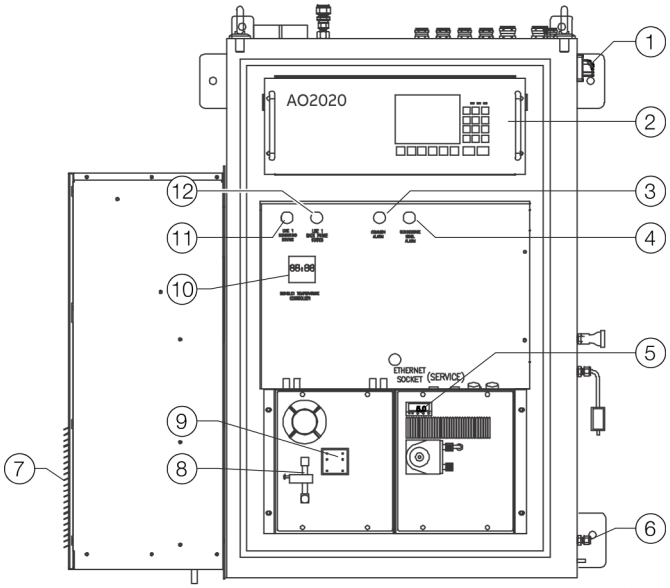


Figure 35: Frontview of the analyzer system

Visual inspection

Pos.	Device, module	Nominal condition
1	Main switch	ON
2	Gas analyzer display: Measured values, flow value, status messages, cabinet temperatur	Green LED 'Power' ON
3	Indicator light 'Common Alarm'	OFF
4	Indicator light 'Condensate Level Alarm'	OFF
5	Sample gas cooler temperature	3 °C
6	Level of condensate collection bottle	See page 83
7	Air filter of analyzer air conditioner	See page 83
8	Sample gas flow	40 to 80 l/h
9	LEDs 'Condensate alarm' and 'Flow alarm'	LEDs OFF
10	Heated line temperature controller	180 °C, ±1 °C
11	Push button 'Measuring point'	ON
12	Push button 'Backpurge Status'	OFF

Cleaning hints

- Never use water or any solvents to clean parts inside the analyzer cabinet.
- Always operate the analyzer system with cabinet door closed. Remove dust inside the analyzer cabinet using a broom and a vacuum cleaner.
- Clean the outside of the analyzer cabinet with a wet towel and mild cleaning agents. Pay attention that no droplets invade the cabinet.

Status LEDs

The three LEDs next to the screen show the user the gas analyzer's status.

Status LED	Description
Power	The green 'Power' LED lights when the power supply is on.
Maint 	The yellow 'Maint' LED lights when the 'Maintenance request' status signal is active. The 'STATUS MESSAGE' softkey appears on the screen at the same time.
Error 	The red 'Error' LED lights when the 'Failure' status signal or the overall status signal is active. The 'STATUS MESSAGE' softkey appears on the screen at the same time.

Note

For detailed information on status messages and status signals refer to **Possible status messages** on page 59.

… 13 Maintenance

Calibrating the analyzer system

Notice

Impairment of the analyzer function

Impairment of the analyzer function due to improper calibration.

- Only persons familiar with the calibration of comparable analyzer systems are certified as being capable of such work and should work on the system.

Note

Calibration of the analyzer system has to be performed on board every 6 to 12 months with test gas, in accordance to agreement with respective certification class.

Conversion of concentration values

Care has to be taken, that the certified test gas used has to be specified in % by volume. In case it is specified in volume by mole there has to be a conversion as following:

$$Vol_C = \frac{\frac{X_C \times m_C}{\rho_C}}{\frac{X_C \times m_C}{\rho_C} + \frac{X_T \times m_T}{\rho_T}}$$

Vol_C	volume fraction of the component
X_C	mole fraction
m_C	molar mass of the component
ρ_C	density of the component in the reference state
X_T	mole fraction of the component in the reference state
ρ_T	density of the carrier gas in the reference state
m_T	molar mass of the carrier gas

Basics

The purpose of the calibration (adjustment) is to scale the analyzer with a reference normal. This reference normal can be a (certified) test gas or a built-in internal gas filled cell.

When calibrating SO_2 with infrared analyzers, some characteristics have to be considered. Firstly, SO_2 is a water-soluble gas, which means that parts of the gas may be solved in water. On the other hand, SO_2 is overlaid by the water signal in the infrared range. Therefore, it is important that the water content in the measured gas is constant. This is achieved by the gas cooler, which stabilizes the output to a constant dew point of 3 °C below the entrance dew point. The error caused by the overlay of the constant water signal is compensated in the analyzer by shifting the zero point.

In continuous operation you will also get a lossless operation, as long as the gas concentration and the inlet humidity do not vary significantly.

Calibration – Principles

Preconditions

- Ambient air temperature: 5 °C to 40 °C
- If used, the flow from test gas bottle has to be as similar to the flow via the membrane pump as possible. The flow of the test gas bottle can be regulated via the pressure valve on top of the bottle.
- Calibration should only be started after the warm-up phase (Approx. 2.5 h)

Calibration control

The analyzer has two methods to control the calibration:

- Automatic calibration, see see page 75.
- Manual calibration, see see page 76.

In the following these are explained step by step.

Plausibility check during the calibration

If during calibration the gas analyzer finds implausible values (e.g. if the span and zero values are equal), calibration is stopped and an error message is generated. The values stored for the last calibration remain in effect.

Output response and waiting period

If the Output Current Response parameter is set to Hold, current output is halted for a specific time to allow the measurement value to stabilize after automatic calibration is ended. By default, this value is not hold.

The complete automatic zero-point calibration with ambient air takes approx. 15 minutes and zero-point calibration with ambient air and end-point calibration with calibration cells approx. 25 minutes (Automatic calibration).

Test gases for zero calibration (without calibration cells)

A zero gas is required for zero calibration in any case. We recommend using N_2 for calibration.

Test gases for end-point calibration without calibration cells

A test gas is required for each detector for span calibration without calibration cells. In the case of automatic and externally controlled calibration, a test gas mixture is required for all detectors since all are calibrated simultaneously. The span gas concentration should be 80 to 100 % of the end value of the largest measurement range.

No test gas is required for the automatic calibration.

Automatic calibration

Definition

Automatic calibration means:
Calibration with internal gas filled cells and ambient air. Zero and span calibration run automatically after starting. No test gas is required for the normal automatic calibration. During automatic calibration, the system runs on ambient air.

Starting automatic calibration

Automatic calibration can be started in two ways:

- At time intervals determined by the internal clock
- Manually via the display and operation unit of the gas analyzer

In the following the start is described in detail.

Internal start

Automatic calibration is normally started cyclically on a time-controlled basis by the internal clock of the gas analyzer.
The cycle time and the start time of the automatic calibration can be adjusted in the menu 'MENU / Configure / Calibration Data / Automatic Calibration' (Password: 081500).

By default, a zero and endpoint calibration is performed daily at 7:00 am.

Manual start

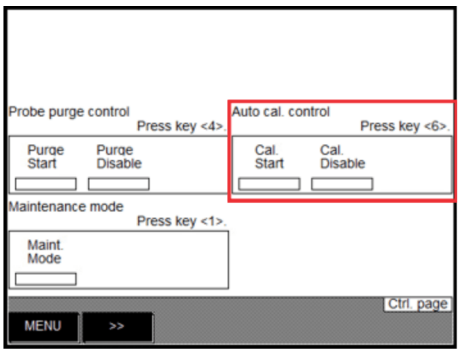


Figure 36: Control page

The automatic calibration can be manually started on the display and control unit. The easiest way to start the automatic calibration manually in the GAA610-M is from the control page. You can find them in the overview by changing the pages with '**>>**'.

When you reach the control page, you can start the calibration by pressing key **6**. You can also deactivate the automatic calibration here. If this option is activated, the automatic calibration is no longer performed.

You can also start the automatic calibration from the menu 'MENU / Calibrate / Automatic Calibration / Zero & span cal.'

It is also recommended to perform the zero & end point calibration here.

Message display

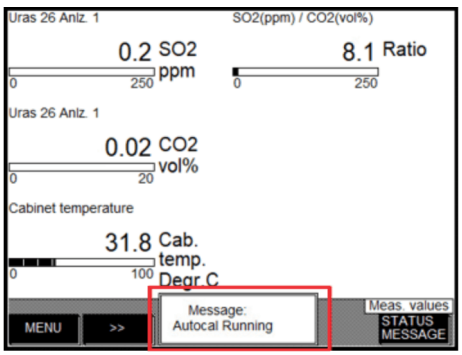


Figure 37: Status message 'Autocal Running'

During automatic calibration an 'Autocal Running' message blinks in the softkey line.

The calibration is completed. This can be checked in the logbook 'MENU → Diagnostic/Information → Logbook'. The logbook saves the last 500 events.

… 13 Maintenance

… Calibrating the analyzer system

Manual calibration

Definition

Manual calibration means:
Calibration with test gases. Zero and span are calibrated separately by pressing the gas analyzer display and control unit softkeys.
Test gases are dry gases, without any amount of water content.
The resulting zero-point shift switches the complete sensitivity line parallel and adjusts the calibration to the operating conditions.

