SWG 100
BIOcompact

USER MANUAL

MRU ATR fair since 1984
EMISSION MONITORING SYSTEMS

9512GB-BIOCOMP

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Die leeren Seiten der Bedienungsanleitung sind kein Fehler sondern herstellungsbedingt erforderlich!

The blank pages of the operating instructions are not a mistake but due to manufacturing required!

Пустые страницы в инструкции по эксплуатации не ошибка, а требуется производством!

Les pages vides sont pas fauses, mais dûs à la production requise!

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1 1. Information for product and safety

1.1. Safety manual

All general information and safety precautions of MRU products are listed in the supplied separate safety manual.
All information and safety precautions for the analyser in the Safety Manual also apply to the analyser.
Therefore, this manual must be read and observed before the first use of the instrument.
Instrument-specific safety and warning requirements in this manual are prefixed before dangerous actions.

1.2. Safety precautions

The used categories of safety precautions are here explained once more.

DANGER

Identifies an immediate, impending hazard that, if ignored, will result in severe bodily injuries or death.

WARNING

Identifies an immediate, impending hazard that, if ignored, may result in severe bodily injuries, material damage or death.

CAUTION

Identifies a possibly dangerous situation that, if ignored, may result in minor injuries.

ATTENTION

Identifies a possibly harmful situation that, if ignored, may result in damages to the device or its surroundings.

NOTE

Identifies user tips and other especially important information.

The following safety procedures must be followed at all times. They are significant and essential part of this manual. Failure to follow safety procedures can result in the loss of your warranty claims.

Gases (landfill gas, bio-methane, coal seam gas etc.) can contain flammable gas component CH4 and toxic gas component as well (H2S and CO2).
Analyzer is continuously sampling a certain volume (approx. 50l/h) of the sample gas and is venting it to ambient air.
For this reason, there are two aspects which must be considered:

Toxicity danger of sample gas

⚠ WARNING

Toxic gas

Sample gas can contain toxic substances, which are harmful for health and can even cause death.

- It is the responsibility of analyser user to ensure that person is skilled and trained in safety aspects of gases being ana-lysed and procedures to follow while using this instrument.
- Local regulations for possible exposure to toxic gases must be known and obeyed by the user of the analyser
- Using a personal gas detector inside the plant is highly recommended since H2S in higher (very dangerous) concentration cannot be detected by human nose. Only small concentrations around few ppm can be detected by human nose
- CO2 gas is heavier than air and therefore operator shall avoid working at underground levels. Beware of that CO2 is also odorless!
- It is not allowed to use the analyser in confined space or rooms without forced ventilation.
- Sample gas exiting the analyser will flow into the ambient air and only outdoor use or forced ventilation rooms are suitable for using the analyser.

Flammable gas

⚠ WARNING

Flammable gas

Gas can contain flammable gas components.

Regarding flammable gases (e.g. CH4 methane) and operating-instruments in the hazardous areas, the user must also be able to recognize the area classifica-tion and be aware of using the instrument there. This area classification is country specific, please observe and adhere to it.
•Stationary analysers are allowed to be mounted in hazardous area zone 2 only if they have the certificate of compliance. These instruments shall never be located in confined places or rooms without forced ventilation.

Only trained personnel should carry out installation of stationary instrument and/or maintenance, service and repair. Opening the stationary analyser cabi-net can expose personnel to injuries and shocks from electrical voltage.

Acid condensate

⚠ WARNING

Acid substances

Moisture or condensate, being pumped out of the condensate outlet port can be slightly acidic.

► In case of skin contact IMMEDIATELY: clean affected parts of the body.
► Avoid getting liquid in eyes.

Please carefully clean all parts that come into contact with the condensate.

NOTE

Condensate
The analyzer is designed for sampling with condensate of max. 14ml/min.
If the sample will be very wet (high condensate of more than 14ml/min), then – to protect the analyzer – please consider special precautions to remove the condensate.
If you do not have your own feasible solution for this topic, please ask MRU.

1.3. Weather and environmental conditions

The analyser is designed for ambient temperatures of +5°C to +45°C (without cabinet heater) resp. -10°C to +45°C (with cabinet heater).
The analyser is designed for indoor mounting. In case of outdoor mounting it is important that the analyser is sufficiently protected against rain, sun and wind. In case of outdoor mounting under extreme environmental conditions like high humidity, salty sea air, etc. further protective measures are necessary. These should be clarified with the manufacturer (MRU).
Any additional protective measures for outdoor mounting have to be provid-ed by the plant operator. The manufacturer (MRU) consults the plant operator in choosing appropriate protective measures.

Battery cell

The analyzer contains battery cells at the following positions:
•Main board (1).

Follow steps must be aware:

⚠ WARNING

Switch off the power of the device

Before removing the battery the device must be switched off.

⚠ WARNING

Educated staff

It is recommended that only trained staff exchange the battery cell from the analyzer.

⚠ WARNING

Identifies an immediate, impending hazard that, if ignored, may result in severe bodily injuries, material damage or death.

⚠ WARNING

Charging

Overcharging, short circuiting, reverse charging, mutilation or incineration of the cells must be avoided to prevent one or more of the following occurrences; release of toxic materials, release of hydrogen and/or oxygen gas, rise in surface temperature.

⚠ WARNING

Watch out of damage

If a cell has leaked or vented, it should be replaced immediately using protective gloves.

⚠ WARNING

Replacement of empty or damage cells

If and when necessary, these cells must be replaced with identical new ones from the same manufacturer. If a cell to be replaced is connected with other cells in series, it is recommended that the other cells be replaced with new ones at the same time.

⚠ WARNING

Identifies an immediate, impending hazard that, if ignored, may result in severe bodily injuries, material damage or death.

⚠ WARNING

Watch out polarity

Reverse polarity installation of the cell in the end product must be avoided.

⚠ WARNING

Ventilation

Cell compartments containing these cells must be provided with means of ventilation to prevent possible accumulation of any released gases under abnormal conditions.

1.4. General important instructions for the plant operator

To guarantee continuous operation of the analyser, the functions, processes, and operation of the analyser have to be monitored regularly by the plant op-erator – especially in case of any initial installation. Thus, it will be possible to take suitable measures to improve the availability and life time of the analyser.
As the plant operator gains more experience concerning the maintenance re-quirements of the analyser, the monitoring frequency may be reduced to more extended periods of time.

NOTE

Warranty claim

In case of not intended use the guarantee will void. Regular controls, inspections and the exchange from polluted and exhausted filters by the operator are also an important part of the determinations “not determined use”- see chapter “Maintenance” for regular maintenance work.

1.5. Packing

Packing regulation of 12.07.1991
If your local waste facility does not accept MRU packing materials for disposal, you may return it to MRU or our local sales representative. Packing materials returned to MRU must be returned prepaid.

1.6. Return of hazardous waste

Waste Disposal/Returns/Warranty -
MRU GmbH is required to accept the return of hazardous waste such as electro-chemical sensors that cannot be disposed of locally. Hazardous waste must be returned to MRU prepaid.
1.7.Return of analyser
MRU GmbH is required to accept the return, for proper disposal, of all analysers delivered after 13th of August 2005. Analyzers must be returned to MRU pre-paid.

1.7. MRU Warranty conditions

The analyzer warranty is 12 months.
1. The warranty on spare parts is 6 months.

2. The term of the warranty conditions starts as of the invoice date.
3. The warranty is void under the following conditions:

- Improper use.
- Improper application.
- Improper mounting.
- Deliberate or negligent destructions.
- External influence like droping, impact, solvents, acids, gas-es, or transport damages. This includes damage, which is caused by exposure to high pollution and/or moisture (con-densate) in the gas path.

4. As well excluded from the guarantee conditions are typical consumable- and spare parts.
5. Use of original MRU consumable parts and sensors is required to maintain the warranty.
6. Removal of tampering of the serial number type plate will void the warranty.
7. The service of a guarantee conditions will not enlarge the guarantee time. Demands because of consequential damages are excluded.
8. MRU is not responsible for the transport costs for the warranty or replacement.
9. MRU reserves the right, to determine individual conditions or exceptions. These will be separately communicated.

MRU GmbH
01.09.2014

2 Analyser Description

- Read and observe the separately supplied Safety manual.
- This manual enables you to understand and safely operate this MRU Analyzer.
- Please read this manual with great vigilant.
- Get familiar with the product before using it.
- This analyser may only be operated by competent personnel and for its intended use.
- The analyser may only be used by qualified personnel for the intended use.
- Please pay special attention to all safety directions and warnings to prevent personal injuries and damaging of the product.
- We cannot be held responsible for any injuries and/or damages that occur by not following the instructions in this manual.
- Always keep the manual near you when working with the analyser, to be able to read instructions as needed. Please ensure to hand over all documents to when handing the analyser over to others.
- Hand over all documents when passing on the analyser to third parties.

2.1. Intended use

The instrument is intended for analysing the composition of several gases.
The list shows the analyser components, which can be determined by the analyser.

- CO
- CO2
- CH4
- H2
- O2

The analyzer comes with a sampling probe for the installation at the measurement point and a sampling line system.
In particular, the instrument is not foreseen to serve as a gas detector or safety device.
In case of unintended use, the warranty is void. Regular controls, inspections and the replacement of polluted and exhausted filters by the operator are also an important part of proper use. See chapter „Maintenance“ regular maintenance work.

Cabinet ventilation

As soon as the analyzer is powered up the cabinet is permanently ventilated by means of the integrated fan. This will prevent any explosive atmosphere in-

side the analyzer in case of inside leakages. The fan is monitored and the analyzer will not operate when the flow speed falls below a certain threshold (system alarm is triggered).

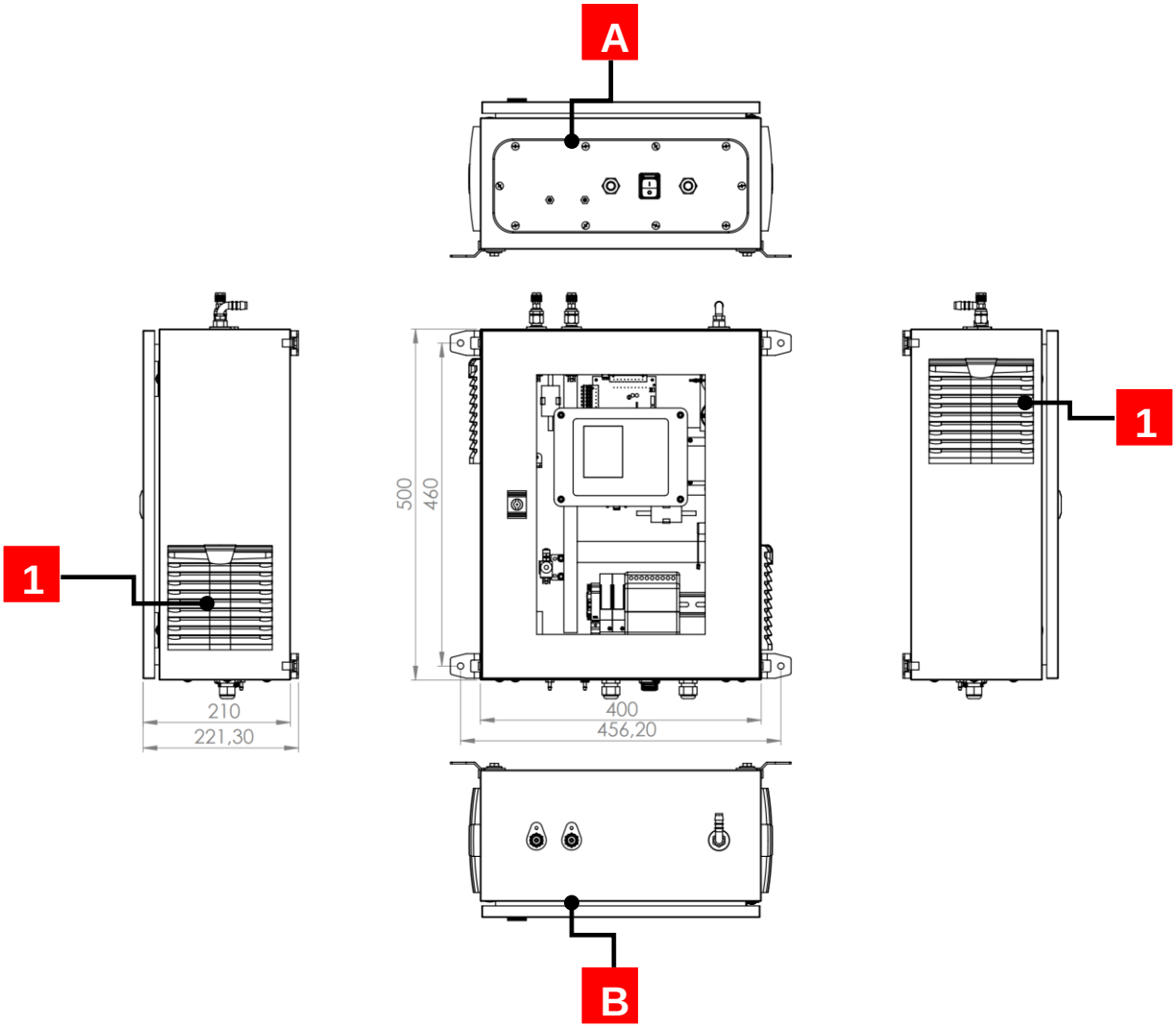
Sample gas flow

The analyzer supports multiple sample points to be monitored. Those points may differ in the pressure range inside the gas pipe by several hPa. In order to establish a constant sample gas flow over all sites, the analyzer's gas pump is regulated. In its initial state the analyzer supports a pressure range as given in the technical data sheet. For pressurized sites the flow restrictor orifice (# 65114) must be screwed in the female 1/8in thread.

2.2. Principle of operation

- Sample gas from one or more sampling points is fed into the analyzer by dedicated ports. Internally mounted electric valves select one point at a time to feed sample gas to the analysis unit.
- The instrument is equipped with a non-dispersive infrared (NDIR) bench for analysis of CO2 and CH4. Two separate infrared detectors for each CO2 and CH4 are included, each operating with a different optical path length and stabilized by referring to a reference detector. The IR source is a highly efficient and stable IR emitter, pulsed at a frequency of several Hertz. By design NDIR technique offers good stability and selectivity together with long life time of sensor (only limited by corrosion or dust, which can be prevented or removed by regular servicing the instrument).
- The instrument is optionally equipped with a number of electro-chemical sensors ECS in order to detect gas components like oxygen O2 or H2S. Those sensors offer a reliable and effective way to detect the target gases. They are typically of limited life time (several years) but may be easily replaced once the end-of-life is reached.
- In regular time intervals the instrument automatically switches to purge the sensors with fresh (ambient) air for readjust the zero point.