Note

Before calibration let the system run with ambient air for at least 12 min.

Starting manual calibration

In the following, the calibration with test gas is explained by using SO_2 as an example. For other components the procedure is the same.

The manual calibration can only be started using the menu ‘MENU / Calibrate / Manual Calibration’.

Zero Point

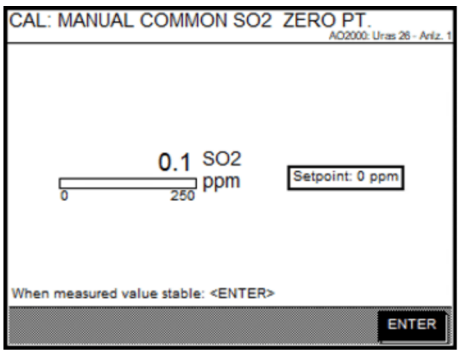


Figure 38: Stable zero point

If you have opened the manual calibration, you must first select the component. Then select the zero or end point. You should start with the zero point.
In the next step, the concentration of the test gas can be entered. For the zero point ambient air can be used, therefore the concentration of SO_2 is 0ppm. Confirm your settings.
You must wait a little until the measured value is stable. If the measured value no longer changes, confirm your setting.
The system now performs the calibration for the zero point.
Confirm the new measurement value again to save the calibration.

Span Point

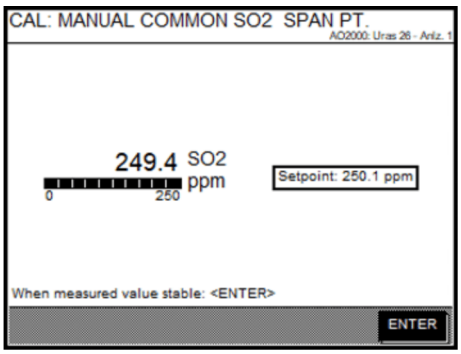


Figure 39: Stable end point

For the end point, the procedure is very similar. First select the component and the option ‘Span gas’.
Now enter the concentration of the test gas you are using. Please note that the test gas should have a concentration of 80 to 100 % of the measuring range. When you have confirmed the concentration, you can give up the test gas using the test gas connection.

From the first visible signal change wait at least 10 minutes (Please do not purge the system with dry gas **for more than 15 min.**). After that, confirm your reading when the end point is reached.

The system now performs the calibration for the span point. Confirm the new measurement value again to save the calibration.

The calibration is completed. This can be checked in the logbook ‘MENU → Diagnostic/Information → Logbook’. The logbook saves the last 500 events.

Basic calibration

What does the basic calibration do?

A basic calibration of an analyzer module sets the module back in an initial state. The offset drift and amplification drift are set to zero. The drift history is lost. This should only be done by staff who are aware of this function.

When should a basic calibration be performed?

Basic calibration of an analyzer module should be performed only in exceptional cases when changes that affect calibration have been made. This may be the case e.g. after exchanging subassemblies. For the Uras26 analyzer module, a basic calibration can be performed at the zero point for calibration to the cooler dew point during commissioning at the sampling point.

Check prior to a basic calibration

Prior to a basic calibration, check and ensure:

- That the gas analyzer is in proper operating condition
- That the sample conditioning units are in proper operating condition
- That the correct test gases are being used.
- Before performing the basic calibration, the pressure sensor should be calibrated.

Test gases

The zero and/or span calibration test gases are required for a basic calibration.

Starting and performing the basic calibration

The basic calibration is performed for each sample component. It is recommended to perform the basic calibration in zero and endpoint.

If a new basic calibration is performed, it is recommended to perform a pressure sensor calibration and a calibration reset first.

Pressure Sensor Calibration

The pressure sensor calibration can be performed at 'MENU / Maintenance/Test / Analyzer spec. adjustm. / Atm. press. anlz'.

1. Confirm the module 'URAS26' and close the next message with '**BACK**'.
2. Then enter the current atmospheric pressure and the password. (Password: 081500)
3. After this, the sensor will be recalibrated. After the adjust all gas components have to be gas calibrated.

Calibration Reset

The calibration reset can be performed at 'MENU / Maintenance/Test / Analyzer spec. adjustm. / Calibration Reset'.

This deletes the current data of the basic calibration.
Select the component and perform the reset. After that the basic calibration can be performed.

Basic calibration

The basic calibration can be started in the menu 'MENU / Maintenance/Test / Analyzer spec. adjustm. / Basic Calibration' (Password: 081500).

1. After entering the password, select the component and the 'Zero/span basic cal.'
2. Confirm your test gas concentration and wait until the reading is stable as shown in Figure 39. The procedure for the end point is the same.
3. After the basic calibration, you have to continue with 'Measurement of calibration cells'.

… 13 Maintenance

… Calibrating the analyzer system

Measurement of calibration cells with test gas

Definition

The measurement of a calibration cell in the Uras26 analyzer modules means:

Determining what calibration cell ‘deflection‘ is equivalent to the calibration reading with test gas. The ‘deflection‘ is stored as the ‘set point‘ of the calibration cell.

When should calibration cells be measured?

We recommend measuring the calibration cells once a year. We recommend measuring the calibration cells:

- after end-point calibration of a sample component with test gas or
- after any change in measurement range limits or
- after a Basic calibration.

Starting and performing the Measurement of calibration cells

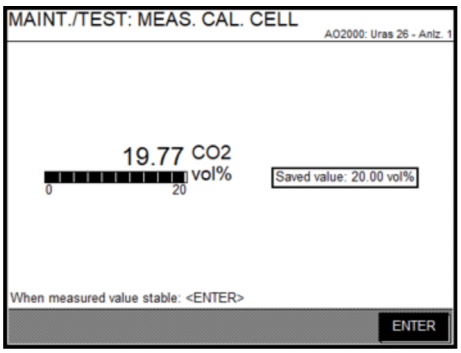


Figure 40: CO_2 end point with calibration cell

Please note that before measuring the calibration cuvettes, the zero and end points of the respective sample components must be calibrated with test gases.

During the measurement, the system should use ambient air.

1. Open the menu ‘MENU / Maintenance/Test / Analyzer spec. adjustm. / Measure cal. cell’.
2. Please wait until the measured value is stable (Figure 40).
3. If this is the case, confirm the setting with ‘**ENTER**’.

Checking the seal integrity

When is the seal integrity check needed?

Complete seal integrity check of the analyzer system is reserved for certified service personnel.

It should be carried out regularly at least every 12 months.

It must be performed after gas paths within the analyzer system have been opened and following a restart from cold.

The seal integrity check should be performed according to the pressure-drop method using a U-tube manometer.

Procedure

1. Interrupt the sample gas supply.
2. Close the sample gas outlet.
3. Disconnect the sample gas line from the sample gas inlet and connect a tee fitted with a shut-off valve.
4. Connect the U-tube manometer half filled with water to the free end of the tee.
5. Blow air or nitrogen through the shut-off valve to a gauge pressure of approx. 100 hPa (= 1000 mm water column).
6. Close the shut-off valve. The pressure should not chance measurably in 1 minute (pressure drop ≤ 1 hPa). A sharp pressure drop is a sign of a leak.

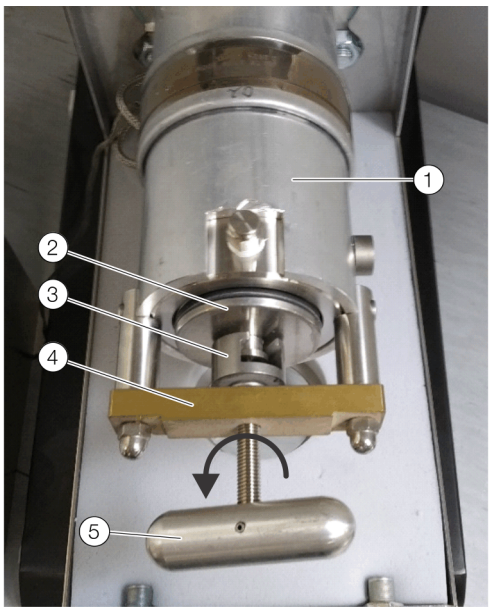
Replacing the filter element in the filter unit

⚠ CAUTION

Danger of burns

Danger of burns on the hot measuring probe.

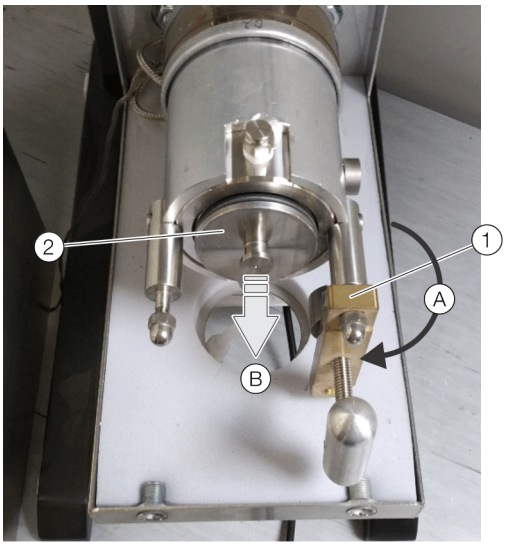
- Switch off the power supply to the probe heater.
- Allow the measuring probe to cool down.
- Wear suitable protective gloves.
- Carefully open the weather protection case.



① Filter housing
② Filter holder
③ Filter retainer
④ Brige
⑤ T-handle

Figure 41: Filter unit without cover

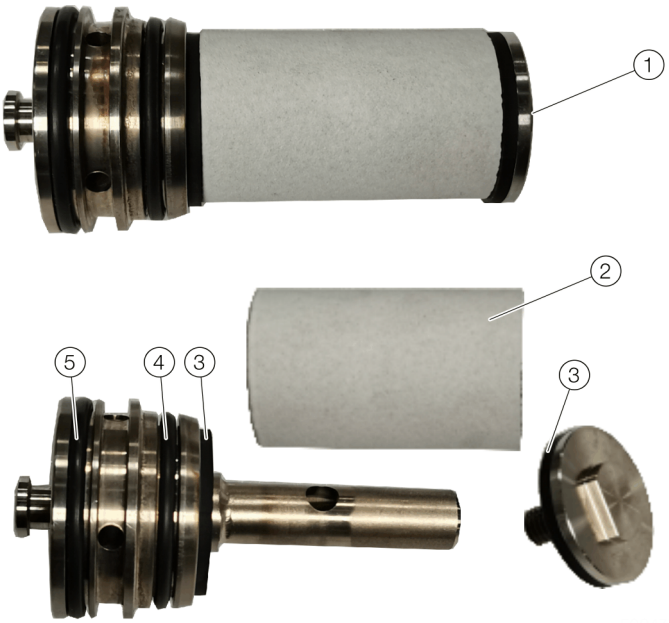
1. Turn off power supply to the probe heater **(–F63)**.
2. Activate the 'Maintenance Mode' on the control panel.
3. Open the cover of the filter unit.
4. Turn the T-handle counter-clockwise direction.
   – This pulls the filter holder via the filter retainer out of the filter housing.



① Bridge
② Filter element

Figure 42: Remove filter element

5. Turn the bridge clockwise Ⓐ.
6. Pull out filter element Ⓑ.



① Filter holding screw
② Filter element
③ Gasket (2×)
④ O-ring (small)
⑤ O-ring (big)

Figure 43: Demount filter holder

7. Unscrew filter holding screw to remove the filter element.
   – A number 14 wrench may be used to loosen the screw
8. Exchange the O-rings and the gaskets.

… 13 Maintenance

… Replacing the filter element in the filter unit

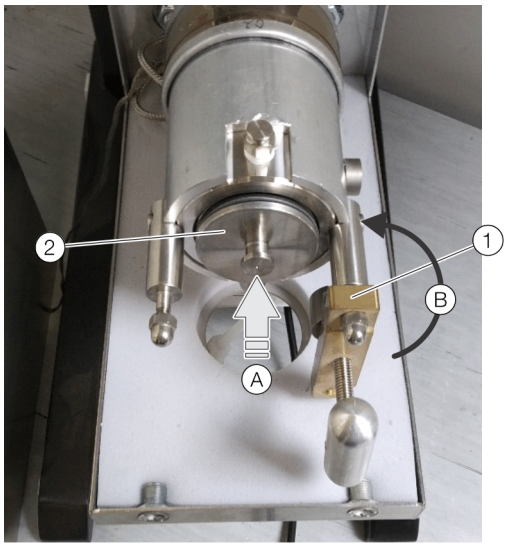
9. Attach the new filter element and tighten it hand-tight with the filter holding screw.

NOTICE

Damage to the filter element

Damage to the filter element due to improper installation.
Excessive force could break the filter element!
The Filter element might expand during the heating process.

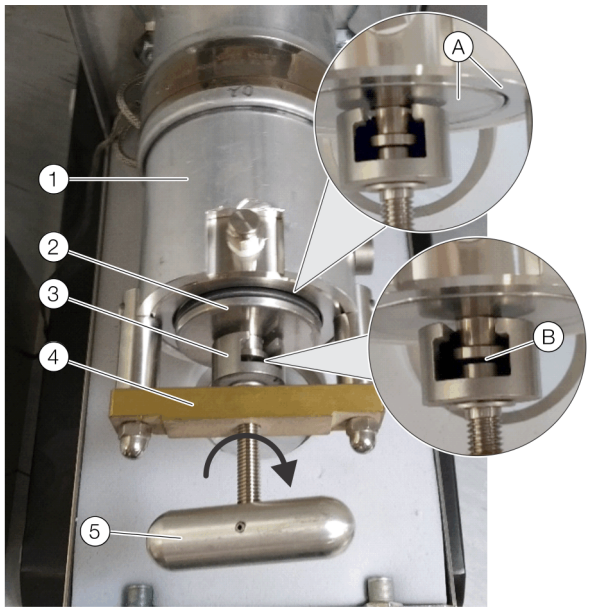
- Fasten the filter element only hand-tight.



① Bridge ② Filter element

Abbildung 44: Insert the filter holder

10. Insert Ⓐ the filter holder back into the Filter housing.
11. Turn the bridge counter-clockwise Ⓐ.



① Filter housing ④ Brige
② Filter holder ⑤ T-handle
③ Filter retainer

Figure 45: Pusch in the filter holder

12. Turn the T-handle in clockwise direction.
    – This push the filter holder via the filter retainer in the filter housing.
13. Press the filter into the housing until the two surfaces Ⓐ are aligned.
14. Turn the T-handle counterclockwise to remove the mechanical force from the filter.
    – Turn the T-handle until there is a gap between the filter holder and the filter retainer.
15. Close the cover of the filter unit.
16. Turn on power supply to the probe heater **(–F63)**.
17. Deactivate the ‘Maintenance Mode’ on the control panel.

Soot filter

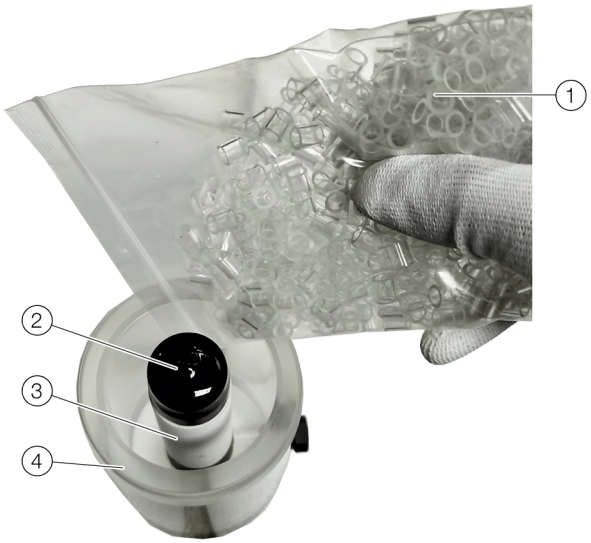
Ⓐ Sample gas inlet from SCC-C
Ⓑ Sample gas outlet to SCC-F
① Coupling nut
② Filter element
③ Filter housing
④ Raschig rings
⑤ Condensate drain

Figure 46: Soot filter

The oil/soot removal filter is located behind the front door of the analyzer cabinet.

Changing of the filter filling and the filter element

1. Activate the ‘Maintenance Mode’ on the control panel.
2. Turn off main switch.
3. Remove the hose from the sample gas inlet.
4. Open the condensate drain and dispose of escaping medium in an environmentally friendly manner.
5. Close and seal the condensate drain.
6. Unscrew the filter housing.
7. Dispose of the soiled raschig rings in an environmentally friendly manner.
8. Unscrew the soiled filter element from the filter housing and dispose of it in an environmentally friendly manner.
9. Screw the new filter element into the filter housing and seal the upper opening.



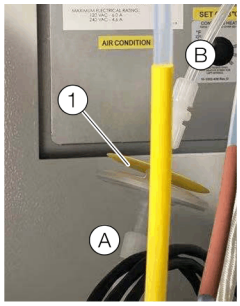
① Raschig rings
② Seal
③ Filter element
④ Filter housing

Figure 47: Replace filter element

10. Fill the new raschig rings into the filter housing.
11. Screw the filter housing in the coupling nut.
12. Connect the hose to the sample gas inlet.
13. Turn on main switch.
14. Check the seal integrity according to the description in .
15. Deactivate the ‘Maintenance Mode’ on the control panel.

… 13 Maintenance

Aqua stop filter



Ⓐ Sample gas inlet from SCC-F Ⓑ Sample gas outlet to AO2020

① Aqua stop filter

Figure 48: Aqua stop filter

The aqua stop filter is located behind the right door of the analyzer cabinet in the near of the sample gas solenoid valve.

Changing the aqua stop filter

1. Activate the ‘Maintenance Mode’ on the control panel.
2. Turn off main switch.
3. Remove the hose from the sample gas inlet and outlet.
4. Remove the used aqua stop filter.
5. Insert the new aqua stop filter in the sample gas line.
   – Make sure the installation direction is correct (gas inlet at the bottom)
6. Turn on main switch.
7. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
8. Deactivate the ‘Maintenance Mode’ on the control panel.