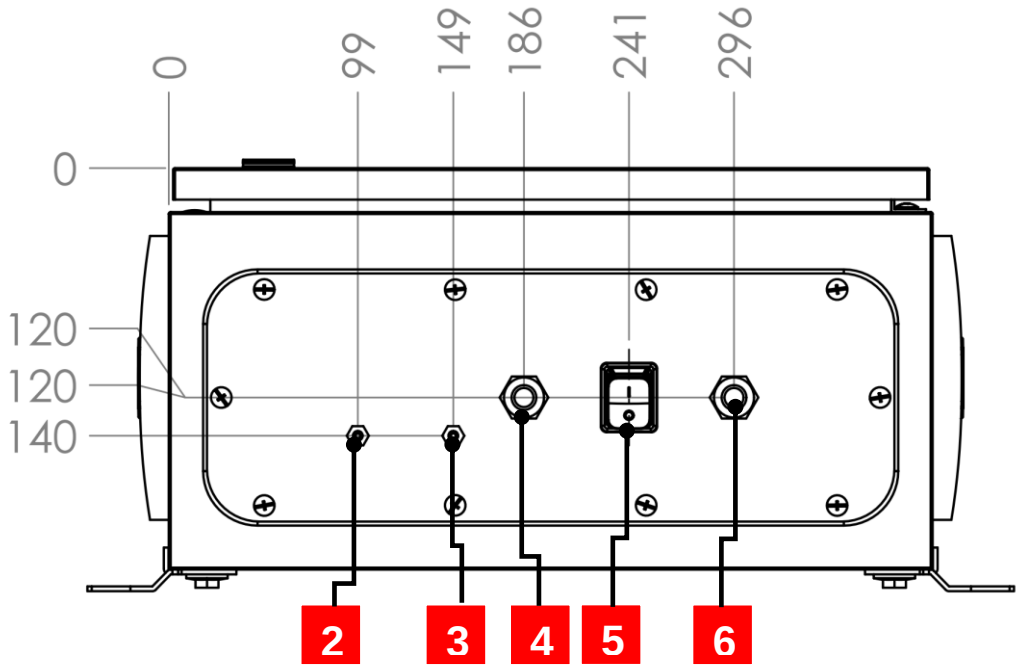
2.3. Packaging dimensions and description



Reference:

1	Filter mat

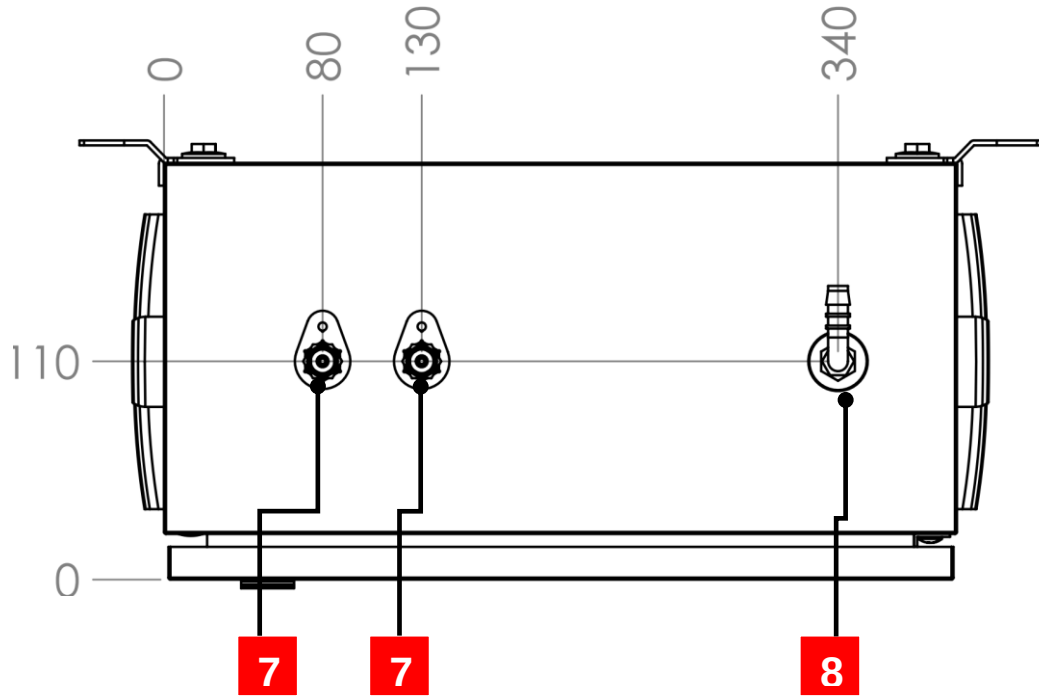
Detail A-A:



Reference:

2	Condensate outlet for DN4/6 tube
3	Zero gas inlet for DN4/6 tube
4	Cable gland for power supply
5	Power switch
6	Cable gland for IO module

Detail B-B:

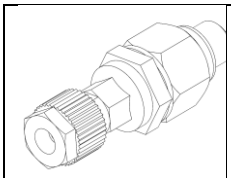
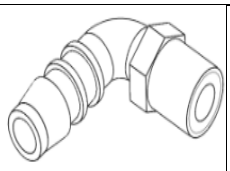
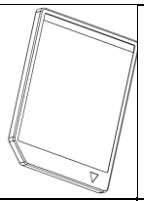
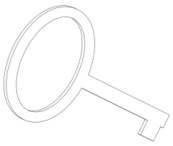


Reference:

7	Sample gas inlet with reducer unit for DN4/6 tube
8	Sample gas outlet with fitting

2.4. Connection options at inputs and outputs

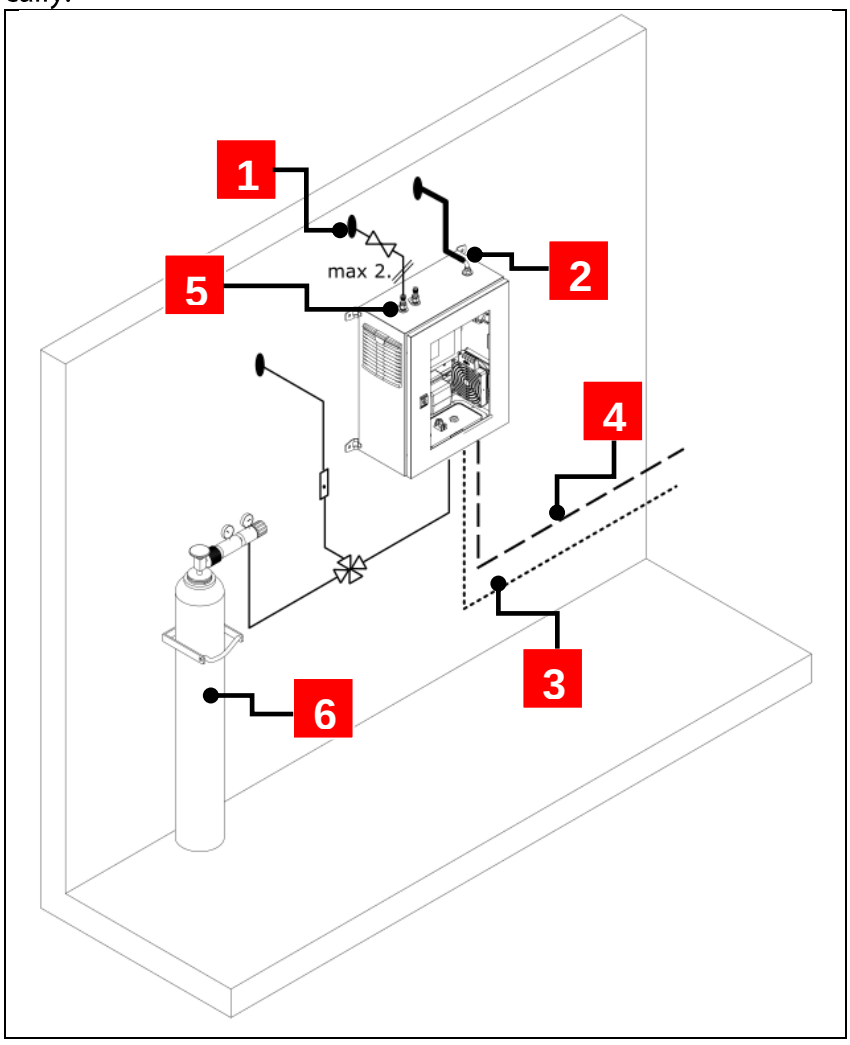
#	Position	Description	Article number
1	7	Reducer unit G1/8 outer thread / DN4/6 tube connection	
2	8	Sample gas outlet fitting G1/4 outer thread – DN8/12 tubing	
3	1	Filter mat	
4		SD card	
5		Cabinet key	

				
1	2	3	4	5

3 Installation manual

3.1. Overview

This manual explains how to install the analyzer mechanically and electrically.



The installer must correctly assemble these parts during installation. The following diagram shows the sequence in which the installation should be carried out:

1Preparation of the measurement points 3.2

2Analyzer mounting 3.3

3Power supply 3.4

4Connect IO module to control room 3.5

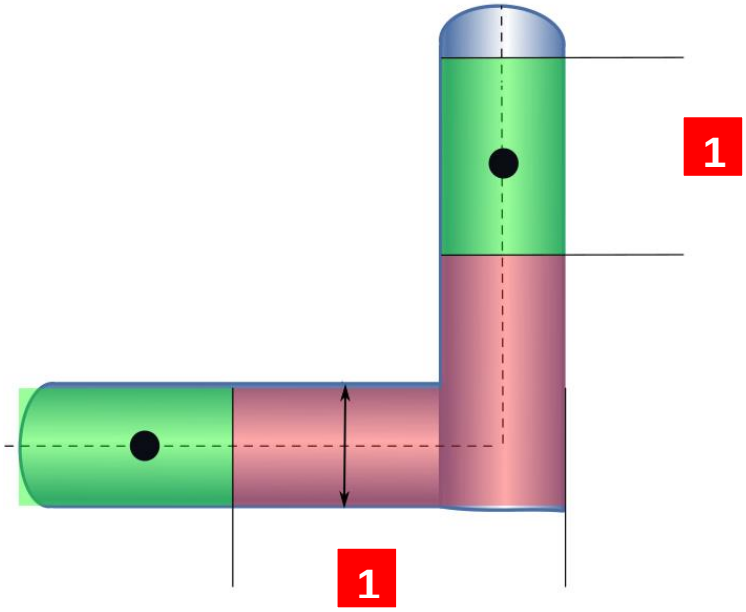
5Connect sample gas inlet 3.6

6Connect zero gas outlet, adjustment gas inlet and condensate outlet.☒3.7

3.2. Select measurement point

The measuring point should be in an area where the flow no longer has any particular turbulence. That is:

- Not directly before or after a pipe elbow. The measuring point must be at least 3 times the chimney diameter from a bend.
- The probe may be mounted both horizontally and vertically.
- The opening should have access to the core flow. This is usually the centre of the pipe.

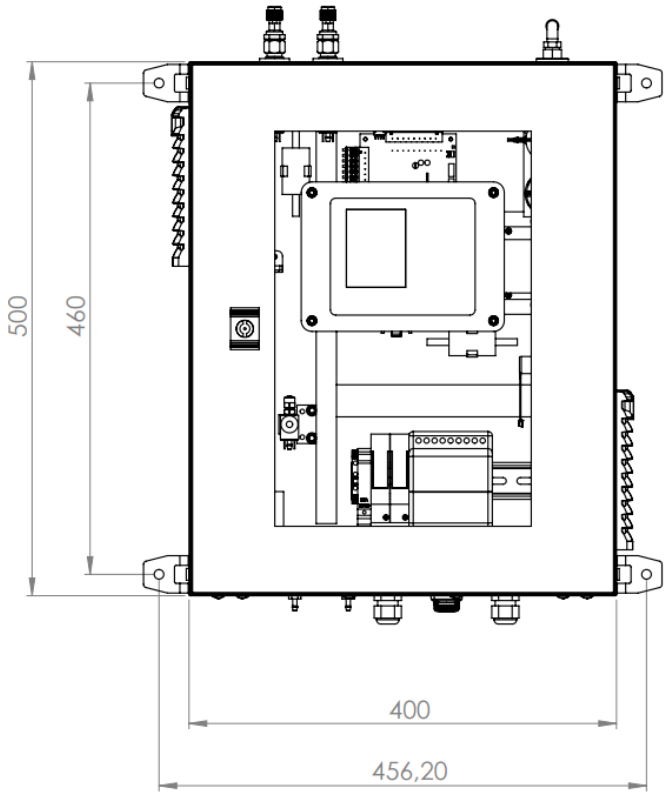


Reference:
1Probe installation in core flow
2

- For installations on a metal pipe, make sure that the wall thickness can support the weight of the probe. For this pur-pose the mounting flange is welded to the pipe.
- For installation on a brick fireplace, it is advantageous to screw a steel plate with the correct hole diameter to the brick fireplace.

3.3. Installation of the analyzer

The analyzer is equipped with adapters for the wall mounting. The dimensions for the wall mounting are shown in picture below.



Picture 1: Dimensions for the wall mounting.
AMin. 500 mmCMin. 300mm
BMin. 300 mmDMin. 300 mm

ATTENTION

Only operate the analyzer in an upright position!
Only power the device up after it is correctly mounted!

General installation rules

•Mount the device on a solid wall or steel rack.
•Be sure, that the air circulation is not obstructed.
•Let enough room for the tubing or piping.

For outdoor installation

Ensure that the analyzer is mounted on a rain and sun protected place (weath-er shade).
For indoor installation
Ensure that the analyzer is installed on a dry and clean place. Be sure that the room is permanently vented with fresh air.
Connect the VENT gas-outlet of the device to ambient by using adequate tube with min Ø 8mm ID.

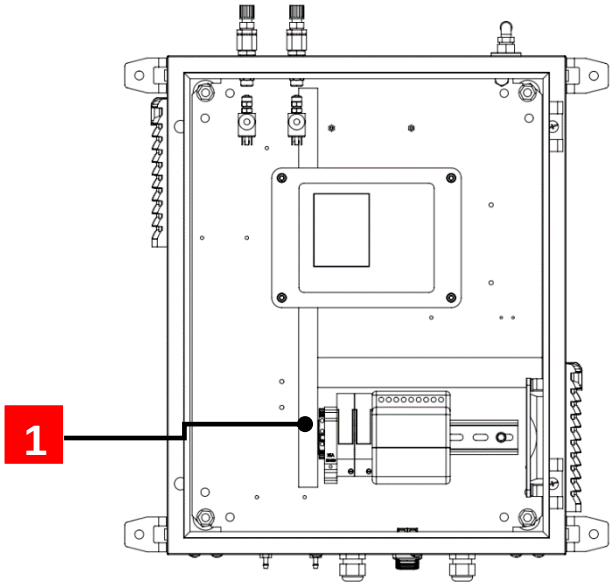
3.4. Connection of main power supply

⚠ WARNING

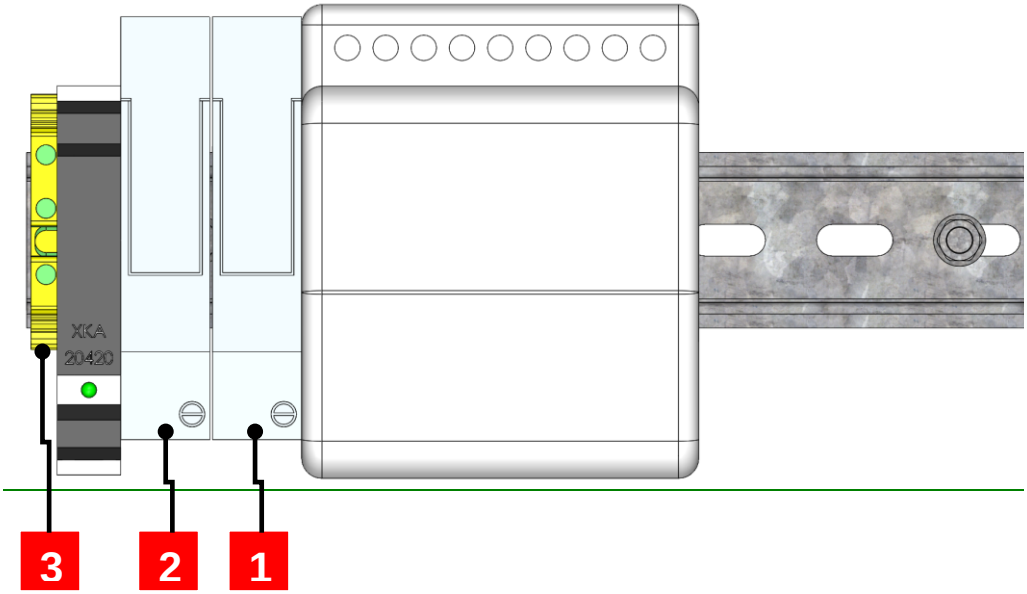
Electrical shock!
Electricity could cause damage, injuries and even death! Only educated staff should install the device.

⚠ WARNING

Use of back-up-fuses
The power supply must be protected with back-up-fuses.



The analyser needs a main power supply of 100-230 VAC/ 47-60 Hz.
The power supply will be connected on the hat-rail.



Reference:
1N-Phase
2L-Phase
3PE

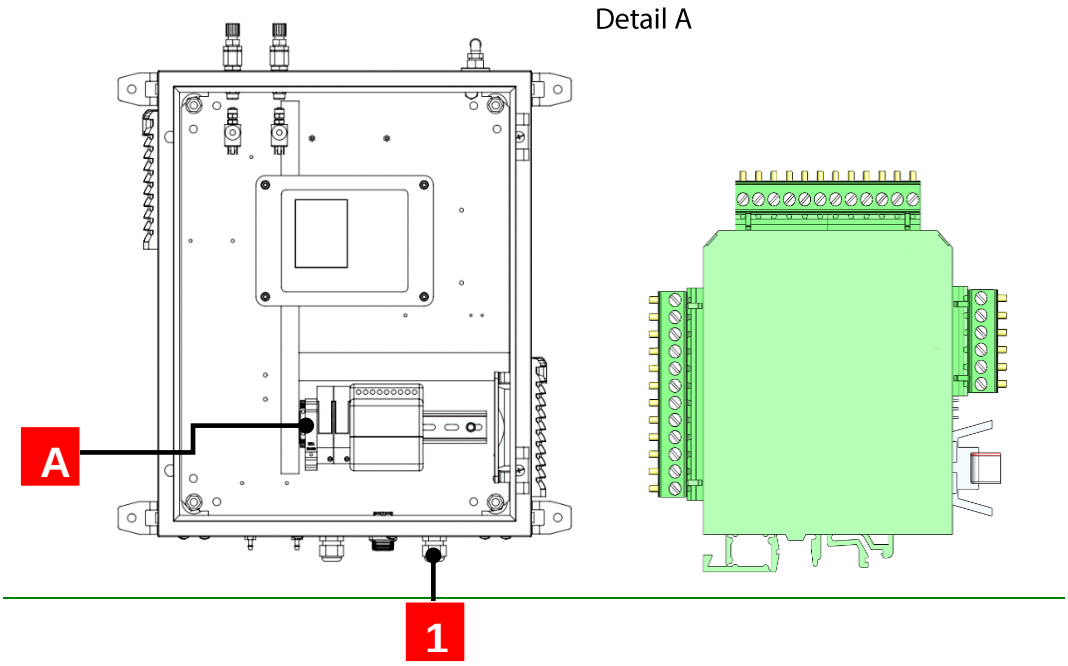
3.5. I/O modules: Installation and setting

The IO module is for monitors and allows for remote operating of the analyser. An IO module has the following features:

- Transmit 4-20 mA output.
- Trigger alarm outputs.
- Reads one PT1000.
- Reads one thermo couple.
- Reads current inputs signals (for sensors with max. 20 mA output signals).
- Reads voltage input signals (for sensors with max. 30 V out-put signals).
- External control of the analyser.

Connection of the I/O module

The option IO module can be found at the hat-rail. The position is shown at the sketch below.



Detail A

Reference:
1. Cable gland for IO module M16

	NOTE
	Analog output current 4-20 mA load resistor is max. 500 Ohm. Analog output does not require power supply.

	NOTE
	Alarm relays Out1 and Out2 contacts are “fail safe” types: Open contact in case of alarm or power failure. Closed contact for normal operation.

Plug connector definition

⚠ WARNING

Electric voltage
Power the system down and protect for reconnecting before start maintenance work.

Slit screws
Stripping length:7 mm
Tightening torque min.-max.: 0,5-0,6 Nm

Conductor cross sections, which can be used:

Information for cables, which go through the cable gland M16:
It is recommended to use only electric lines with ferrules.

Type of electric line	Conductor cross section min.-max.
Solid	0,2-2,5 mm^2 (30-12 AWG)
Stranded	0,2-2,5 mm^2 (30-12 AWG)
Solid with ferrule (with/ or without plastic)	0,25-2,5 mm^2

3.6. Installation sample gas inlet

⚠ DANGER

Explosion hazard
Do not operate the analyser without pressure reducer unit.

⚠ DANGER

Explosion hazard
The measuring point must not have an overpressure of 150 mbar.

⚠ WARNING

As part of the safety concept, a reducing unit must be installed on each sample gas inlet.

NOTE

The copper seal of the nozzle is intended only for single use.

NOTE

Use PTFE strips to tighten the fitting inside the thread!

NOTE

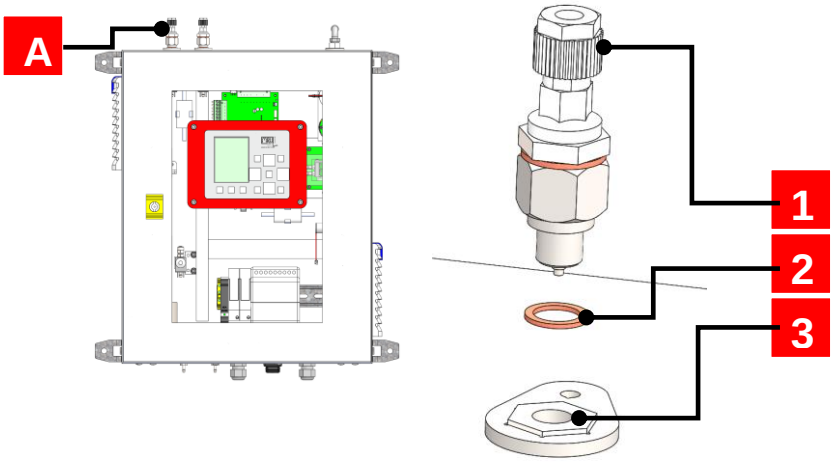
The pressure reducer unit is equipped with a PTFE DN4/6 fitting. Use a 1/8G outer thread fitting for using another fitting.

For safety reasons, the gas inlet must be equipped with a pressure reducing unit. This fitting prevents the gas flow from being limited in the event of a pipe leak in the unit. The ventilation of the unit prevents the creation of an explo-sive atmosphere.
The sketch below shows how the pressure reducer unit is built.

Correct installation of the pressure reducer unit:

- Install a copper seal to the pressure reducer unit.
- Use PTFE strip for the outer thread of the pressure reducer unit.
- Screw the pressure reducer unit into the sample gas inlet. Use a 19 open end spanner.

Detail A



Reference:

1	Pressure reducer unit with fitting for tube DN4/6
2	Copper seal
3	Gas inlet with G1/8 inner thread.

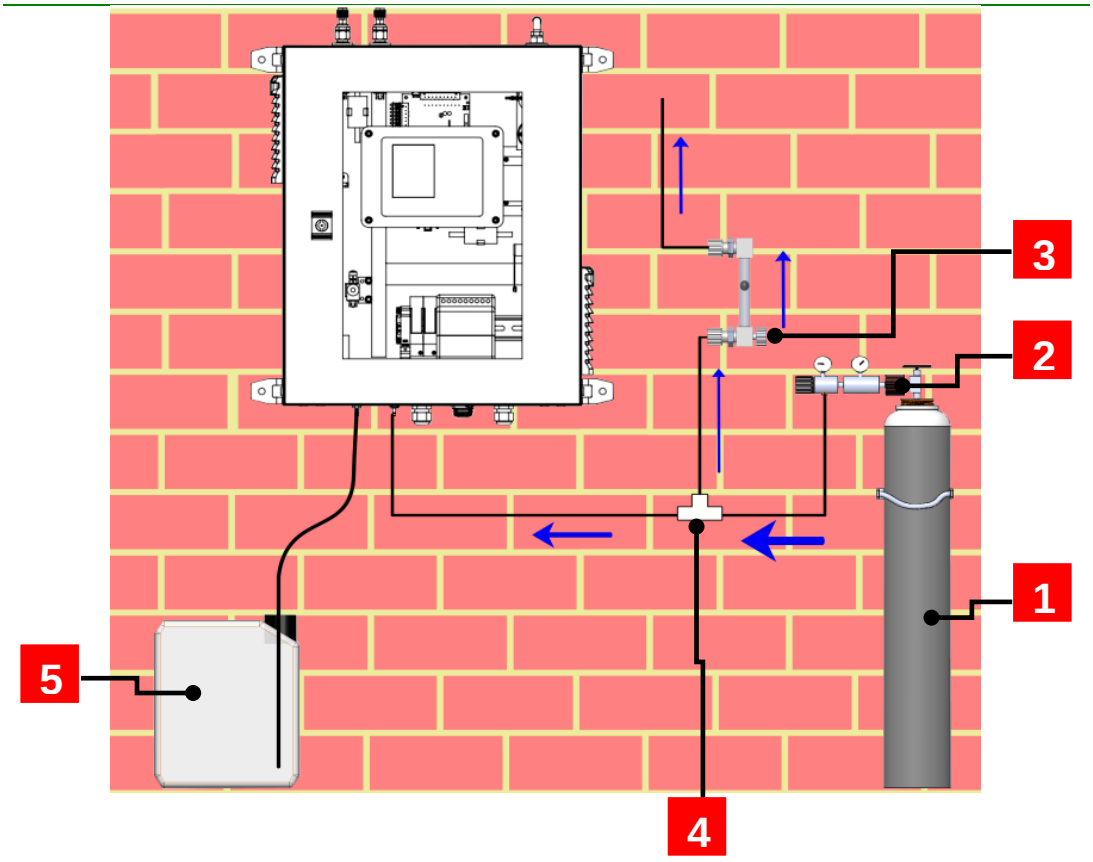
3.7. Installation: Calibration gas / zero gas condensate outlet and sample gas outlet (Vent)

⚠ WARNING

Installation of a Bypass-System
The calibration gas must be installed to a bypass system. The connection is at the zero gas inlet.

Zero gas and calibrationgas inlet share one gas inlet. Most of the time the ana-lyzer needs the zero gas inlet for its zeroing. In some cases it could be neces-sary to calibration the measurement technic with a calibration gas cylinder. There it is important to know, that the analyzer needs a bypass system, to cali-brate the measurement technic with gas.

The picture below shows the mounting position of the calibration gas cylinder.



Reference:

1 Calibration gas cylinder
2 Pressure reducer
3 Flowmeter
4 T-connector → Installed at the zero gas inlet for DN4/6 tubes
5 Condensate outlet vessel

Settings:

Pressure reducer	Max.500 mbar
Flowmeter	Approx. 60 l/h

Installation: Sample gas outlet (Vent)

⚠ WARNING

The gas outlet must not be closed.

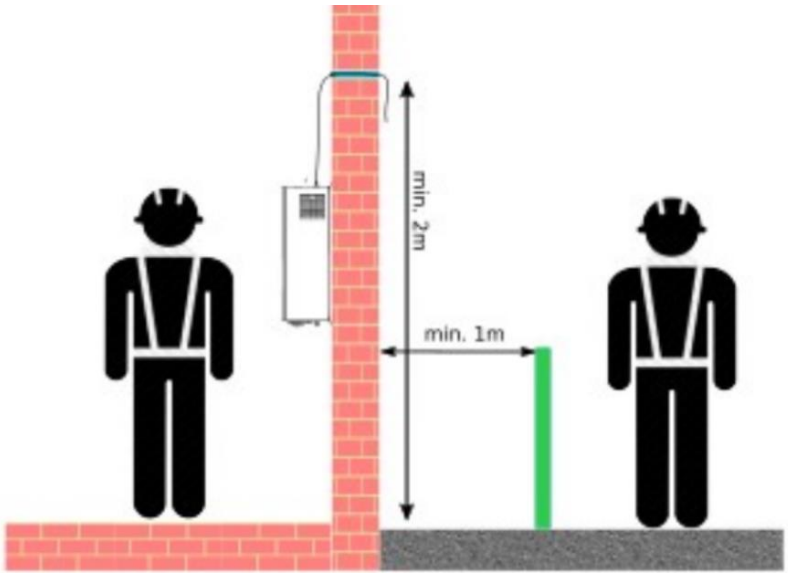
⚠ WARNING

The tubing should be positioned so that the gas can escape from the analyser almost without pressure.

⚠ WARNING

The line should therefore not be longer than 10 m and should be laid with almost no kinks.

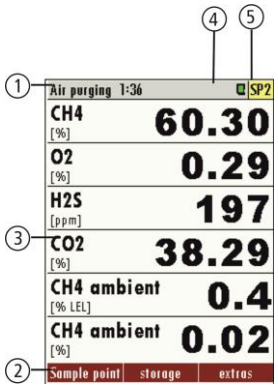
The sample gas flows into the sample gas inlet and out of the analyser again after the analysis is completed. Because the sample gas can be toxic, environ-mentally harmful or explosive, it is important to discharge this gas into a se-cured environment.
Therefore, the following principle applies: Never let sample gas escape into the installation room but lead it outside with a tube/pipe connection.



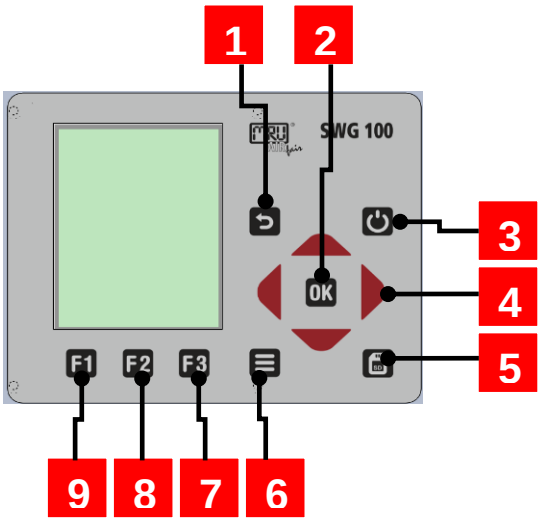
4 Operation of the analyser (HMI)

4.1. Display and keypad

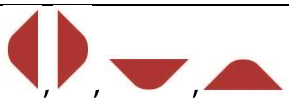
All information required to operate the analyser is displayed as shown below.



1	Menu indication bar • "air purging" or • "gas sampling" or • "measurement"
2	Function key bar • F1 "sample point" • F2 "storage" • F3 "extras"
3	Display area of Menu • Measurement value…
4	SD-Card symbol • Indication green → read- and write access • Indication yellow only read access (SD-Card write protected)
5	Sample point number



#	Symbol	Description
1		ESC: abort or return to the menu above
2		Prepare Power-Down: Press this key before you disconnect mains. The analyzer will store changed user settings and other operational data and will purge the sensors

3		Arrow keys: context dependent functions, e.g. scroll in between lines, change values, change view.
4		OK: confirmation key, select a marked menu point.
5		Screen shot: press this key in order to store a screen shot of the current display contents onto the SD card.
6		Menu key: Will show all available functions in the window that is currently in use – also those which have an individual key on the key pad like the printer and the three function keys.
7-9		Function Keys: Activates the functions seen on the display (2 function key bar)

5 Analyser settings

5.1. Checking list for commissioning

After the first start of the analyser it is necessary to make some settings at the analyser. These settings are:

- Check the country and language.
- Check the date and time of the instrument.
- Configuration of the alarm relays.
- Configuration of the Modbus.
- Configuration of the external control via relay contacts (IO module).
- Configuration of the analog outputs at the I/O module.
- Configuration of the AUX inputs at the I/O module.
- Configuration of the alarm outputs at the I/O module.
- Configuration of the auto calibration.

5.2. Check country and language

Important note:
In case the analyser shows a language you don't understand, you may swap the language to English by pressing the menu key and selecting the function 'Set English language'.

Use the menu EXTRAS – GENERAL SETTINGS.

The analyser will automatically set some country-typical parameters like the language, the date format, the temperature unit, the daylight saving time function and the CSV-export settings.

5.3. Check date and time of the instrument

The analyser stores automatically measurement values including timestamps. Therefore the instruments' system clock should be set correctly.

Use the menu EXTRAS – GENERAL SETTINGS – DATE & TIME.

In case the date & time is not correct, press the key F2=modify, change date & time and then press the key F2=store.

Note:
According to the selected country (see previous chapter) the analyser automatically switch the daylight saving time in spring and autumn. This function is active for most European countries. Whenever the daylight saving time is currently active, then you'll see a '*' in the time line of the menu, thus 'Time *' instead of 'Time'.

5.4. Configuration of the alarm relays

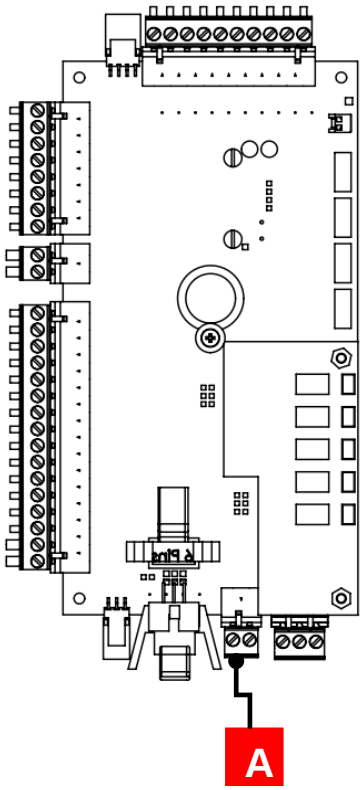
On the main PCB there is one “system alarm” relay with “fail safe” NC contact. The following errors will turn the relay from NC to NO.

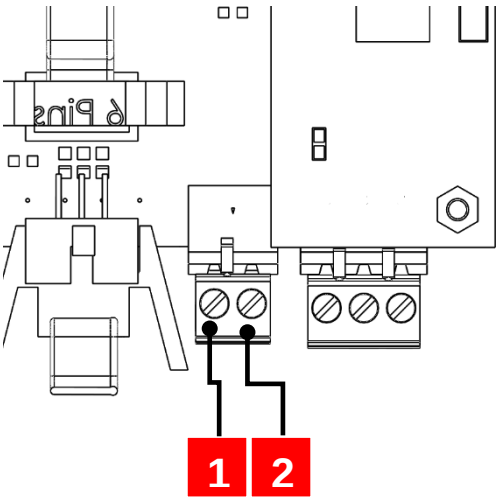
1	Internal RS485 bus communication failure
2	Analyser is in bootloader phase
3	Gas leakage inside analyser cabinet (CH4 > 20% to 50% LEL)
4	Condensate alarm (contacts resistance < 35kΩ)
5	Low fan rotation (speed rotation < 900U/min)
6	Sample flow alarm (sample flow < 20 l/hr)
7	Gas cooler high alarm (temperature > +10°C)
8	Gas cooler low alarm (temperature < +2°C)
9	Cabinet high temperature (> +55°C)
10	Cabinet low temperature (< +5°C)

Errors 1 to 5 alarm will force a measurement stop (all analog outputs are on hold or at 2mA, depending on configuration).
Errors 6 to 10 will be displayed as warning message only; analog outputs of active sampling point are live all others are on hold.

NOTE

Analyser system alarm relay is a potential free contact, with max 300 VAC / 10 A or 150 VAC / 12 A.