Ambient air filter (zero gas)

① Ambient air filter

Figure 49: Ambient air filter

The ambient air filter is located outside the analyzer cabinet at the zero gas inlet.

Note
The exchange can be carried out during operation. Make sure that the calibration does not start during this period.

Changing the ambient air filter

1. Remove the used ambient air filter.
2. Insert the new ambient air filter at the zero gas inlet.
   – Make sure the flow direction is correct (Arrow to the system).

Analyzer air conditioner

Compressor

The compressor requires no maintenance. It is hermetically sealed, properly lubricated at the factory and should provide years of satisfactory operating service.
Should the refrigerant charge be lost, recharging ports (access fittings) on the suction and discharge sides of the compressor are provided for recharging and/or checking suction and discharge pressures.
Under no circumstances should the access fitting covers be loosened, removed or tampered with.
Breaking of seals on compressor access fittings during warranty period will void warranty on hermetic system.
Recharging ports are provided for the ease and convenience of reputable refrigeration repair service personnel for recharging the air conditioner.

Inlet air filter

Proper maintenance of the inlet air filter, located behind the front cover, will assure normal operation of the air conditioner. If filter maintenance is delayed or ignored, the maximum ambient temperatures under which the unit is designed to operate will be decreased.

If the compressor's operating temperature increases above designed conditions due to a dirty or clogged filter (or plugged condenser coil), the air conditioner's compressor will stop operating due to actuation of the thermal overload cut-out switch located on the compressor housing. As soon as the compressor temperature has dropped to within the switch's cut-in setting, the compressor will restart automatically. However, the above condition will continue to take place until the filter or coil has been cleaned. It is recommended that power to the air conditioner be interrupted intentionally when abnormally high compressor operating temperature causes automatic shut-down of the unit. The above described shutdown is symptomatic of a clogged or dirty filter, thus causing a reduction in cooling air flow across the surface of the compressor and condenser coil.

Note

- Do not run the air conditioner for extended periods of time with the filter removed. Particles of dust, lint, etc., can plug the fins of the condenser coil which will give the same reaction as a plugged filter. The condenser coil is not visible through the filter opening, so protect it with a filter.
- Continued operation under the above conditions can and will damage and shorten compressor life. The air conditioner is available with an easily removable inlet filter to facilitate necessary cleaning. There should be no reason to neglect this necessary maintenance.

Cleaning and changing the inlet air filter

Aluminum washable air filters are designed to provide excellent filtering efficiency with a high dust holding capacity and a minimum amount of resistance to air flow. Because they are constructed entirely of aluminum, they are lightweight and easy to service. To achieve maximum performance from your air handling equipment, air filters should be cleaned on a regular basis.

Filter removal and installation:

The inlet air filter is located behind the front access cover.

1. To access the filter, loosen the access-cover screw.
2. Swing top edge of access cover forward.
3. Slide air filter up and out of retaining tabs.
   – The filter may now be cleaned, or new filter installed.

Cleaning Instructions:

1. Flush the filter with warm water from the exhaust side to the intake side. DO NOT USE CAUSTICS.
2. After flushing, allow filter to drain. Placing it with a corner down will assure complete drainage.
3. Recoat the filters with RP Super Filter Coat adhesive. When spraying filter do so from both sides for maximum concentration of adhesive.

Note

It is recommended to exchange the filter once a year depending on the environmental conditions!

Emptying the condensate collection bottle

⚠ CAUTION

Risk of injury due to corrosive condensates

Condensates are often corrosive.

- When working with corrosive reagents note the hazard information and safety precautions contained in the applicable material safety data sheets.
- Neutralize condensates and follow the prescribed measures for disposal.

Empty the condensate collection bottle when the applicable status message is displayed.

… 13 Maintenance

SCC-C – Replace peristaltic pump hose

⚠ CAUTION

Risk of injury due to corrosive condensates

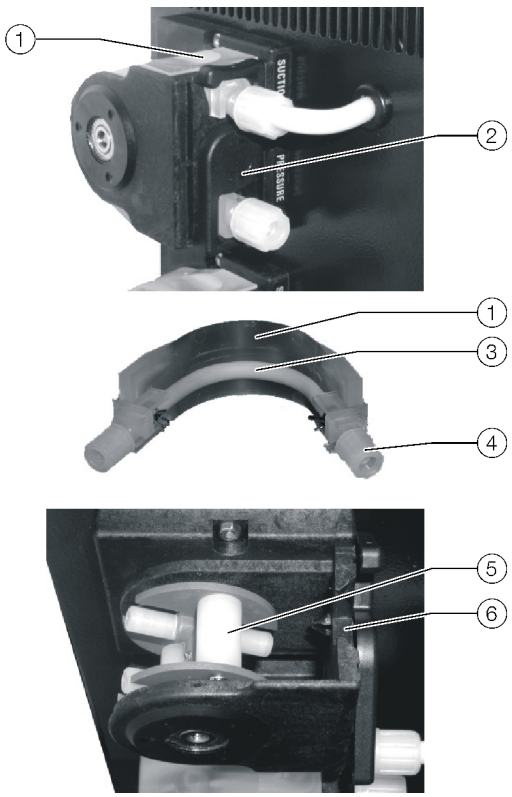
Condensates are often corrosive. The hoses can contain condensate residue. These materials can flow out when the hose connections are opened.

- Take appropriate measures where needed to collect residual condensates.
- Appropriate precautions should be taken, and relevant regulations on disposal should be complied with.

NOTICE

Damage to components!

The hoses on the peristaltic pumps should never be lubricated.



1 Moving belt
2 S-clip
3 Peristaltic pump hose
4 Hose connections
5 Pressure rollers
6 Dovetail guide

Figure 50: Replacing peristaltic pump hose

1. Activate the ‘Maintenance Mode’ on the control panel.
2. Turn off main switch.

Remove the old hose:

3. Remove the hoses from the hose connections (4).
4. Using the handles, press the moving belt (1) together and turn the s clip (2) in a clockwise direction as far as its limit stop.
5. Remove the moving belt (1) from the pump head and pull the old hose (3) by the hose connections (4) to release it from the moving belt’s guides.
6. Press the pressure rollers (5) together and check the spring pressure; if it is too weak, then the pressure springs and possibly rollers should be replaced.

Fit a new hose:

7. Insert a new hose (3) with hose connections in the guides on the moving belt (1).
8. Insert moving belt (1) with the new hose in the dovetail guide (6) in the pump head; using the handles, press the moving belt together while at the same time turning the s-clip (2) counterclockwise until it engages.
9. Screw hoses to the hose connections (4).
   - Take care not to kink or crush the hoses.

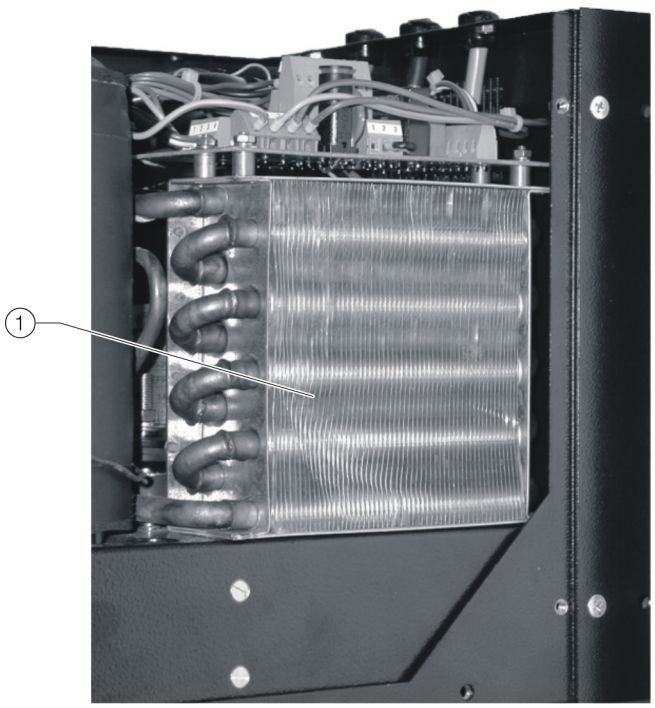
Restart the sample gas cooler:

10. Turn on main switch.
    – The sample gas flow should only be restarted after the lead time period.
11. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
12. Deactivate the ‘Maintenance Mode’ on the control panel.

SCC-C – Clean condenser fins

When should the condenser fins be cleaned?
Cooling performance is reduced by the accumulation of dust on the condenser fins.

For this reason the condenser fins should be inspected regularly and cleaned if any dust deposits are visible.