Detail A:

1 and 2	Connection for alarm relais

Slit screws
Stripping length: 7 mm
Tightening torque min.-max.: 0,5-0,6 Nm

Conductor cross sections, which can be used:

Type of electric line	Conductor cross section min.-max.
Solid	0,2-2,5 mm^2 (30-12 AWG)
Stranded	0,2-2,5 mm^2 (30-12 AWG)
Solid with ferrule (with/ or without plastic)	0,25-2,5 mm^2

Information for cables, which go through the cable gland M16:

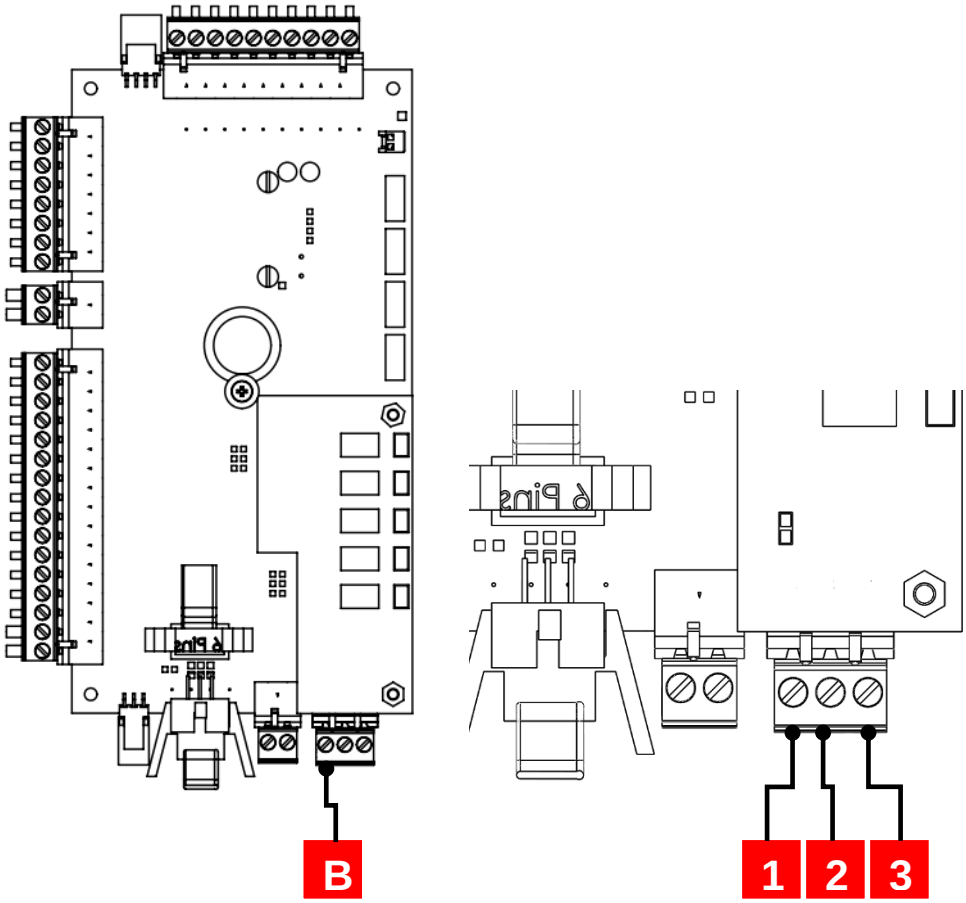
It is recommended to use only electric lines with ferrules.

Following analyzer errors will produce a system alarm (open contact of System Alarm relay).

5.5. Configuration of the Modbus

The Mobdbus connector can be found on the PCB-distributor (see sketch below).

Detail B:



Reference for user RS-485 (Modbus RTU):

1	GND
2	B_EXT-
3	A_EXT+

Slit screws
Stripping length: 7 mm
Tightening torque min.-max.: 0,5-0,6 Nm

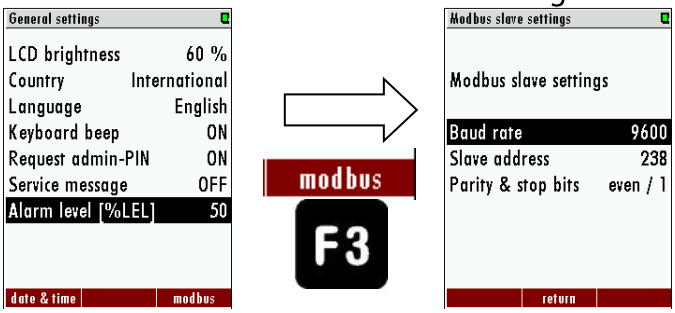
Conductor cross sections, which can be used:

Type of electric line	Conductor cross section min.-max.
Solid	0,2-2,5 mm^2 (30-12 AWG)
Stranded	0,2-2,5 mm^2 (30-12 AWG)
Solid with ferrule (with/ or without plastic)	0,25-2,5 mm^2

Information for cables, which go through the cable gland M16:
It is recommended to use only electric lines with ferrules.

Configuration at the analyser

- Open the path EXTRAS/ GENERAL SETTINGS.
- Press F3 “Modbus”.
- The Modbus store settings will be open. The user can commission the slaves settings.



6 Cycle configuration

6.1. Path and default setting

Extra/ Measurement cycle config.
When the menu "MEASUREMENT CYCLE CONFIG." is selected the user definable setting for the measurement cycle will appear (see screenshot below).

Screenshot shows default setting, when the „MEASUREMENT CYCLE CONFIG." will be started the first time.

6.2. General information

The menu point "CYCLE CONFIGURATION" allows the user to configure an individual measurement cycle. Every installed sample point can be configured. For the configuration the user has the following phases, which can be selected:

- Zeroing.
- Purging.
- Stand-by.
- Measurement SPx (SPx stands for Sample point 1, 2…).

The configuration is performed with the three function keys F1, F2 and F3.

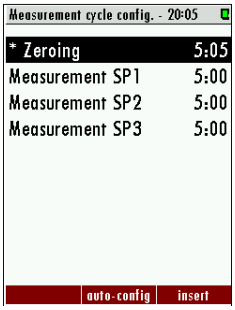
- F1: Delete a phase.
- F2: Make an Auto-config.
- F3: Insert a new phase.
- OK:View/change phase details
- Left/right:Change the phase type.

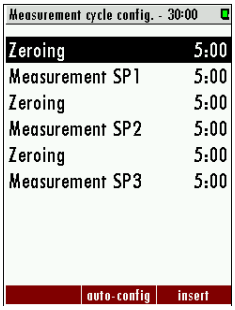
6.3. Auto configuration

With F2 the "Auto-config." can be selected. The user can select one of two default cycle configurations.

- One zeroing / cycle.
- One zeroing / sample point.

The first program is for applications where the different measurement points have almost the same gas concentrations. The zeroing is not necessary at every change of the measurement SPX.
The second program is for applications where the different measurement points have different gas concentrations. A zeroing is recommended after every measurement point change.
The screenshots below show the "One zeroing / cycle" and "One zeroing / sample point" in comparison.

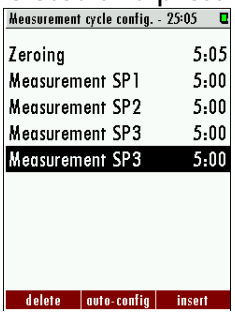




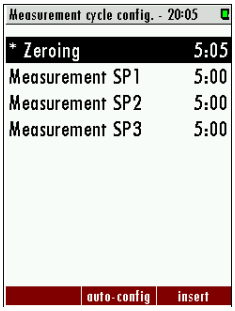
Depending on the analyser type, the first or the first and second phase cannot be deleted, deactivated or moved to another position.

Delete a phase

With F1 a phase can be deleted. To do this, select the phase, which should be deleted and press F1.



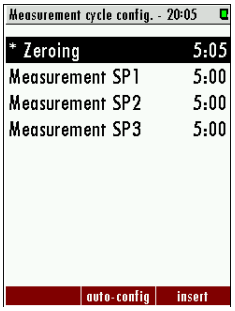
F1



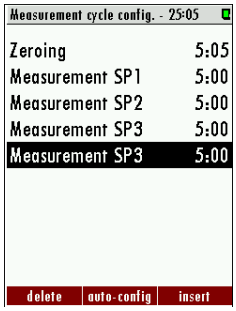
Screenshot shows how a phase can be deleted. In this example the last phase “Measurement SP3” is deleted.

6.4. Insert a phase

With F3 a new phase is inserted in the measurement cycle. With the right/left arrow keys the different phase types can be selected.
In the title-bar the entire cycle time is shown. It is called “Measurement cycle config.”
With OK the “Cycle phase details” can be shown and changed.



F3



6.5. Configuration of the phase details

In this chapter the different cycle phase details will be explained.

Zeroing (Cycle phase details):

In the cycle phase detail "ZERORING" the zeroing time can be configured.

ZEROING	
Measuring site valvesValves	closed
Zeroing valve	Valve open
Duration	2min to 1 h
Recommendation	5min., in general not to be changed by user as depending only on analyzer internal setup

Measurement SPX (Cycle phase details):

In the cycle phase details of "Sample point X" the measurement time and the suction delay can be configured. Each sample point can be configured individually. In the cycle phase details the following times can be set:

MEASUREMENT SPx	
Measuring site valves	Valve of selected site is open, others closed
Zeroing valve	Valve closed
Duration:	Phase duration: 2 min. to 24 h Suction/response time: 30 sec. to 1h Pure measurement: calculated H2S-low: Activated/protect (Optional)

Stand-by (cycle phase details):

In the cycle phase details "Stand-by" the sleep mode time can be configured. In the cycle phase details the following times can be set:

- Phase duration: Entire Stand-by time (Purging time + Quiet time = Phase time).
- Purging time: The time, to purge the analyser with ambient air, through the zero gas inlet.
- Quiet time: The time, where the analyser is in the pure stand-by mode.

STAND-BY	
Measuring site valves	Valves closed
Zeroing valve	Valve closed
Duration	Phase duration: 2 min to 24h Purging time: 30 sec. to 1h Quiet time: calculated

Purging (cycle phase details):

The purging is a separate configuration point to purge the analyser with ambient air through the zero gas inlet. It can be helpful, if the analyser must switch between a sample point with different sample gas concentrations.

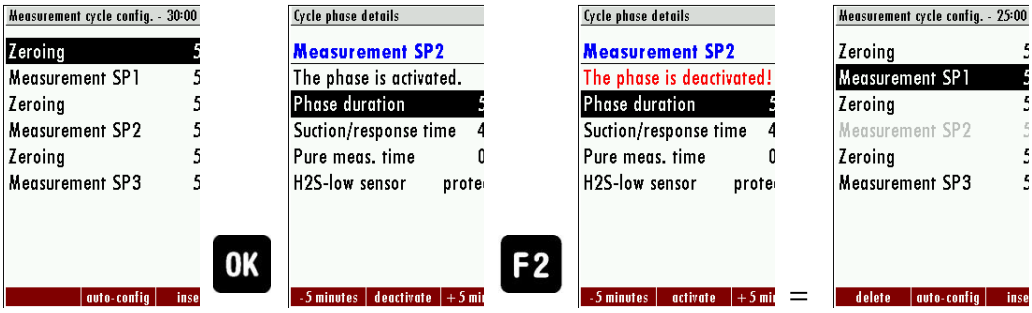
PURGING	
Measuring site valves	Valves closed
Zeroing valve	Valve open
Duration	30 sec. to 1 h

Activated/deactivated a phase

The user has the opportunity to deactivate a phase in the measurement configuration cycle. This could be necessary for example if a sample point is temporarily not in use. The activation and deactivation of a phase can be done in the cycle phase details of the concerning phase.

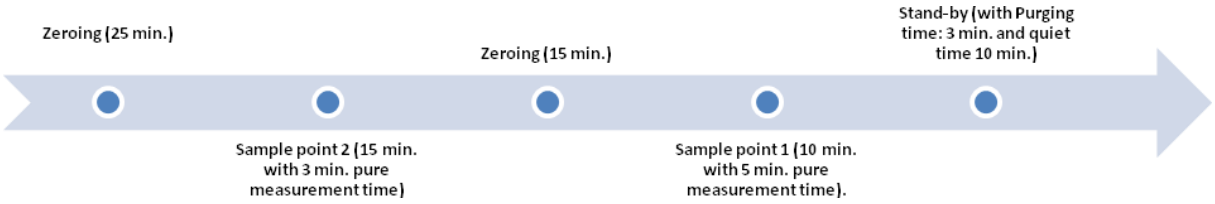
Example for the deactivation of a phase

In this example the “Measurement SP2” will be deactivated. The deactivated phase is grey out.



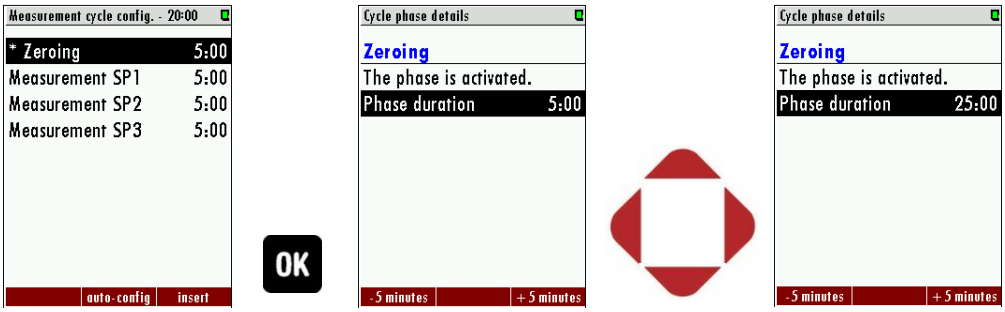
6.6. Example for a measurement cycle configuration

In this chapter an individual measurement cycle should be created with the features described at the chapters below.
The measurement cycle should have the following sequence:

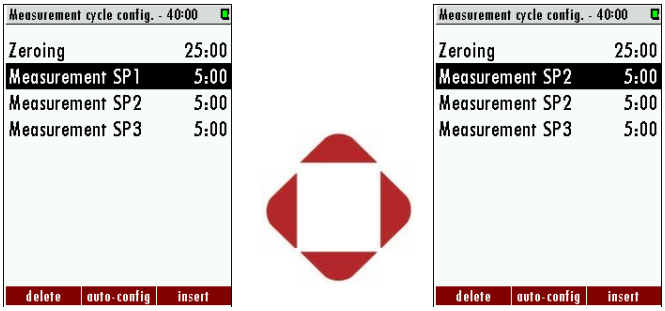


Following points must be done to configure the individual measurement cycle:

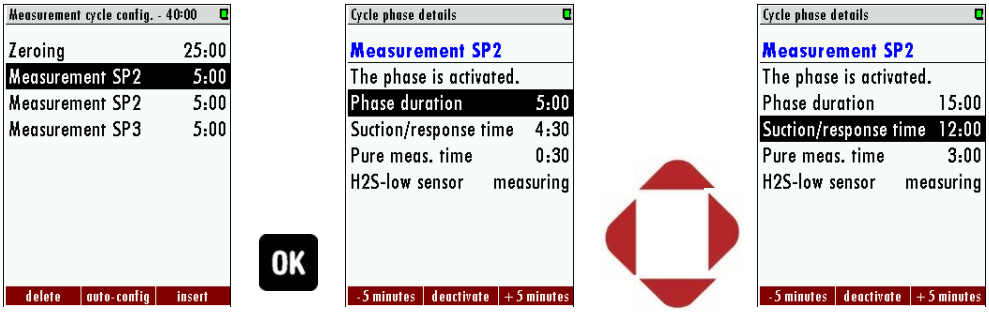
- Open the measurement cycle config. menu: Path: EXTRA/ MEASUREMENT CYCLE CONFIG.
- The default measurement cycle will appear. Open the cycle phase detail of the first zeroing and adjust the phase duration at 25 min.



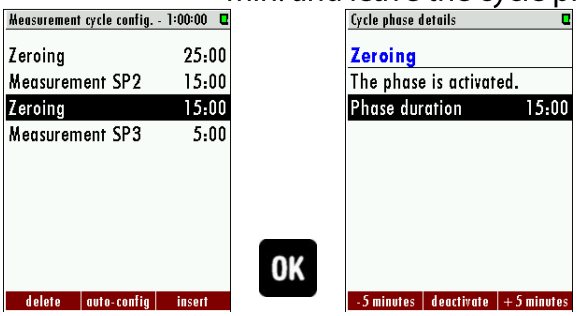
- Leave the cycle phase detail and select the second point. Switch with the left/right arrow keys until the measurement SP2 is selected.



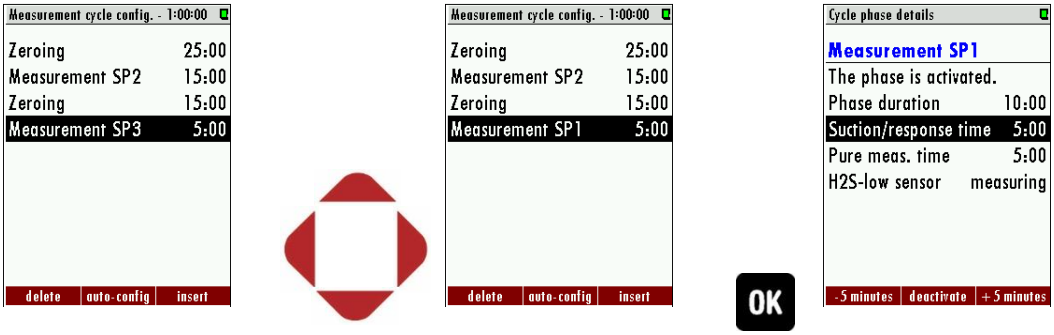
- Open with the OK key the cycle phase detail of the measurement SP2. Adjust the duration-phase at 15 min. and the suction/response time until the pure meas. time has the value of 3 min. Use for this operation the arrow keys.



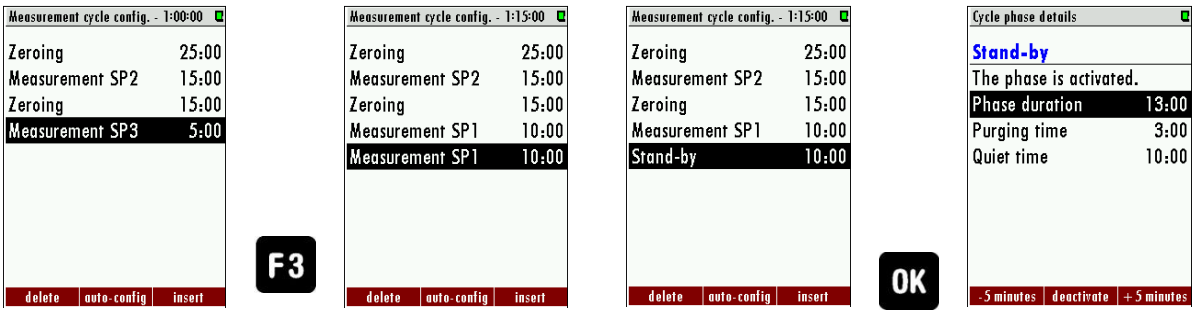
- Leave the cycle phase detail and select the next phase. Select with the left/right arrow keys the phase “zeroing” and go in the cycle phase detail. Adjust the phase-duration at 15 min. and leave the cycle phase detail.



- Switch to the next point and select with the left/right arrow key the measurement SP1. Go in the cycle phase detail of the measurement SP1. Here adjust the duration-phase 10 min. and the pure measurement time: 5 min.



- At last push F3 key for insert a new phase and select with the left/right arrow key the “Stand-by” phase. Go into the cycle phase detail and adjust the Purging time at 3 min. and the Quiet-time at 10 min.



Leave the menu and safe the adjustments. The individual configuration is done.

7 Binding to a process control system: I/O modules

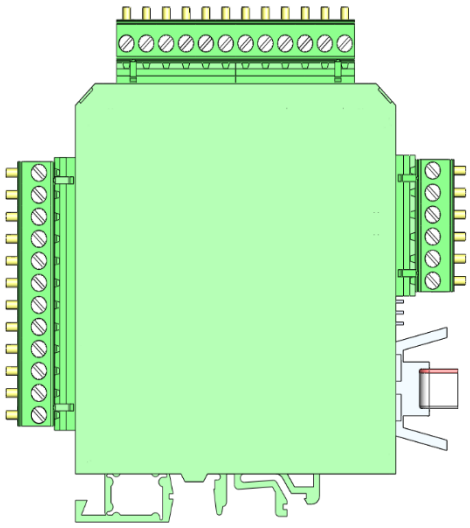
The IO module is a necessary module for the signal forwarding, into a control room.
This module is an interface for signal transmitting, remote operating and to read signals, from extern transducers. An IO module has the following features:

- Transmit 4-20 mA output.
- Trigger alarm outputs.
- Reads one PT1000.
- Reads one thermocouple (Type K).
- Reads current inputs signals (for sensors with max. 20 mA output signals).
- Reads voltage input signals (for sensors with max. 30 V output signals).
- External control of the analyzer.

7.1. Position of the IO module inside the analyzer

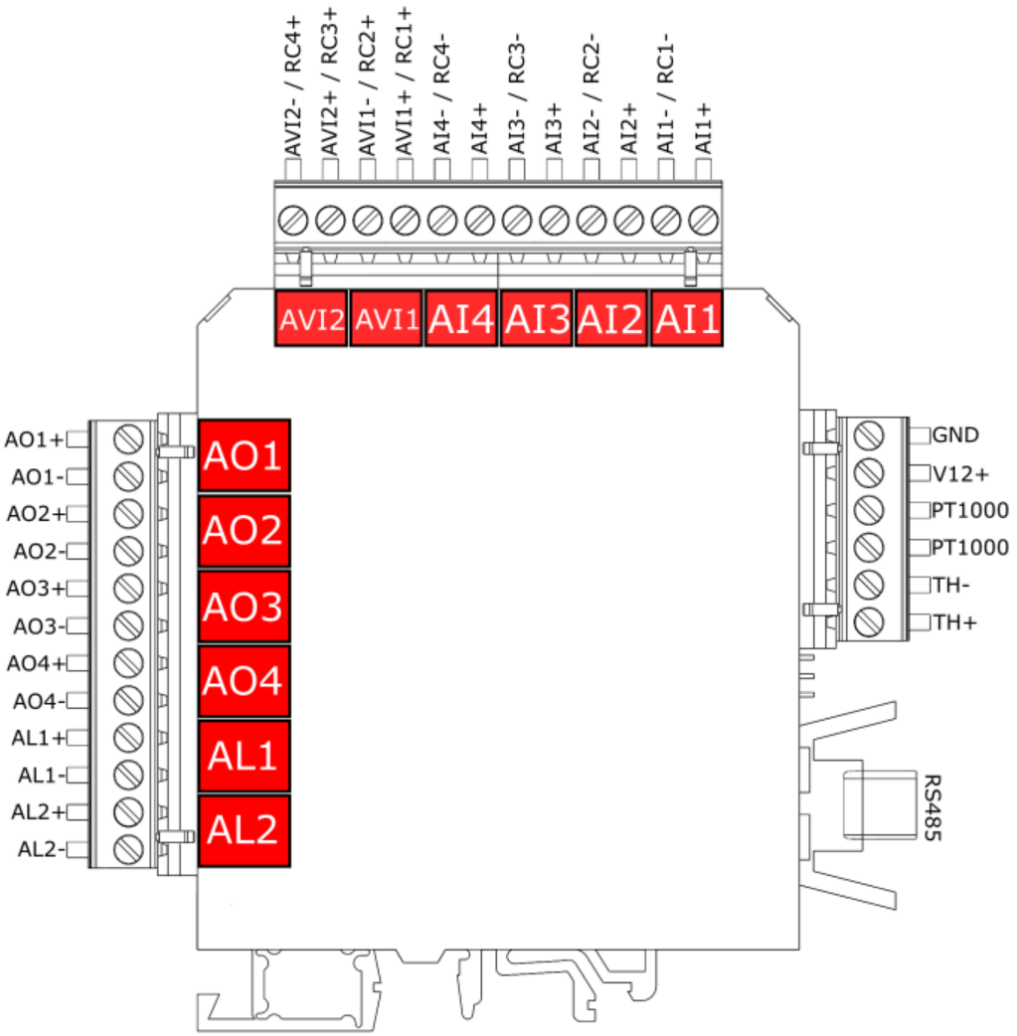
An analyzer can be equipped with further IO modules (max. 10).

The IO module(s) are installed on the hat-rail.



7.2. Pin assignment

The follow pin assignment-plan shows where the different pins for the interfaces can be found and which pins has a double occupancy.



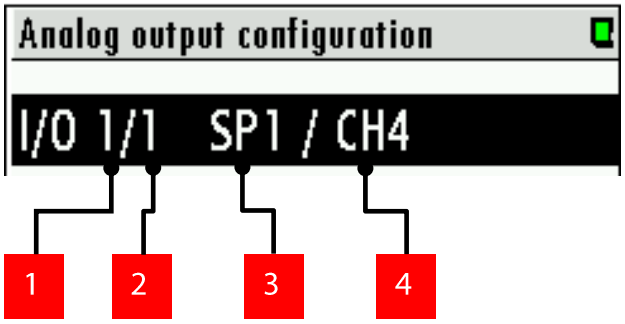
Description	Abbrevation	Pin	max. external Voltage	max. Load (for outputs)	Internal load (in inputs)	Double occupancy
Analog-Outputs 4-20 mA	AO1	AO1+	--	max. 500R	--	No
		AO1-	--	max. 500R	--	No
	AO2	AO2+	--	max. 500R	--	No
		AO2-	--	max. 500R	--	No
	AO3	AO3+	--	max. 500R	--	No
		AO3-	--	max. 500R	--	No
	AO4	AO4+	--	max. 500R	--	No
		AO4-	--	max. 500R	--	No
Alarmouputs	AL1	AL1+	24 VDC	--	--	No
		AL1-	24 VDC	--	--	No
	AL2	AL2+	24 VDC	--	--	No
		AL2-	24 VDC	--	--	No
Analog-Input 4-20 mA	PWROUT	V12+	--	--	--	No
		GND	--	--	--	No
	AI1	AI1+	--	--	50R	No
		AI1-	--	--	50R	RC1-
	AI2	AI2+	--	--	50R	No
		AI2-	--	--	50R	RC2-
	AI3	AI3+	--	--	50R	No
		AI3-	--	--	50R	RC3-
	AI4	AI4+	--	--	50R	No
		AI4-	--	--	50R	RC4-
Remote control	RC1	RC1+	--	--	--	No
		RC1-	--	--	--	AL1-
	RC2	RC2+	--	--	--	No
		RC2-	--	--	--	AL2-
	RC3	RC3+	--	--	--	No
		RC3-	--	--	--	AL3-
	RC4	RC4+	--	--	--	No
		RC4-	--	--	--	AL4-
Analog-Input 0-10V	AVI1	AVL1+	--	--	--	JMP1_out
		AVL1-	--	--	--	JMP2_out
	AVI2	AVL2+	--	--	--	JMP3_out
		AVL2-	--	--	--	JMP4_out

7.3. Analog outputs 4-20 mA

☞ Assignment: See 7.2 Pin assignment

Software-settings

- Open the menu: EXTRAS/ANALOG OUTPUT CONFIGURATION (1).
- The overview screen appears. This menu shows, how much analog-outputs are available and how the analog outputs are occupied.
- At the overview screen all analog-outputs are listed. The amount of the analog-outputs is dependent from the amount of the installed IO-modules. Every IO module has 4 analog-outputs. If two IO modules are installed, the entire amount of analog-outputs is eight. At the list, the user finds the information which analog signal is carry out at which analog-output channel. The follow list-notation can be found (example):

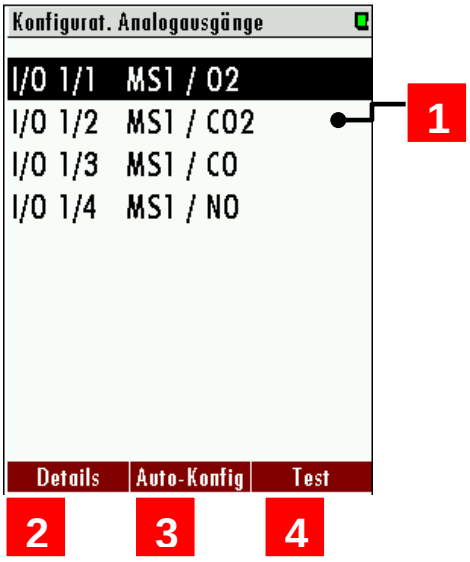


Reference:

1:	Number of the IO module	Means, first IO module
2.	Value of the analog output	Means the first analog-output
3.	The sample point	SP1 means, the first sample point.
4.	Signal name	CH4 means, that this analog-output transfers CH4 signals.

This example means: At the first channel of the first IO module, the CH4 signal from the first sample point will be transferred.

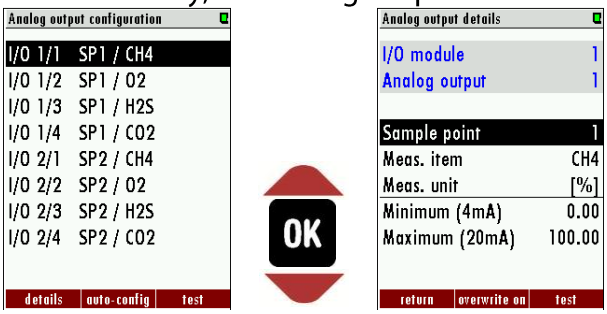
At the sketch below, the menu-screen and the analog-outputs at the first, of two IO modules are shown.



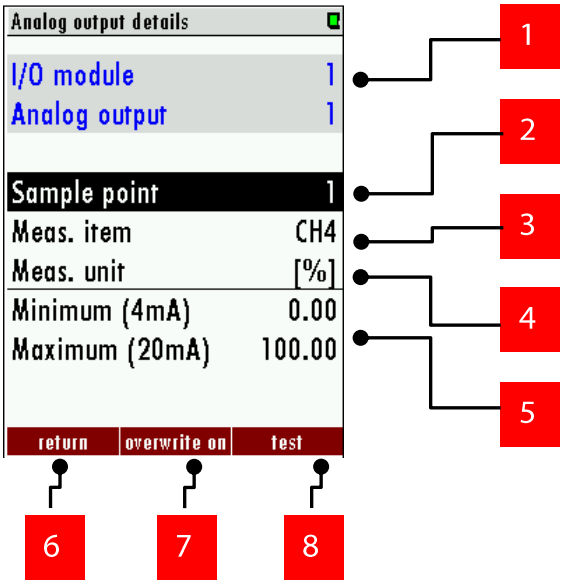
Reference:

1	List of the installed analog output ports	At this list the operator can select, which analog-output should be configured. To select an analog-output, move the up/down arrow keys.
2	Details	Here the operator can open the configuration screen for the selected output port. To open the details-menu, push F1 or OK.
3	Auto configuration	If the operator pushes this key (F2) the output pins would be configured by default values.
4	Test	The test-menu is for testing the analog outputs. To open the test-menu, push F3 or OK.

The navigation inside the menu taken place with the up/down arrow keys.
With the OK key, the analog-output can be edited:



The settings for an analog-output can be change in the “Analog output details” menu. See the screenshot below.

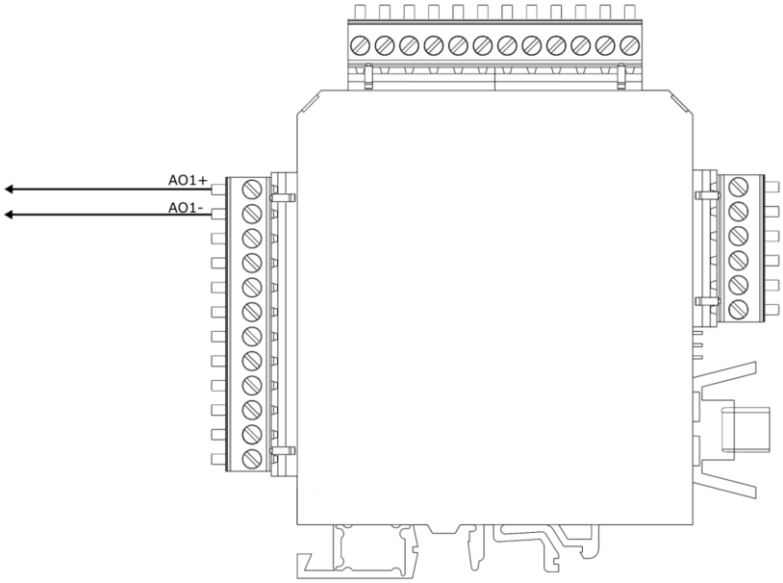


Reference:

1	Section	Shows the operator, which analog-output will be changed.
2	Sample point	The operator can select the sample point. This means, that the analog-output signal from the choose sample point will be transmitted to the process control system.
3	Meas. Item	At this point the operator selects the measurement item, which should be transmitted. Basically, all measurement-channels, which can be measured, can be selected at this point.
4	Meas. Unit	This point shows, which unit the transmit signal have. This point cannot be changed.
5	Minimum / Maximum	Here the operator entering the equivalent measurement value, for a current of 4 mA or 20 mA.
	Return	Leave the menu. Alternate push F1.
7	Overwrite on	A function to simulate values. If the overwrite function is activated, the set value will be transferred to the DCS.
8	Test	Further to a test-menu. Alternate push F3.

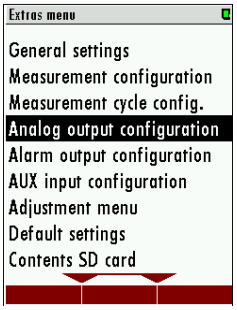
Example: 4-20 mA signal outputs to control room

Starting position:
An operator wants to read the measured values of the CO2 channel to his DCS. The analyzer has only one IO module and three sample points. All outputs are free. The CH4 values from the second sample point should be logged in the control room.