(1) Condenser fins

Figure 51: Cleaning the condenser fins

1. Activate the ‘Maintenance Mode’ on the control panel.
2. Turn off main switch.
3. Remove the SCC-C from the analyzer cabinet.
4. Undo the 4 fastening screws on the front cover and open it forwards (the front cover remains attached in the rebate of the base plate).
5. Undo the 8 fastening screws on the covering hood, release the cable lug of the protective leads from the quick terminal on the inside of the covering hood, then lift the covering hood off.
6. Carefully blow compressed air onto the condenser fins (1).
7. Press the cable lug of the protective leads onto the quick terminal on the inside of the covering hood, put the covering hood in place (taking care not to trap any cables or hoses), and secure it in place with the 8 screws.
8. Close front cover (taking care not to trap cables or hoses), and fasten it with the 4 screws.
9. Install the SCC-C in the analyzer cabinet.
10. Turn on main switch.
    – The sample gas flow should only be restarted after the lead time period.
11. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
12. Deactivate the ‘Maintenance Mode’ on the control panel.

… 13 Maintenance

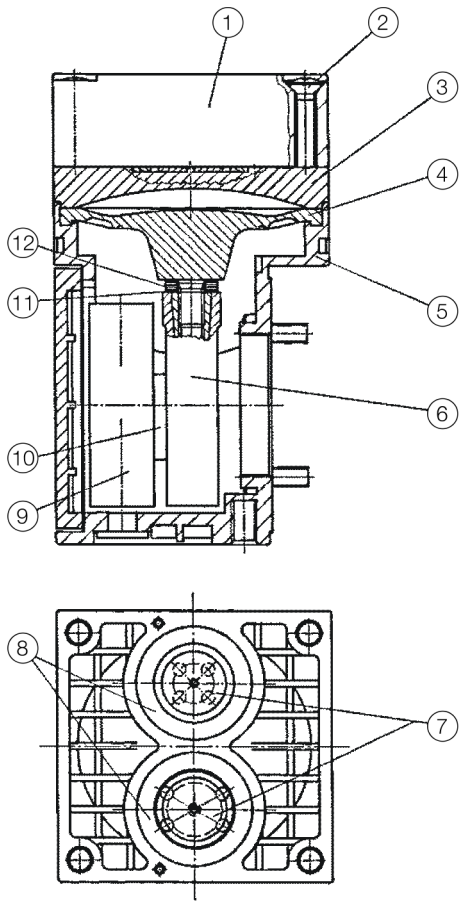
SCC-F – Replacing the diaphragm and valve plates

When do the diaphragm and valve plates need to be replaced?
The diaphragm and valve plates in the diaphragm pump must be replaced when the diaphragm pump no longer feeds gas efficiently enough.

⚠ CAUTION

Risk of injury due to sample gas
The medium being fed may be corrosive and poisonous. Residues from the gas that the pump has been feeding may be found on the diaphragm and valve plates. These materials can flow out when the diaphragm pump is opened.

- Take appropriate measures where needed to collect such residues.
- Appropriate pre¬cautions must be taken.



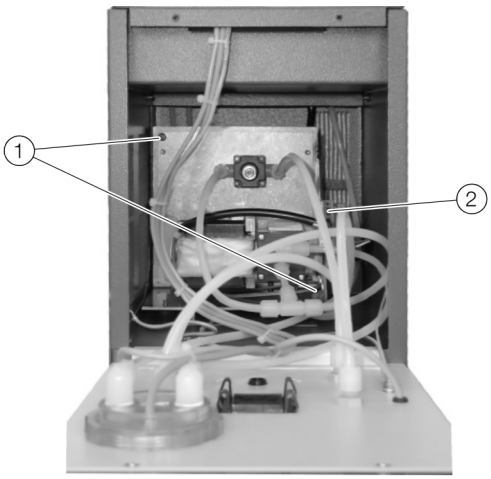
(1)	Head cap	(7)	Valve plates
(2)	Head cap screws	(8)	Sealing rings
(3)	Spacer plate	(9)	Counter weight
(4)	Structural diaphragm	(10)	Eccentric
(5)	Casing	(11)	Belleville spring
(6)	Connecting rod	(12)	Distance ring(s)

Figure 52: Diaphragm pump

1. Activate the 'Maintenance Mode' on the control panel.
2. Turn off main switch.

Dismantle the diaphragm pumps:

3. Disconnect electrical connection (2), loosen two hex socket head screws (1) and remove mounting plate with the pumps from the sample gas feed unit's casing.



4. Take off the pump hoses and clean the outside of the pump.

Remove the pump head (see Figure 52):

5. Mark the head cap (1), spacer plate (3) and casing (5) with a felt pen. This prevents the possibility of these parts being fitted incorrectly when the pump is reassembled later.
6. Undo the four head cover screws (2) and remove the head cap along with the spacer plate from the pump casing.

Replace diaphragm (see Figure 52):

7. Move the structural diaphragm (4) by rotating the fan impeller to its upper return point.
8. Hold opposite sides of the structural diaphragm, raise it, and then remove it by rotating in a counterclockwise direction.
   - During this procedure you should take care to ensure that the Belleville spring (11) and the distance ring(s) (12) do not fall from the structural membrane's threaded bolt into the casing.
9. Remove the Belleville spring (11) and distance ring(s) (12) from the structural diaphragm's threaded bolt and retain them.
10. Check all the parts for dirt and, if necessary, clean them with a dry cloth or compressed air.
    - Do not use solvents for cleaning as they can attack the plastic parts.

11. Push the distance ring(s) and the Belleville spring in that order onto the threaded bolt of the new structural diaphragm.
    - The disk edge of the spring must be aligned with the structural diaphragm.
12. Move the connecting rod (6) to its upper return point.
13. Screw the new structural diaphragm with distance ring(s) and Belleville spring in a clockwise direction onto the connecting rod and hand-tighten it.

Replace valve plates (see Figure 52):

14. Separate head cap (1) from the spacer plate (3).
15. Remove the valve plates 7 and the sealing rings (8) from the spacer plate (3).
16. Check that the valve seats, spacer plate and head cap are clean; if any of them display unevenness, scratches or corrosion they should be replaced.
17. Insert the new valve plates in the valve seats on the spacer plate. The valve plates for the compression and suction sides are identical; the same applies to the upper and lower sides of the valve plates.
18. Move the valve plates gently in a horizontal plane to ensure that they are not locked.
19. Insert sealing rings in the spacer plate.

Fit the pump head:

20. Using the fan impeller, move the structural diaphragm to its upper dead point.
21. Place the spacer plate (3), the valve plates (7), sealing rings (8) and the head cap (1) on the casing in accordance with the markings.
22. Check that the head cap is centered correctly by moving it gently sideways.
23. Tighten the head cap screws (2) crosswise only slightly.
24. Check that the pump moves freely by turning the fan impeller.
25. Using the fan impeller, move the structural diaphragm to its upper dead point.
26. Hand-tighten the head cap screws.

Reinstall diaphragm pumps:

27. Connect pump hoses.
28. Insert mounting plate with the pumps into the sample gas feed unit's casing and fasten it with the two hex socket head screws. Connect electrical connection.

Start the sample gas feed unit again:

29. Turn on main switch.
    – The sample gas flow should only be restarted after the lead time period.
30. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
31. Deactivate the 'Maintenance Mode' on the control panel.

… 13 Maintenance

Replacing the SCC-C

If there is a malfunction of the SCC-C, it may be necessary to replace it. In the following, the individual points are described step by step. Because this is a 1:1 exchange, no software adjustments are required.

⚠ CAUTION

Risk of injury from electric shock

The SCC-C can be hazardous if the protective lead is interrupted inside or outside the sample gas feed unit or if the protective lead is disconnected.

- Follow all applicable national safety regulations for the installation and operation of electrical devices as well as the following safety precautions.
- The protective lead should be attached to the protective lead connector before any other connection is made.

NOTICE

The sample gas cooler should always be transported and stored with the gas ports up. Otherwise the oil in the compressor circuit could leak from the compressor cap. The sample gas cooler must stand in its operating position for about 24 hours prior to commissioning.

Remove the old SCC-C

Figure 53: SCC-C cover screws

1. Switch off the entire system with the main switch.
2. Open the front cover plate by unscrewing the two screws (1).
3. Disconnect the hose connections to the cooler (two on top (4), one on the front (3)).
4. Unscrew the four screws on the front that hold the cooler in the housing.
5. Remove the four screws (5) on the top of the cooler and the four screws (6) on the right side of the cooler to disconnect the connections. The two upper screws (2) of the front panel also have to be unscrewed.
6. Carefully remove the cover and disconnect the PE connection to it.
7. **Check that the device is free of power**. (Voltage measurement at **–X1**)
8. Disconnect the cables at **–X1** 2,3,4 and **–X4** 1,2.
9. Remove the cables from the housing and remove the cooler.

Prepare the new SCC-C

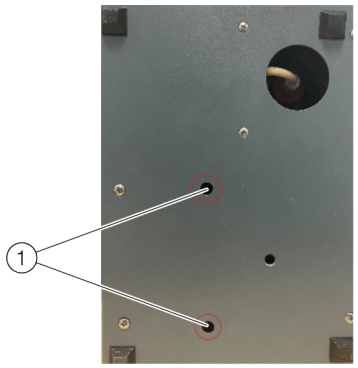


Figure 54: Transport lock SCC-C

1. Unscrew the mounting brackets from the rear of the side covers and screw them securely at the front of the side covers, flush with the front cover, using the drill holes provided for this purpose.
2. Using a Ph2 cross-head screwdriver, turn the two screws counterclockwise through the holes (1) in the base plate up to the point at which resistance can be felt.
3. Remove the four screws (Figure 60 (5)) on the top of the cooler and the four screws (Figure 60 (6)) on the right side of the cooler to disconnect the connections. The two upper screws (Figure 60 (2)) of the front panel also have to be unscrewed.
4. Carefully remove the cover and disconnect the PE connection to it.
5. The cooler can now be installed.