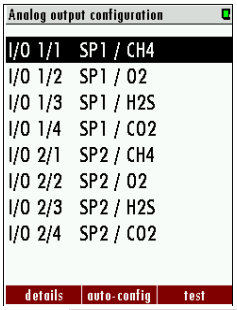


Follow steps must be done to do this:

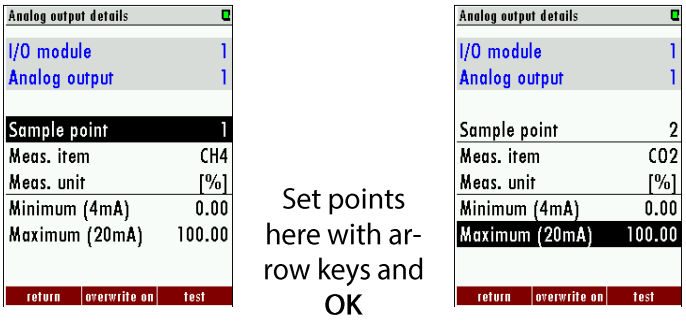
- Connect analogue output 1 (AO1) to the process control system. The terminals of the IO module are designed for cables with a cross-section of 0.2...2.5 mm^2.
- In the next step, the analogue output must be configured. For this purpose use the menu: EXTRAS /CONFIGURAT. ANALOG OUTPUTS. The configuration menu for the analogue outputs appears. In the overview list, the first analogue output must be selected (channel: I/O 1/1 MS1 / CH4).



Select ANALOG OUTPUT and **OK**



- In the menu for "DETAILS FOR ANALOG OUTPUTS", the desired settings can finally be made. Here, select the second measuring point and the CO2 value as the measured variable. Finally, set the minimum (i.e.: 0 % CO2) and the maximum (depending on the measuring range).
- In the last step, exit the menu and confirm the save message. The 4-20 mA output is now configured.



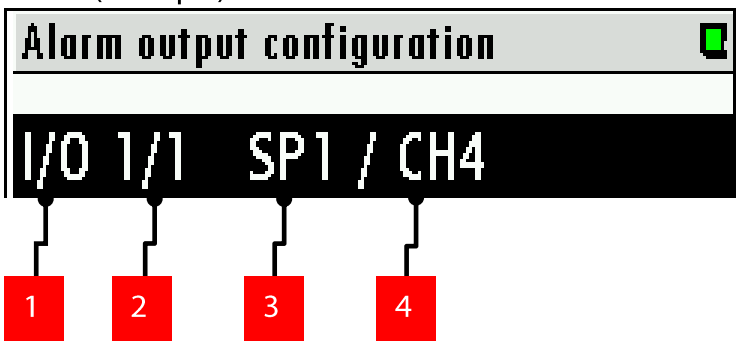
7.4. Alarm outputs

Hardware side:

☞ Assignment: See 7.2 Pin assignment

Software-side

- Open the menu: EXTRAS/ANALOG OUTPUT CONFIGURATION (1).
- The overview screen appears. This menu shows, how much alarm-outputs are available and how the alarm outputs are occupied.
- At the overview screen all alarm-outputs are listed. The amount of the alarm-outputs is dependent from the amount of the installed IO-modules. Every IO module has 2 alarm-outputs. If two IO modules are installed, the entire amount of alarm-outputs is four. At the list, the user finds the information which alarm signal is carry out at which alarm-output channel. The follow list-notation can be found (example):

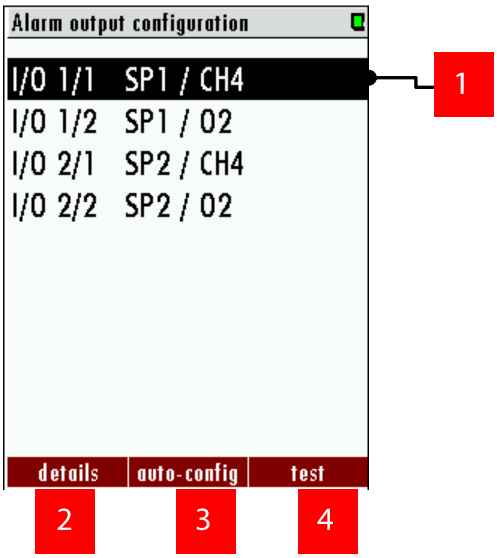


Reference:

1 The number of the IO module. 1 means, first IO module.
2 The value of the alarm-output. 2 means, the second alarm-output.
3 The sample point, from where the signal come. SP1 means, the first sample point.
4 The signal-name. CH4 means, that this alarm-output monitors the CH4 channel.

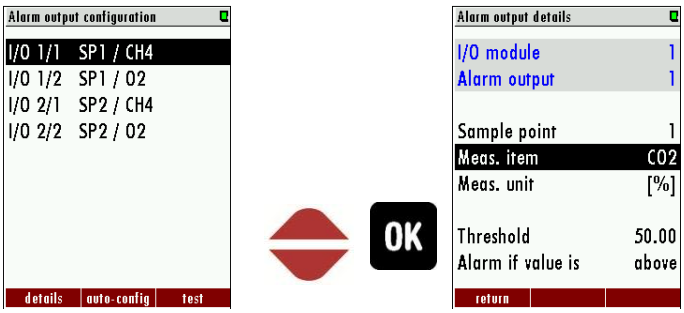
This example means: At the second channel of the first IO module, the CH4 signal from the first sample point will be transferred.

At the sketch below, the menu-screen and the analog-outputs at the first of two IO modules are shown.

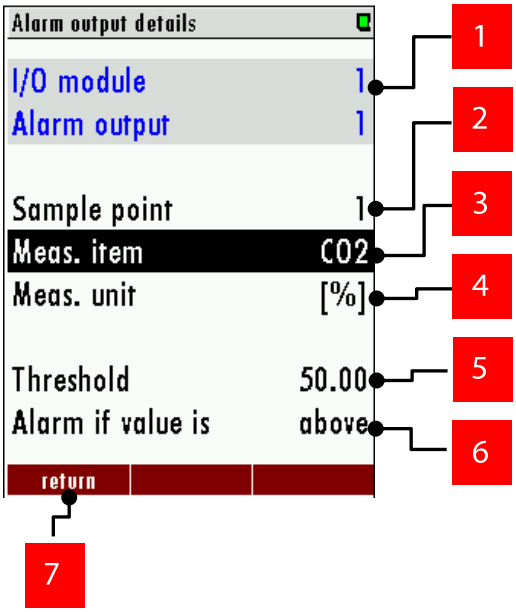


Reference:

1	List of the installed alarmoutput ports	At this list the operator can select, which alarm output should be configured.
2	Details	Here the operator can open the configuration screen for the selected alarm output. To open the details-menu, push F1 or OK.
3	Auto configuration	If the operator pushes this key (F2) the output pins would be configured by default values.
4	Test	The test-menu is for testing the alarm outputs. To open the test-menu, push F3 or OK.



The settings for an alarm-output can be changed in the “Alarm output details” menu. See the screenshot below.



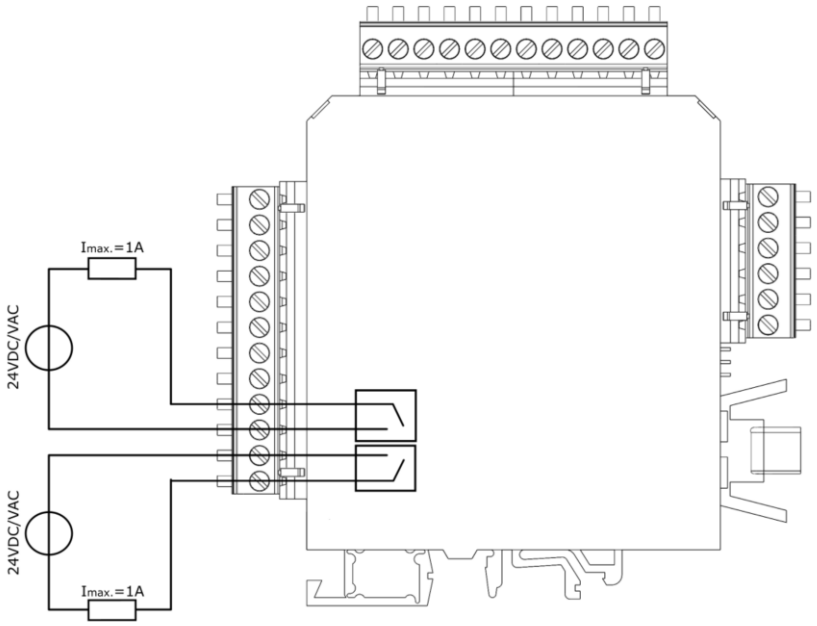
Reference:

1	Section	Shows the operator, which alarm-output will be changed.
2	Sample point	The operator can select the sample point. This means, that the alarm-output signal from the choose sample point will be transmitted to the process control system.
3	Meas. Item	At this point the operator selects the measurement item, which should be monitored. Basically, all measurement-channels, which can be measured, can be selected at this point.
4	Meas. Unit	This point shows, which unit the transmit signal have. This point cannot be changed.
5	Thresh-old	Here the threshold will be determined.
6	Alarm of value is	The operator can determine, if the alarm will be triggered above the determine threshold, or below the threshold.
7	Return	Leave the menu. Alternate push F1.

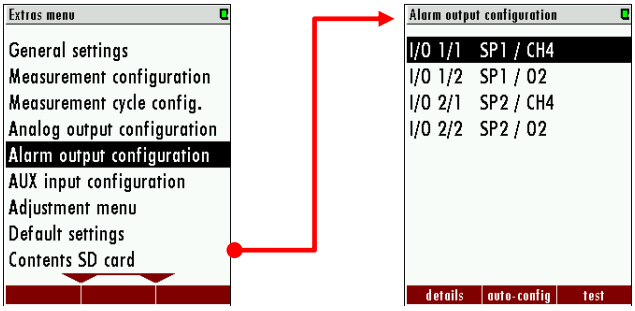
Example: Alarm output to control room

Start position:
A warning light should be installed in the system. It should be switched on when the H2S concentration at measuring point 2 is above 550 ppm. The analyzer has an IO module. The two alarm outputs are not connected.
The following steps must be carried out:

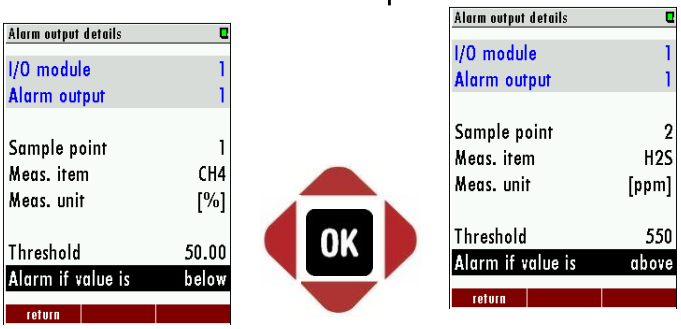
- Both alarm outputs are equipped with a potential-free relay. The maximal voltage of the power supply is 24 VDC. So, the operator must provide a 24 VDC power supply and a warning light, which works with 24 VDC.



- Connect the parts to the relay.
- In the next step, the alarm output must be configured. To do this, the path: EXTRAS/CONFIGURAT. ALARM OUTPUTS. The menu heading for the setting appears. To configure the first alarm output, the menu item (channel I/O 1/1 MS1 / CH4) must be selected in the menu.
- To change the configurations, press "Details" (F1). The Details menu opens for the selected alarm output.



- The follow screen appears. To configurate the channel 1, the red marked positions must be changed:



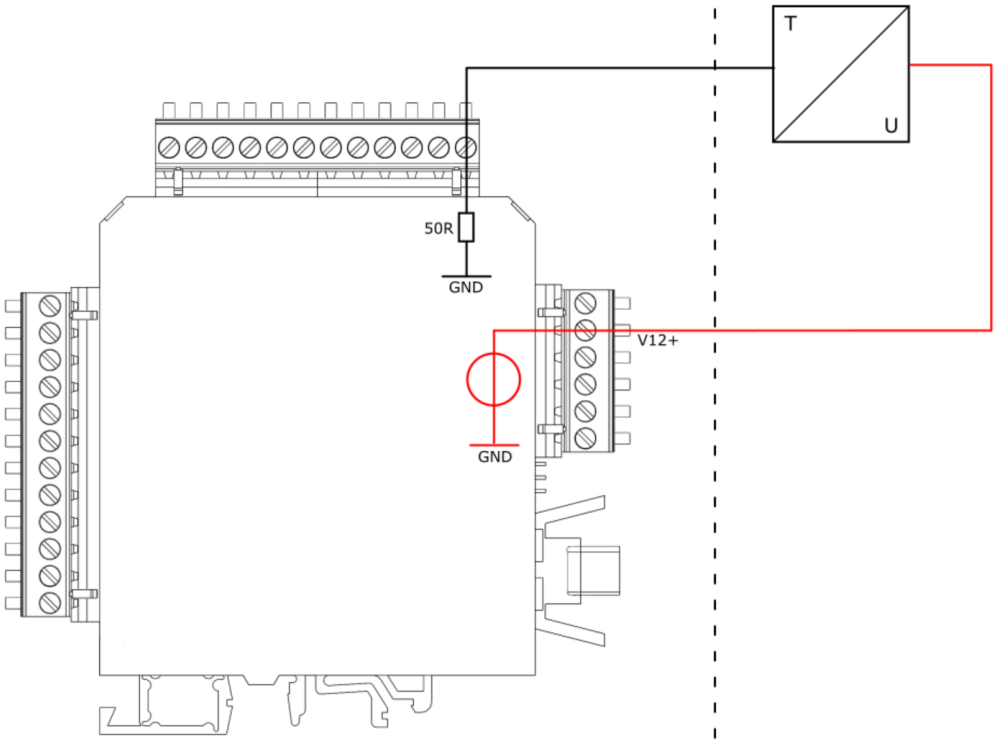
7.5. Analog inputs (4-20 mA)

☞ Assignment: See 7.2 Pin assignment

The analog inputs are on the top of the IO module. Through the help of the analog inputs, the IO module can read all common 4-20 mA transducer in the analyzer directly. The IO module has a separate 12 V power source, for the supply of the transducer. At the sketch below, the inputs and the power supply, for the transducer are marked.

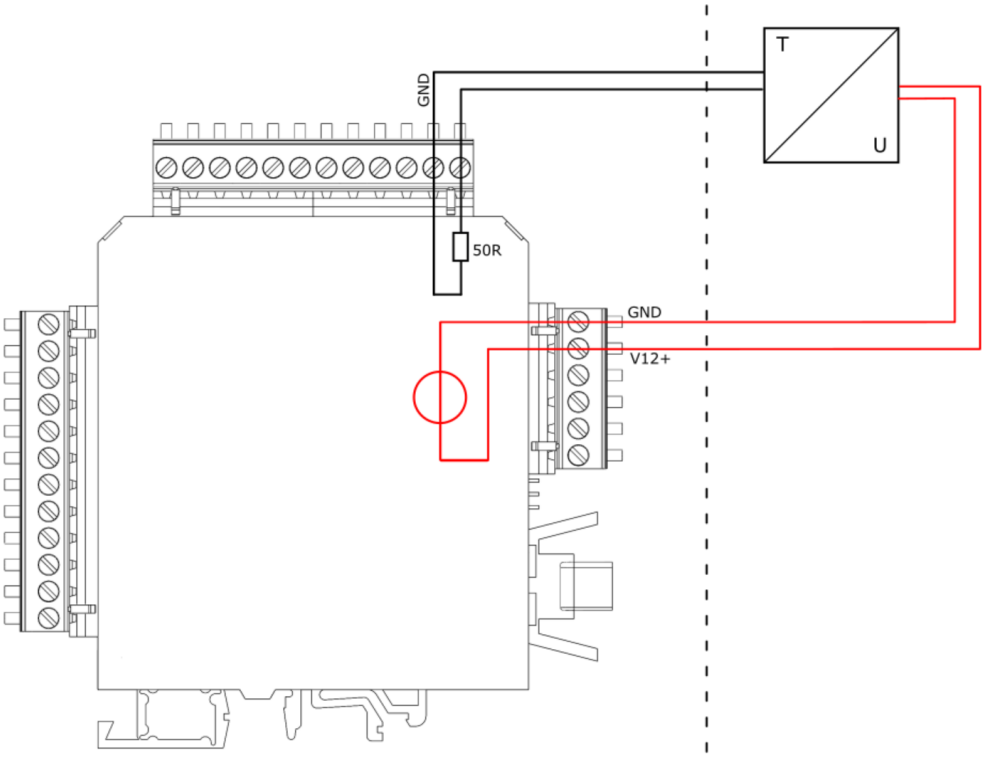
Information
Measuring resistor: 50Ohm
Power supply for transmitter: 12 VDC/200 mA
Connection options for...: 2-wire/3-wire and 4-wire transmitter

Connection: 2 wire transmitter



With a 2-wire transmitter, only the 12VDC pin and the AIx+ pin are used.

Connection: 4 wire transmitter

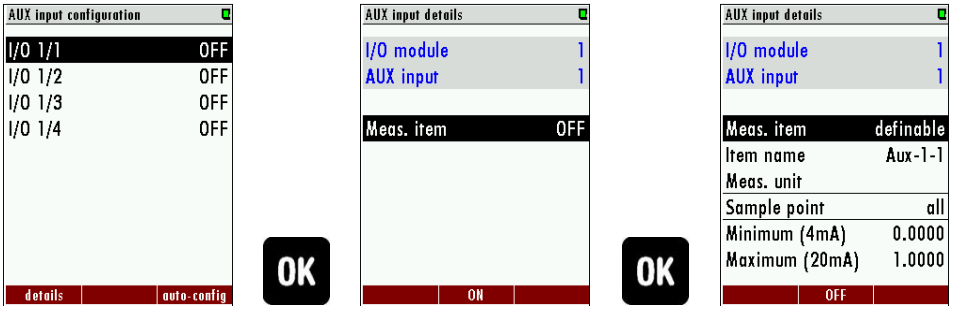


With a 4-wire transmitter, the transmitter has two separate terminals for its power supply. These must be connected to the two voltage supply pins. The measurement signal is then connected to the two AIx+/AIx- pins.

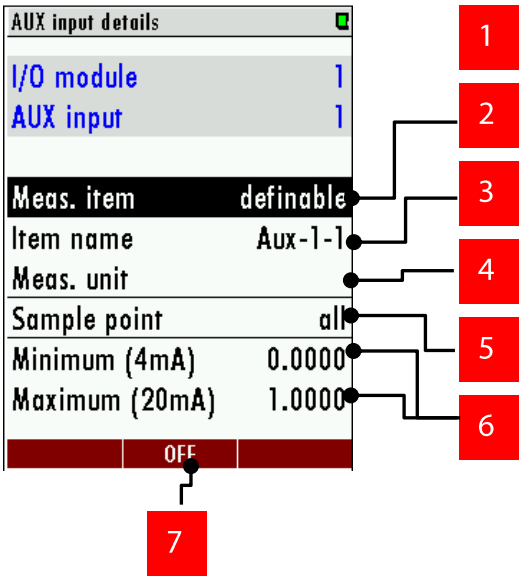
Software-side

- Open the menu: EXTRAS/AUX INPUT CONFIGURATION (1).
- The overview screen appears. At the overview-screen, the installed AUX-inputs are listed. Every IO module has four AUX-inputs. At the default settings all AUX-inputs are deactivated (OFF at the overview-screen).
- To activate an AUX-input, push F1 (=details). The different IO-inputs can be selected with the up/down arrow keys.
- After one AUX-input is selected, the measurement item must be activated. To do this, turn the measurement item from OFF to definable.
- The measurement item “definable” is an individually measurement configuration, where the user can configure by himself.

The measurement item “definable” is an individual configuration channel. The menu “AUX input details” contains some pre-configurated settings, like for temperature, or pressure sensors.



The structure of the menu “AUX input details”, for the channel “definable” is given at the screenshot below.

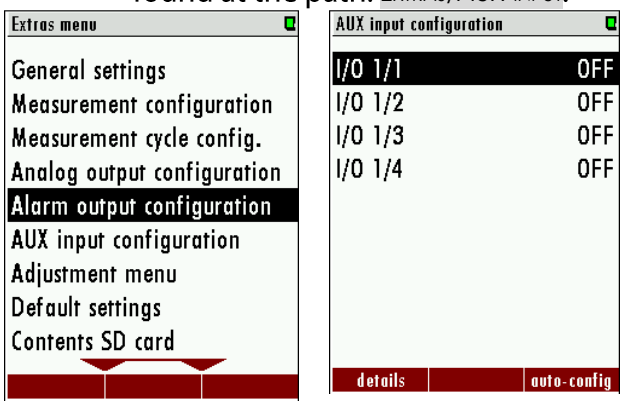


Reference:

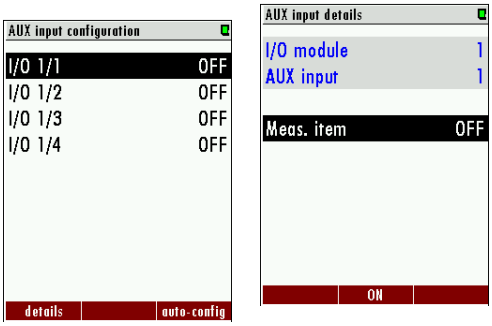
1 Show the operator, which analog-input will be changed.
2 The operator can select the sample point. This means, that the analog-output signal from the choose sample point will be transmitted to the process control system.
3 At this point the operator selects the measurement item, which should be transmitted. At the chart below, the typical measurements items are counted. Basically, all measurement-channels, which can be measured, can be selected at this point.
4 The dimension of the measurement item (example: %,ppm…)
5 This point shows, which unit the transmit signal have. This point cannot be changed.
6 Here the operator entering the equivalent measurement value, for a current of 4 mA.
6 Here the operator entering the equivalent measurement value, for a current of 20 mA. The IO module will create the linear relation.
7 Leave the menu. Alternate push F2.

After the sensor is connected to the IO-module correctly, the sensor must be configured at the SWG100.

- Open the menu: AUX-input configuration. This menu can be found at the path: EXTRAS/AUX-INPUT.



- First the operator sees an overview, which shows with kinds of sensors are mounted at the IO-module. In this example, there is no transducer mounted at the SWG100.
- To configure a new sensor, push F1.
- The follow screen appears. Here, the sensor can get an individual name.
- At the toolbar, the operator can select the options:
- Details (F1): Here the select analog-inputs can be configured. If F1 is pressed the follow screen appears.
-



This screen means, that no transducer is configurated. Meas. Item is OFF (default). With the ON key (F2) or the arrow right/ left key, the operator can skip inside the menu.

- If the AUX input is activated, the follow screen appears. At this screen the operator can define the incoming signal.
- Meas. Item: This is the skip menu-point. Push the right/ left arrow key, to activate another define AUX-input.
- Item name: Here the operator can enter a name for the AUX-input. To enter a name, press the OK key. An alphabet will appear, where the operator can enter a name.

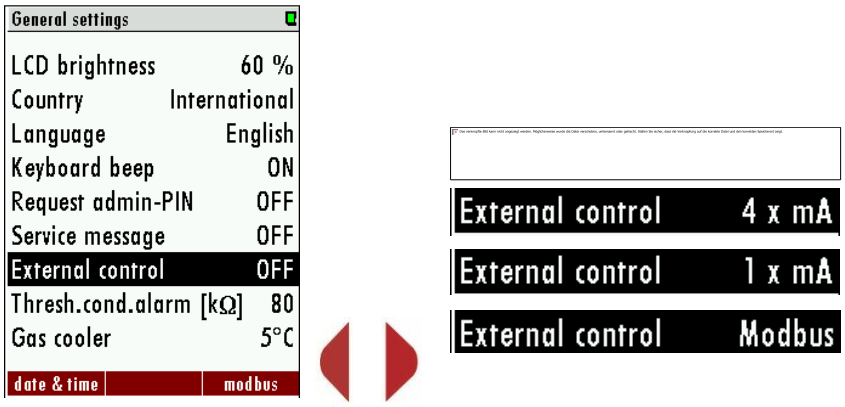
7.6. Configuration of the external control (Option: IO module)

This feature requires an I/O module (optional) and the function must be activated.
This feature can be used for the external control of the analyser. With the help of the external control follow operations can be done:

- Externally controlled sampling point selection,
- Stand-by.
- The commands will be given by a 4-bit binary number, which will be built through four external signals. The pins for the signal are shown in the sketch below. It exists two different types to set the four pins:
- Potential free relay contacts.
- 4-20 mA signal inputs.
- Through one 4...20mA input.
- Through Modbus (RTU).

The settings-menu can be found at the path: EXTRAS /GENERAL SETTINGS → EXTERNAL CONTROL.

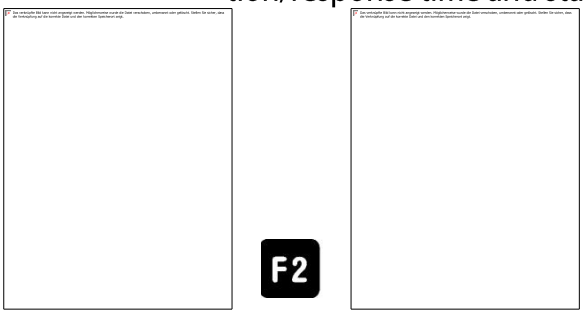
The user can set three different types for the external control. The types can be found at the sketch below.



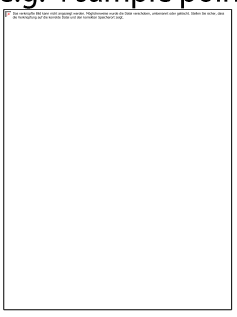
Configuration at the analyzer

- Open the path: EXTRAS/GENERAL SETTINGS.
- Switch the menu-point “External control” from “OFF” to “Relais”/“4x mA” or “1 x mA” (dependent from the connected signal input.). When the external control is activated an arrow symbol will appear at the title line.

- If a valid input state (>0) is present, an arrow in the title line will appear. The analyzer is now slave and will perform the measurement until it gets another command from the master unit. Some external control settings can be configured. This can be found at the path: EXTRA/GENERAL SETTINGS then F2= ext.crtl.
- The user has the opportunity to set the zeroing time, suction/response time and stand-by purge time.



Case 1: Stand-by
The Stand-by modus will be activated if the input state is higher than the number of sample points (example: 4 sample points and input state 5…15).
The Stand-by modus has the following pass:
- Purging with zero gas (for the configured duration)
- Standby until the input state is below or equal the number of sample points (e.g. 4 sample points and input state 1.4)



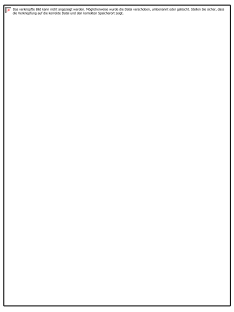
Case 2: External control of a sample point
-Zeroing: First the zeroing will be done. The duration of the zeropoint can be set at the menu ext. crtl. (see point “configurated at the analyzer” in the same chapter).
-Gas sampling: The gas sampling is for purging the entire system and give the analyzer enough time for response. (Response time). To set the suction/ response time, see point “configurated at the analyzer” in the same chapter.

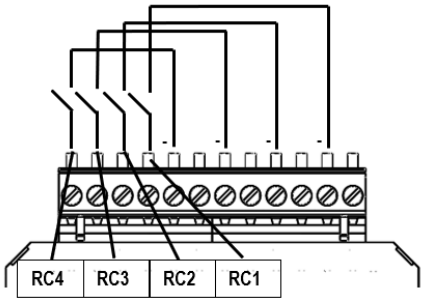
-Measurement: The measurement will be started after the response/ suction time is finished. It will be only abort if the user changes the status of the external signal sources. The chart below shows the possible statues, which can be set at the analyzer:
(*1): Whenever the selected sample point will be changed, then the analyzer will start a zeroing before measuring the new sample point.
(*2): Not only status numbers 4 to 15, but all status numbers larger than the number of installed sample points will start the “stand-by” (example: when you have 4 sample points, then status numbers 5 to 15 will trigger “stand-by”).
(*3): When the status number changes to a “stand-by“ number, then the analyzer will purge the sensors, then it will close all solenoid valves and switch off the gas pump. When the status number changes back to a value less or equal to the number of installed sample points, then a “set to zero” cycle will start and afterwards the selected sample point will be measured.
Note: The “stand-by” status can easily be used to initiate just a zeroing without any “stand-by” and without changing the sample point.
Example :- status number=1 (for any time period, recommended max. 1 hour)
- status number=15 (for a few seconds, recommended min. 10 seconds)
- status number=1 (for any time period, recommended max. 1 hour)

After installation and power-up of the analyzer few steps should be processed in order to operate the instrument properly.

Connection of the external control via relay contact

This feature can be used for externally controlled sampling point selection, zeroing and stand-by, using external potential free relay contacts, see also diagram in $4.4
The relay contacts build a 4-bit binary number: RC4 - RC3 - RC2 - RC1 open=0, closed=1.
Let us tell this number 'status number'.

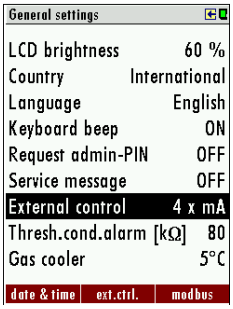


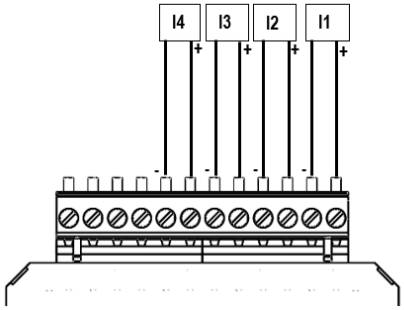


Status of external signal source				Status number	Description
RC4	RC3	RC2	RC1	-	-
0	0	0	0	0	Automatic sampling point switching
0	0	0	1	1	Analyzer is sampling the point SP1 (*1, *2)
0	0	1	0	2	Analyzer is sampling the point SP2 (*1, *2)
0	0	1	1	3	Analyzer is sampling the point SP3 (*1, *2)
0	1	0	0	4	Analyzer is sampling the point SP4 (*1, *2)
0	1	0	1	5	Analyzer is sampling the point SP5 (*1, *2)
0	1	1	0	6	Analyzer is sampling the point SP6 (*1, *2)
0	1	1	1	7	Analyzer is sampling the point SP7 (*1, *2)
1	0	0	0	8	Analyzer is sampling the point SP8 (*1, *2)
1	0	0	1	9	Analyzer is sampling the point SP9 (*1, *2)
1	0	1	0	10	Analyzer is sampling the point SP10 (*1, *2)
1	0	1	1	11	Analyzer is “stand-by” (*3)
1	1	0	0	12	Purge phase for H2S-low-sensor
1	1	0	1	13	Auto-Calibration
1	1	1	0	14	Remote reset of all system alarms
1	1	1	1	15	Analyzer is “stand-by” (*3)

**only SWG100-BIO analyzers.

Connection of the external control via 4-20 mA input signals





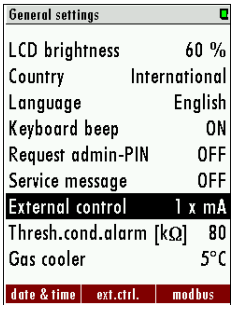
The signal inputs built a 4-bit binary number: **I4 – I3 – I2 – I1: 0-11 mA=open=0; 11/12-20 mA=closed=1.**

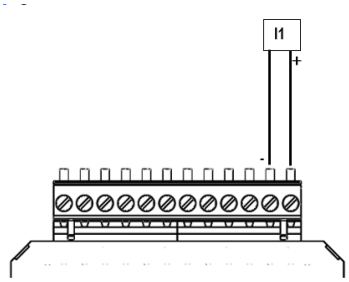
Status of external signal source				Status number	Description
I4	I3	I2	I1	-	-
0	0	0	0	0	Automatic sampling point switching
0	0	0	1	1	Analyzer is sampling the point SP1 (*1, *2)
0	0	1	0	2	Analyzer is sampling the point SP2 (*1, *2)
0	0	1	1	3	Analyzer is sampling the point SP3 (*1, *2)
0	1	0	0	4	Analyzer is sampling the point SP4 (*1, *2)
0	1	0	1	5	Analyzer is sampling the point SP5 (*1, *2)
0	1	1	0	6	Analyzer is sampling the point SP6 (*1, *2)
0	1	1	1	7	Analyzer is sampling the point SP7 (*1, *2)
1	0	0	0	8	Analyzer is sampling the point SP8 (*1, *2)
1	0	0	1	9	Analyzer is sampling the point SP9 (*1, *2)
1	0	1	0	10	Analyzer is sampling the point SP10 (*1, *2)
1	0	1	1	11	Analyzer is “stand-by” (*3)
1	1	0	0	12	Purge phase for H2S-low-sensor**
1	1	0	1	13	Auto-Calibration
1	1	1	0	14	Remote reset of all system alarms
1	1	1	1	15	Analyzer is “stand-by” (*3)

**only SWG100-BIO analyzers.

Connection of the external control via one 4-20 mA input signal

The user has the opportunity to control the analyzer with only the first 4-20mA input (see sketch below). The different commands will be given by the changing of the current signal. The offset-signal is 4 mA. Every 1 mA step describes a condition of for the external control. Overall, the analyzer can take 16 different statuses. The first status is by 5 mA (4 mA+1 mA) the second is by 6 mA (4 mA + 2 mA) and so on until the 20-mA signal is reached.