Install the new SCC-C

1. Insert the prepared SCC-C into the housing of the GAA610-M.
2. Put the cables through the cable inlets of the SCC-C and connect them. Make sure that the connection is correct. **(–X1** for 230 V AC (1) and **–X4** for the signal (2)).

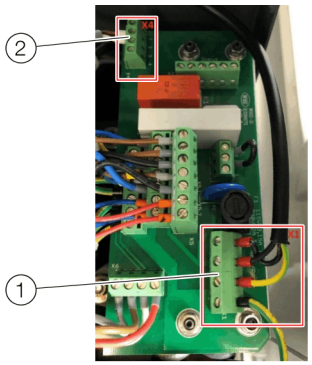


Figure 55: Electrical connection SCC-C

3. Carefully place the cover on the cooler. While doing so, connect the PE to the cover.
4. Screw the cover with the four screws on the top and the four screws on the right side. Also remember the two screws on the front.
5. Mount the SCC-C in the housing of the GAA610-M (four screws on the front side)
6. Reconnect the hose connections.
7. Now wait 24 hours without starting up the system.
8. Turn on main switch.
9. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
10. After heating up, everything should now work again as usual. If necessary, perform an automatic calibration.

… 13 Maintenance

Replacing the SCC-F

If there is a malfunction of the SCC-F, it may be necessary to replace it. In the following, the individual points are described step by step. To replace the SCC-F, adjustments must be made in the AO's menu.

Note
A qualified electrician is required for this work.

⚠ CAUTION

Risk of injury from electric shock
The SCC-F can be hazardous if the protective lead is interrupted inside or outside the sample gas feed unit or if the protective lead is disconnected.

- Follow all applicable national safety regulations for the installation and operation of electrical devices as well as the following safety precautions.
- The protective lead should be attached to the protective lead connector before any other connection is made.

NOTICE

Damage to the SCC-F
Damage to the SCC-F due to incorrect mains voltage setting.

- The sample gas feed unit voltage must be set to match the line voltage before the power supply is connected (see rating plate).

Remove the old SCC-F

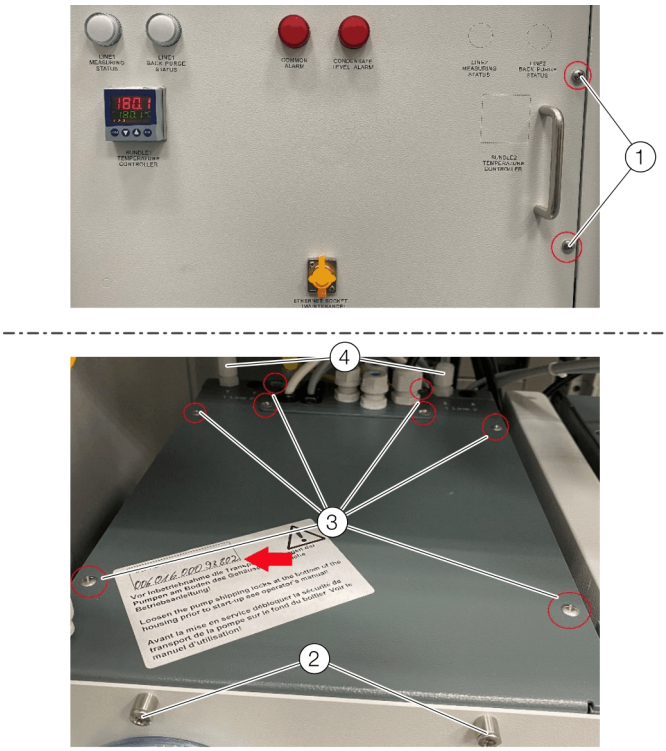


Figure 56: SCC-F cover screws

1. Switch off the entire system with the main switch.
2. Open the front cover plate by unscrewing the two screws (1).
3. Disconnect the hose connections (4).
4. Unscrew the four screws on the front that hold the SCC-F in the housing.
5. Unscrew all 8 screws (3) of the cover. To remove the cover, you have to unscrew the four screws (2) on the front side. Pay attention to the PE on the cover.
6. Carefully remove the cover and disconnect the PE connection to it.
7. **Check that the device is free of power**. (Voltage measurement at **–X1**)

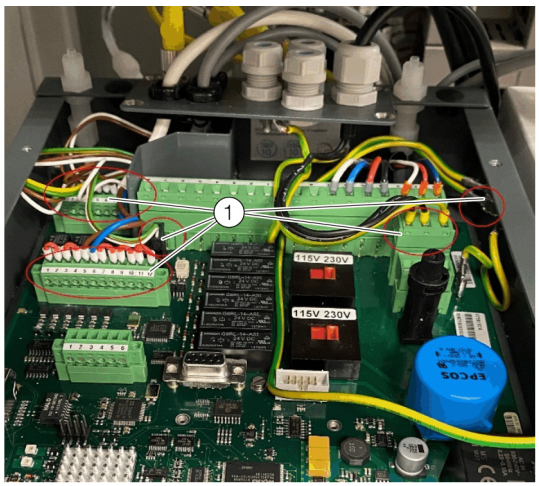


Figure 57: Electrical connections SCC-F

8. When the cover is removed and the power is disconnected, you can remove the marked connectors (1). Pay attention to the PE on the connection plate. All connections to the SCC-F are now disconnected.
9. Remove the four screws that connect the SCC-F to the GAA610-M.
10. The SCC-F can now be removed.

Prepare the new SCC-F

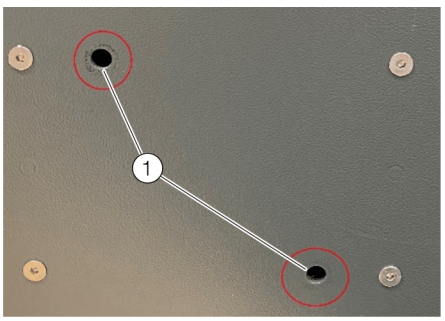


Figure 58: Transport lock SCC-F (Bottom view)

1. Unscrew the mounting brackets from the rear of the side covers and screw them securely at the front of the side covers, flush with the front cover, using the drill holes provided for this purpose.
2. Use a Ph2 crosshead screwdriver to loosen the transport lock (1) (two M6×25 mm screws) in the base plate.
3. Unscrew all 8 screws of the cover (Figure 56 (3)). Remove the cover and connection plate. Pay attention to the PE connections.

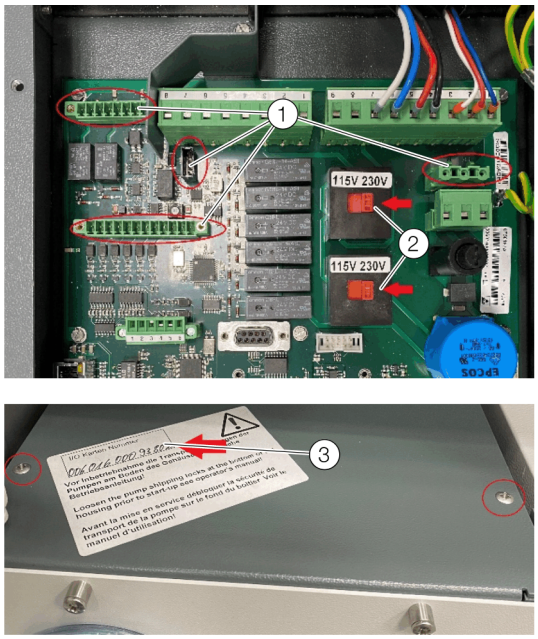


Figure 59: Required connections SCC-F, electronics number

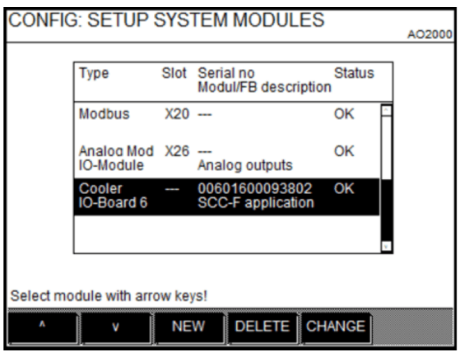
4. Remove the marked connectors (1) and make sure that the 230 V setting (2) is selected.
5. Make a note of your individual electronics number (3).
6. The SCC-F can now be installed.

… 13 Maintenance

… Replacing the SCC-F

Install the new SCC-F

1. Insert the prepared SCC-F into the housing of the GAA610-M and fix it.
2. Plug the connectors into the circuit board. Make sure that the connections are all correct (Figure 57). Secure the connectors with the safety screws. Make sure that the PE to the connection plate is properly connected.
3. Close the cover with all eight screws (Figure 56 ③). Also remember the four screws at the front (Figure 56 ②). Make sure that the PE to the cover is properly connected.
4. Reconnect the hose connections.
5. Turn on main switch.
6. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
7. That the SCC-F work with the system, the new number must be entered in the menu. Proceed as follows:
   'MENU /Configure / System / Setup system modules'
8. Select the Cooler, SCC-F Application.



9. Press '**CHANGE**' (PW: 081500).
10. Now enter the individual electronics number you have noted. Confirm your settings.
11. Save the changed configuration.
    'MENU /Configure / System / Save configuration' ⇒ '**ENTER**'.
12. The system should now work as usual. (It is possible that you will have to acknowledge the error messages that have appeared after the system has been changed. This is possible in the '**STATUS MESSAGE**').

Replacing the AO2020

If there is a malfunction of the AO2020, it may be necessary to replace it. In the following, the individual points are described step by step. To replace the AO2020, adjustments must be made in the AO's menu.

Note
A qualified electrician is required for this work.

⚠ CAUTION

Risk of injury from electric shock
The AO2020 can be hazardous if the protective lead is interrupted inside or outside the sample gas feed unit or if the protective lead is disconnected.

- Follow all applicable national safety regulations for the installation and operation of electrical devices as well as the following safety precautions.
- The protective lead should be attached to the protective lead connector before any other connection is made.

Remove the old AO2020

Figure 60: Front AO2020, mounting AO2020 on housing (right)

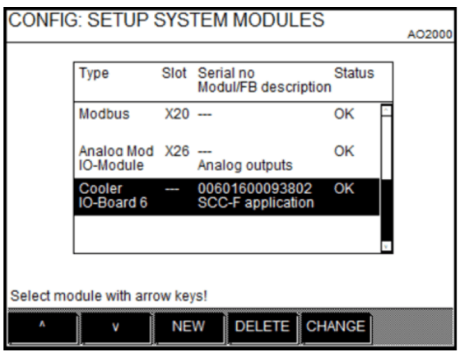
1. Switch off the entire system with the main switch.
2. Unscrew the four front screws ① to be able to pull out the AO2020.
3. Remove all connectors and hoses from the rear panel. Mark the position so that there is no mix-up later.
4. Remove the holder for the cable tube.
5. Unscrew the four screws ② on the front edge (left & right) of the slide-in unit to remove the AO2020.
6. The AO2020 can now be removed.

Prepare the new AO2020

The new AO2020 is calibrated and ready for use. Only the gas connections need to be screwed into the connection plate. Make sure that the connections are gas tight.

Install the new AO2020

1. Insert the prepared AO2020 into the housing of the GAA610-M and fix it.
2. Mount the holder for the cable tube.
3. Connect all plugs and hoses as previously marked.
4. Mount the rack with the four screws on the front side.
5. Turn on the main switch and wait for the system to power up. Note that the system must heat up before it is ready for operation.
6. The serial number of the SCC-F must now be entered in the menu. Proceed as follows:
   'MENU /Configure / System / Setup system modules'
7. Select the Cooler, SCC-F Application.



8. Press '**CHANGE**' (PW: 081500).
9. Now enter the individual electronics number you have noted. Confirm your settings.
10. Save the changed configuration.
    'MENU /Configure / System / Save configuration' ⇒ '**ENTER**'.
11. The system should now work as usual. (It is possible that you will have to acknowledge the error messages that have appeared after the system has been changed. This is possible in the '**STATUS MESSAGE**').
12. Check the seal integrity according to the description in **Checking the seal integrity** on page 78.
13. If there are no errors and the system is heated up, perform an automatic calibration. The system is now ready for operation.

14 Decommissioning

Safety instructions

⚠ CAUTION

Risk of injury due to corrosive condensates

Condensates are often corrosive.

- When working with corrosive reagents note the hazard information and safety precautions contained in the applicable material safety data sheets.
- Neutralize condensates and follow the prescribed measures for disposal.

NOTICE

Damage to components!

Damage to components due to improper decommissioning.

- Before being shut down the analyzer system should be purged in order to prevent condensation and condensate deposits in the individual units.

Shutting Down the Analyzer System

1. Flush the sampling probe, filter and sample gas line, e.g. by drawing outside air from the sampling probe.
2. Purge the gas paths of the analyzer system for 30 minutes.
3. Turn off the analyzer system with main switch **–Q60**.

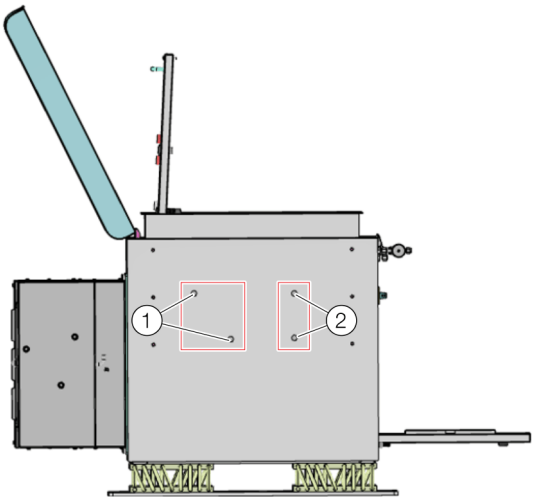
Emptying the Condensate Collecting Bottle

Empty the condensate collecting bottle and dispose of condensates according to applicable regulations.

Note

Make sure the analyzer system is free of residual moisture that can freeze if low temperatures are encountered during shipping and storage.

Transportation restraints activation



① Sample Gas Feed Unit SCC-F transportation restraints

② Sample Gas Cooler SCC-C transportation restraints

Figure 61: Position of transportation restraints (Bottom view of analyzer cabinet)

Sample Gas Feed Unit SCC-F

Diaphragm Pumps transportation restraints:

Using a Ph2 crosshead screwdriver, screw two M6x25 screws through the holes ① in the base plate into the diaphragm pumps base plate and tighten them.

Sample Gas Cooler SCC-C

Compressor transportation restraints:

Using an offset Ph2 crosshead screwdriver, turn the two screws clockwise through the holes ② in the base plate to the point at which the compressor housing is in contact with the base plate (noticeable resistance).

Ambient conditions

Ambient temperature during transport / storage

- 2 to 60 °C (35.6 to 140 °F);
- −20 to 70 °C (−4 to 158 °F) after draining and drying parts in contact with condensate.

Max. permissible humidity

Year-round average max. 75%, short-term max. 95%, occasional slight condensation is permitted.

15 Recycling and disposal

Note

Products that are marked with the adjacent symbol may **not** be disposed of as unsorted municipal waste (domestic waste).
They should be disposed of through separate collection of electric and electronic devices.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:

- As of 8/15/2018, this product will be under the open scope of the WEEE Directive 2012/19/EU and relevant national laws (for example, ElektroG - Electrical Equipment Act - in Germany).
- The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment properly, our Service can take care of its pick-up and disposal for a fee.

16 Specification

Note

The device data sheet is available in the ABB download area at www.abb.com/analytical.

17 Additional documents

Note

All documentation, declarations of conformity, and certificates are available in ABB's download area.
www.abb.com/analytical

Trademarks

Modbus is a registered trademark of Schneider Automation Inc.

PROFIBUS and PROFIBUS DP are registered trademarks of PROFIBUS & PROFINET International (PI)

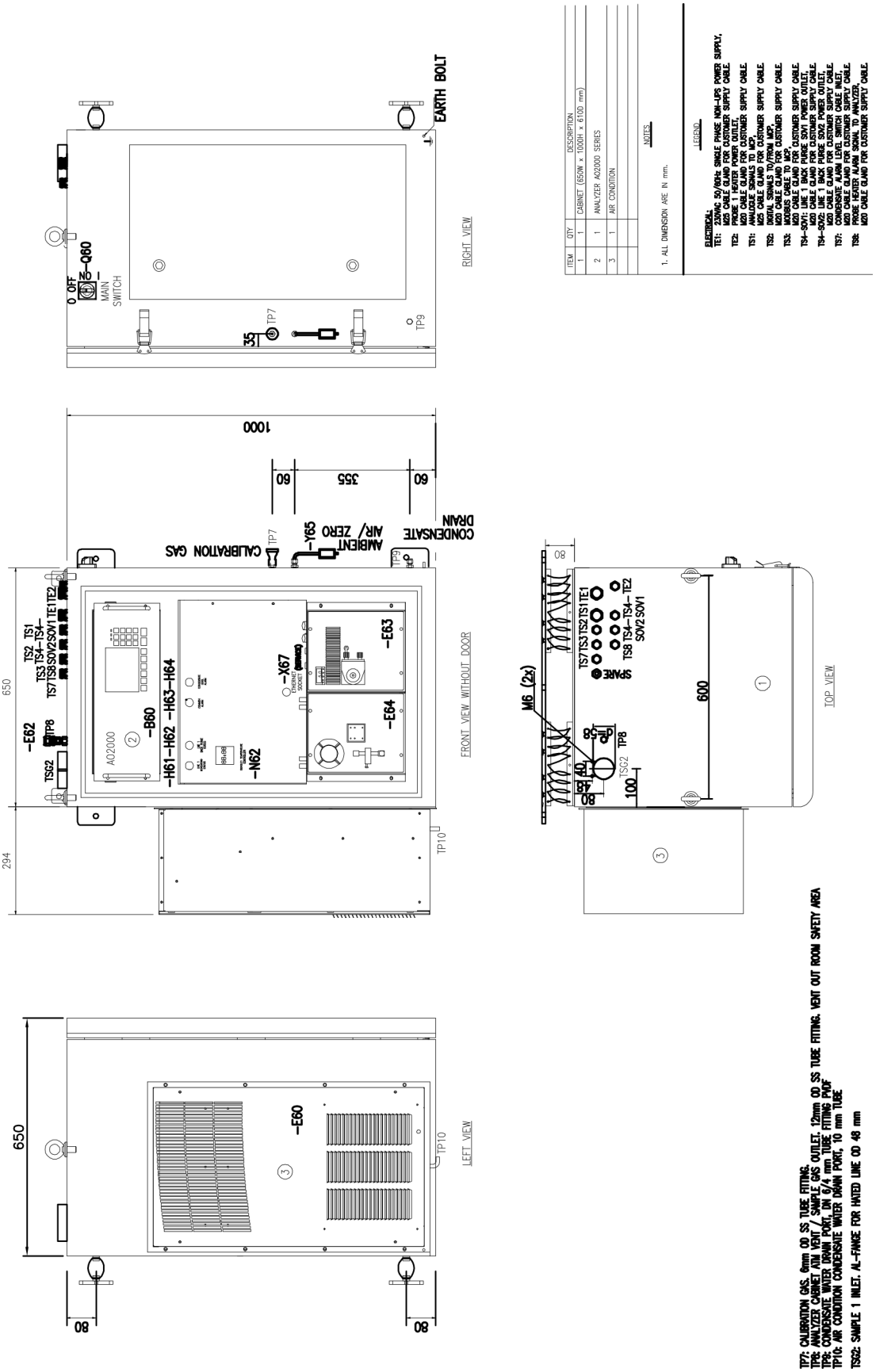
Windows is a registered trademark of Microsoft Corporation.

18 Appendix

Fuses type 5×20mm

Marking	Function	Tripping characteristic	Tripping current
-F70	Fuse protection 24V DC control emergency shutdown system (-K60, -S60)	time-lag fuse	2A
-F71	Fuse protection 24V DC control of sample gas valve (-Y60)	time-lag fuse	2A
-F72	Fuse protection 24V DC control of blowback valves (-Y61,-Y62)	time-lag fuse	2A
-F73	Fuse protection 24V DC signal lamps (-H61,-H62,-H63,-H64)	time-lag fuse	2A
-F74	Fuse protection 24V DC u-Remote CAN-Bridge (-D60)	time-lag fuse	2A
-F75	Fuse protection 24V DC relay for signal doubling (-K61,-K62)	time-lag fuse	0,5A
-F	SCC-F: Fuse protection 230V entire unit and cooler SCC-C	time-lag fuse	6,3A

Location diagram



ITEM	QTY	DESCRIPTION
1	1	CABINET (650W x 1000H x 610D mm)
2	1	ANALYZER A02000 SERIES
3	1	AIR CONDITION

NOTES

1. ALL DIMENSION ARE IN mm.

LEGEND

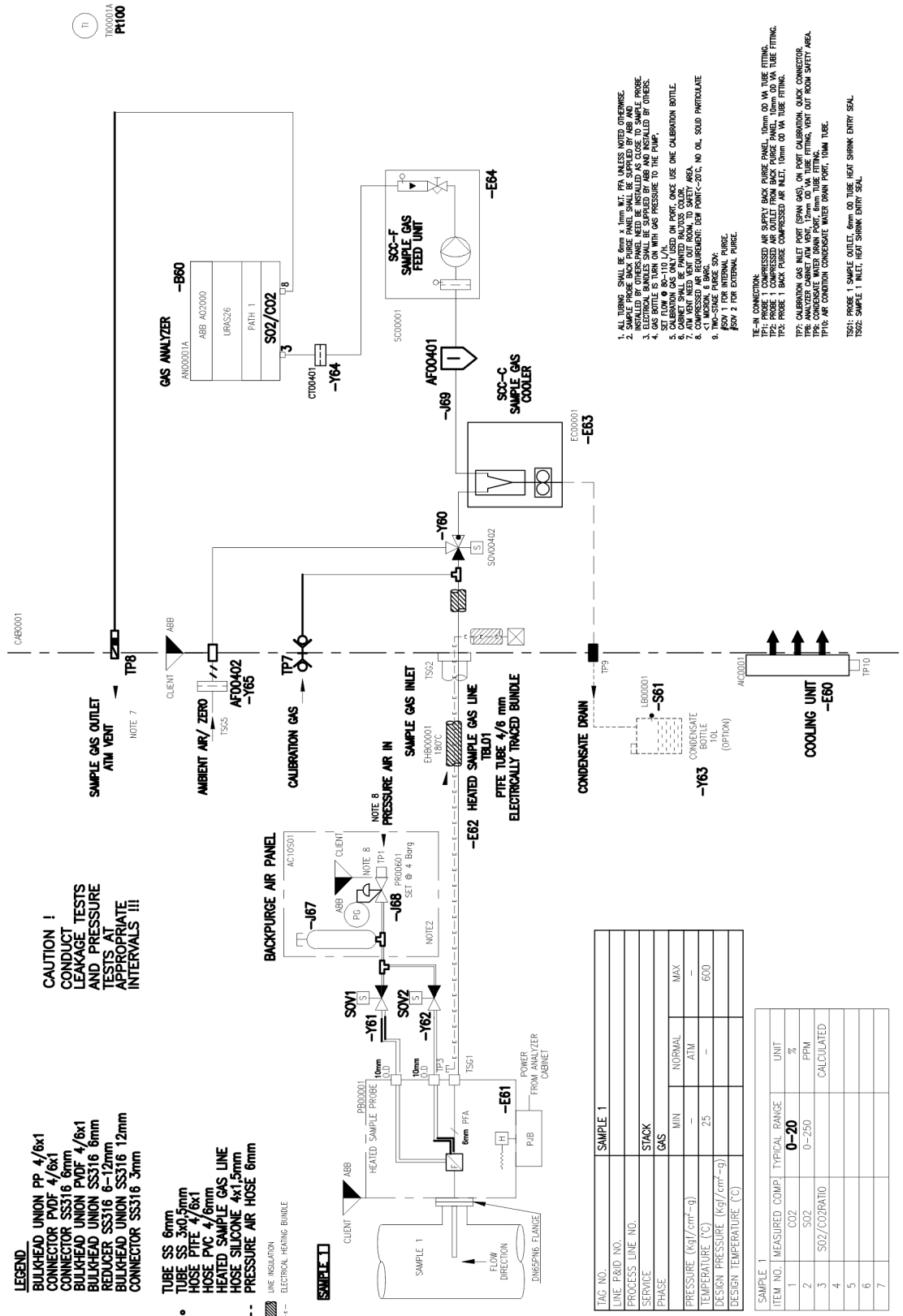
ELECTRICAL:

TE1: 230VAC 50/60Hz SINGLE PHASE NON-UPS POWER SUPPLY, MCB-SINGLE CLAMP FOR CUSTOMER SUPPLY CABLE.
TE2: PROBE 1 HEATER POWER OUTLET.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS1: ANALOGUE SIGNALS TO MCP.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS2: DIGITAL SIGNALS TO/FROM MCP.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS3: MODBUS CABLE TO MCP.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS4-SOV1: LINE 1 BACK PURGE SOV1 POWER OUTLET.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS4-SOV2: LINE 1 BACK PURGE SOV2 POWER OUTLET.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS7: CONSOLE ALARM LIGHT FOR CUSTOMER SUPPLY CABLE.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.
TS8: PROBE HEATER ALARM SIGNAL TO ANALYZER.
M20 CABLE GLAND FOR CUSTOMER SUPPLY CABLE.

TP7: CALIBRATION GAS, 6mm OD SS TUBE FITTING.
TP8: ANALYZER CABINET AMBIENT / SAMPLE GAS OUTLET, 12mm OD SS TUBE FITTING. VENT OUT ROOM SAFETY AREA
TP9: CONDENSATE WATER DRAIN PORT, DN 6.4 mm TUBE FITTING PVDF
TP10: AIR CONDITION CONDENSATE WATER DRAIN PORT, 10 mm TUBE
TSG2: SAMPLE 1 INLET. AL-FLANGE FOR HEATED LINE OD 48 mm

… 18 Appendix

Piping diagram



Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.
Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:

Address:

Contact person: Telephone:

Fax: Email:

Device details:

Type: Serial no.:

Reason for the return/description of the defect:

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items):

☐ biological ☐ corrosive / irritating ☐ combustible (highly / extremely combustible)

☐ toxic ☐ explosive ☐ other toxic substances

☐ radioactive

Which substances have come into contact with the device?

1.

2.

3.

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date Signature and company stamp

—

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/analytical

3KXG141006R4201

OI/GAA610-M-EN Rev. B 06.2021