Status of external signal source I [mA]	Status number	Description
4	0	Automatic sampling point switching
5	1	Analyzer is sampling the point SP1 (*1, *2)
6	2	Analyzer is sampling the point SP2 (*1, *2)
7	3	Analyzer is sampling the point SP3 (*1, *2)
8	4	Analyzer is sampling the point SP4 (*1, *2)
9	5	Analyzer is sampling the point SP5 (*1, *2)
10	6	Analyzer is sampling the point SP6 (*1, *2)
11	7	Analyzer is sampling the point SP7 (*1, *2)
12	8	Analyzer is sampling the point SP8 (*1, *2)
13	9	Analyzer is sampling the point SP9 (*1, *2)
14	10	Analyzer is sampling the point SP10 (*1, *2)
15	11	Analyzer is “stand-by” (*3)
16	12	Purge phase for H2S-low-sensor**
17	13	Auto-Calibration
18	14	Remote reset of all system alarms
19	15	Analyzer is “stand-by” (*3)

**only SWG100-BIO analyzers.

Connection of the external control via Modbus

A further option is, to control the external control via Modbus. To do this, follow steps must be done:

•Connect the RS485 to Modbus converter to the Modbus connector found at the main pcb. A description can be found in the chapter XX.

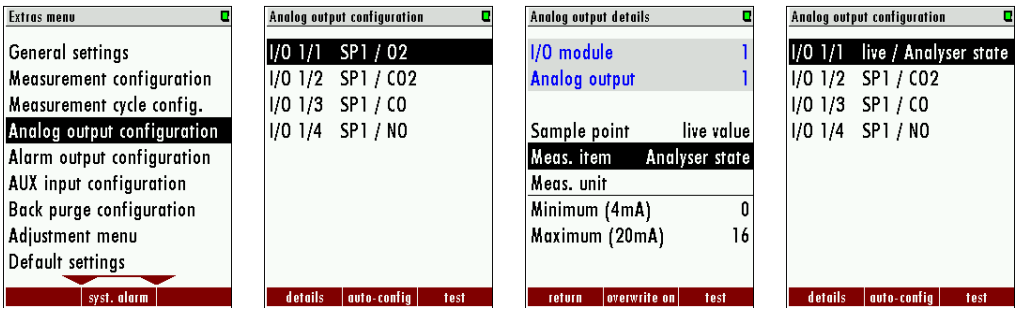
•Set the external control: Open the menu point "General settings": EXTRAS/GENERAL SETTINGS. Select the menu-point EXTERNAL CONTROL" MODBUS.

•The master writes a value on the address 6000, the value is the same than with external control via digital or analog inputs:

Status number values	Description
0	Automatic sampling point switching
1	Analyzer is sampling the point SP1 (*1, *2)
2	Analyzer is sampling the point SP2 (*1, *2)
3	Analyzer is sampling the point SP3 (*1, *2)
4	Analyzer is sampling the point SP4 (*1, *2)
5	Analyzer is sampling the point SP5 (*1, *2)
6	Analyzer is sampling the point SP6 (*1, *2)
7	Analyzer is sampling the point SP7 (*1, *2)
8	Analyzer is sampling the point SP8 (*1, *2)
9	Analyzer is sampling the point SP9 (*1, *2)
10	Analyzer is sampling the point SP10 (*1, *2)
11	Analyzer is "stand-by" (*3)
12	Purge phase for H2S-low-sensor
13	Auto-Calibration
14	Remote reset of all system alarms
15	Analyzer is "stand-by" (*3)

**only SWG100-BIO analyzers.

this feature, open the path: EXTRAS / ANALOG OUTPUT DETAILS (see pictures below).



Each 1 mA steps represent a function. The chart below shows the different states:

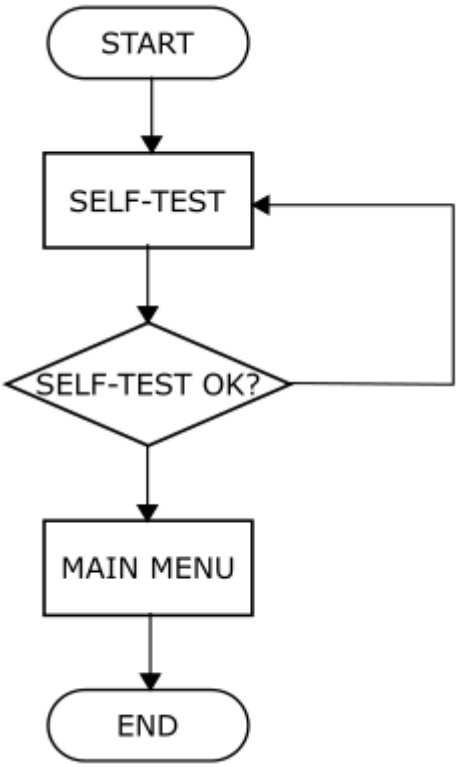
#	mA-Signal	Function
0	4,0 mA	Power-On / self test
1	5,0 mA	Measuring sample point 1
2	6,0 mA	Measuring sample point 2
3	7,0 mA	Measuring sample point 3
4	8,0 mA	Measuring sample point 4
5	9,0 mA	Measuring sample point 5
6	10,0 mA	Measuring sample point 6
7	11,0 mA	Measuring sample point 7
8	12,0 mA	Measuring sample point 8
9	13,0 mA	Measuring sample point 9
10	14,0 mA	Measuring sample point 10
11	15,0 mA	Zeroing
12	16,0 mA	Gas sampling (from any sample point)
13	17,0 mA	System Alarm (measurement halted)
14	18,0 mA	Manual calibration in progress
15	19,0 mA	Automatic calibration in progress
16	20,0 mA	Stand-By

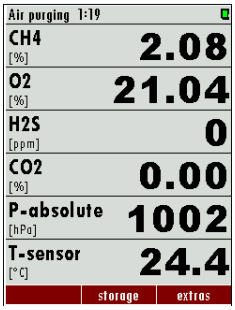
8 Menu navigation

This chapter has the follow structure:

- In the first part it will be explained, how to start the analyser and the selftest menu.
- Part three shows the submenu, which are listed at the EXTRA menu.
- Part four shows the store menu.

8.1. General process of the measurement cycle





Main menu

Self-Test

The first menu to be displayed after Power-On is the self-test menu. The analyser won't leave this menu before all sub-systems will be connected and the gas cooler (option) has reached the target operation temperature.

During the self-test phase

- the gas pump is switched off
- all analog outputs will deliver 2mA
- all alarm outputs will have alarm status (open contacts)

Usually the self-test will be left automatically as soon as all conditions for measurement are satisfied. Then the first zeroing will be started.

If one of the internal RS485 bus participants are issuing alarm (faulty) status, the user can still leave the self-test manually by pressing F2='forward' (PIN code requested), even if not all sub-systems or the gas cooler are ready.
NOTE: this is for service purpose only!

Main menu measurement

This menu is the root of all menus and will be shown automatically as soon as the self-test is finished. The title bar you can see on the left the current measurement cycle status and how long it lasts and the actual sampling point number. In the middle section of the actual measurement values are displayed.
Representation during the status "measurement"
The title bar you can see on the left "measurement" and the remaining measurement duration, and the right light blue highlighted sampling point number SPx (x = 1 to 10) that is being measured. In the middle section of the menu, the current (live) values are displayed.

Representation outside the status of "measurement"

The title bar you can see on the left "air purging" or "gas sampling SPx" and the remaining duration of the current status. On the top right you can see the yellow highlighted sampling point number SPx previously measured or that you have selected for display and their measuring values are hold until it is measured again. In the middle section of the menu hold measured values of these measurement sites are displayed.

Change the Display Zoom / Standard

Two display modes are available:

- standard view mode with 6 values per page, up to 4 pages (indicating up to 24 values)
- zoom view mode with 2 values per page, up to 6 pages (indicating up to 12 values)

The indication mode can be swapped with the menu key and the selection of zoom view or standard view.
For devices with just one measuring point the switching is additional possible with the arrow keys up / down.

Change the displayed page

Use the arrow keys left / right can be changed in both display modes the page. The new page number is displayed in the title bar for a moment just after the successful change.

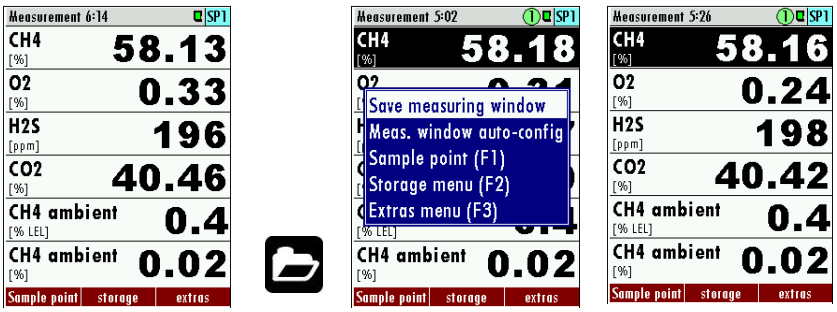
Change sampling point displayed

For analysers with several measuring points can used the arrow keys up / down the displayed (not measured) measuring point can be changed. In this way you can get an overview very quickly over the last measured values for all points. In the background, the analyser uses the measurement cycle continues uninterrupted. However, once a measurement phase is completed, the display automatically switches to the actual measurement location.

Configuration of the measurement window (display content)

The measuring values selection and arrangement is user free configurable in both display modes.
Press the content menu key and select the function 'Define measuring window'. A cursor (inverted line) will appear. The cursor can be moved with the arrow keys up and down. The arrow keys left and right will change the measuring value in the selected line. When the cursor is moved over the top or under the bottom line, then the next definable page will show up.

As soon as you have finished the configuration, press the ESC key (or press again the menu key and select the function 'Save measuring window'). You will be asked, whether the changed settings shall be stored or discarded. Select 'keep them' in order to store your changes.

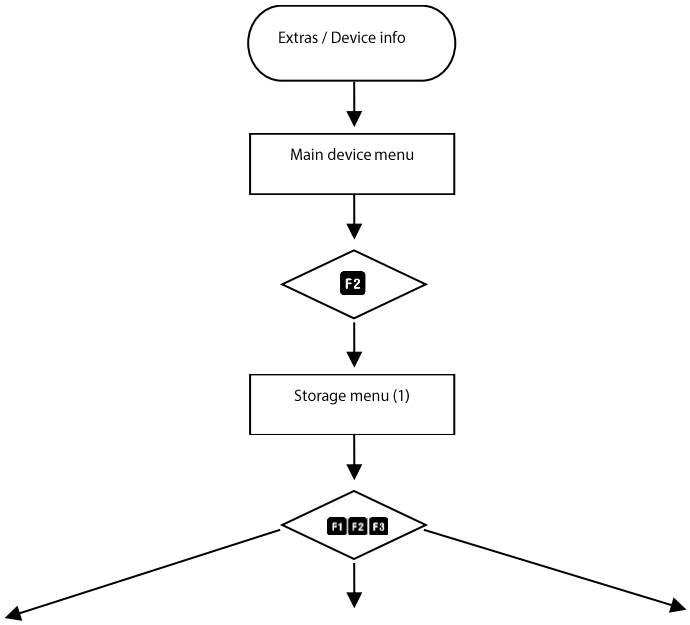


8.2. Data Storage Menu

The data storage menu can be reached by pressing F2='storage' in the measurement menu:
The menu provides an overview of stored measurements of each sample point and of the memory usage.

NOTE

DATA STORAGE
The analyser makes use of an internal flash memory to store measurement values automatically.

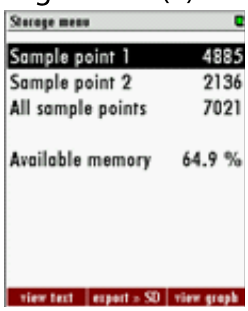


View text (2)

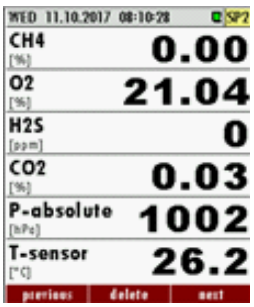
Export → SD

View graph (3)

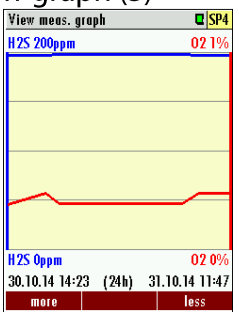
Storage menu (1)



View text (2)



View graph (3)



General information about the data storage

Data storage strategy is as follows:

- The analyser may store up to 20,000 measurement points (including all relevant data).
- At the end of each measurement cycle (per sampling point) the current values will be stored.
- The memory is used as a ring buffer. As soon as the memory is completely occupied, the latest measurements will replace the oldest measurements.

Specifically:
If the used memory is 99%, then the oldest 20% of the measurements will automatically be exported to SD card in CSV format and then deleted from the memory. In case the SD card export doesn't succeed (SD Card missing or read-only), then only the oldest 4% of the measurements will be deleted. The file names reflects the date of the most recent measurement contained in the export file, e.g. "20141031.csv".
Example:
An analyser with 2 sample points and a total configured cycle time of 32 minutes saves 2 * 24 * 60/32 = 90 measurements per day (45 of each sample point). So the ring buffer will provide measurements of the last 20000/90 = 222 days (more than 7 months).

View stored measurements in text mode

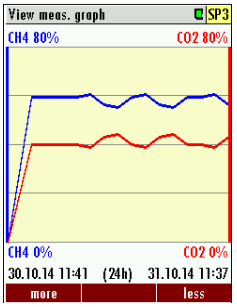
This function can be reached from the Data Storage Menu by selecting one or all sample points and by pressing F1='view text':

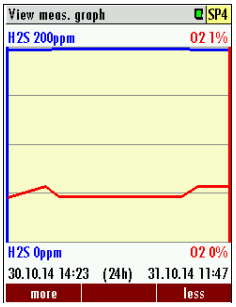
When entering the menu the latest stored measurement will be displayed. With the keys F1='previous' and F3='next' the measurements can be browsed (F3 will lead to the oldest measurement when the latest was displayed before - wrap-around).

You may delete a single measurement here, usually you won't need this function. The arrow keys have the same function than in the measurement menu.
View stored measurements in graphic mode

This function can be reached from the Data Storage Menu by selecting one sample point (not all) and by pressing F3='view graph':
Two curves for one pair of data are shown at the same time in one diagram. The used scales are determined automatically and can't be changed by the user.

The offered pairs of data are determined by the setting of the zoom values in the measurement menu. The displayed pair of data can be changed by pressing the arrow keys up or down.
When entering the menu the measurements of the last 24 hours will be displayed. This interval can be changed by pressing the keys F1=more or F3='less'.





Export of measurements to SD card

This function is used to export the measurements from the analyser to a PC. The used format is CSV (comma-separated values). Many computer programs are able to read this format, e.g. spread sheet calculation programs.

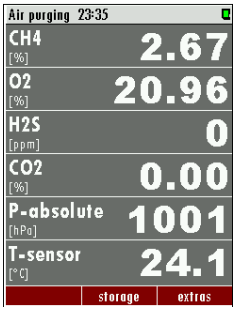
The CSV format is not exactly the same in all countries. The analyser selects a fitting format variation according to the selected country. Nevertheless the CSV output can be changed the Data Storage Menu.

This function is only available, when a SD card is inserted and is not write protected. The export can be started in the Data Storage Menu by selecting one or all sample points and by pressing F2='export >> SD'. The created files have names like 'xxxxx.csv', in which the xxxxx are continuing 5 digit numbers with leading zeros.

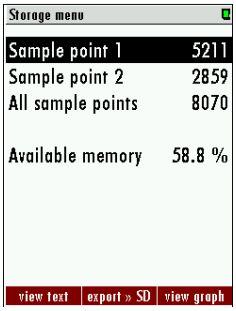
The 1st line of the created file is a column header with the following information: Sample point number, Date, Time and all measurements. The following lines contain the data.

CSV-configuration settings

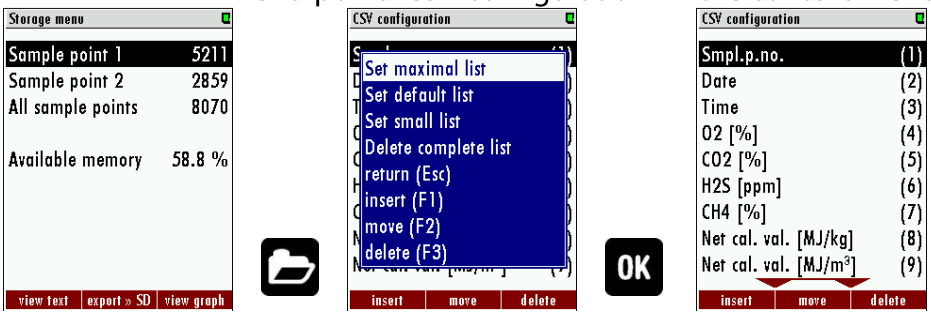
- Push „store“ (F2) in the main-menu.



F2



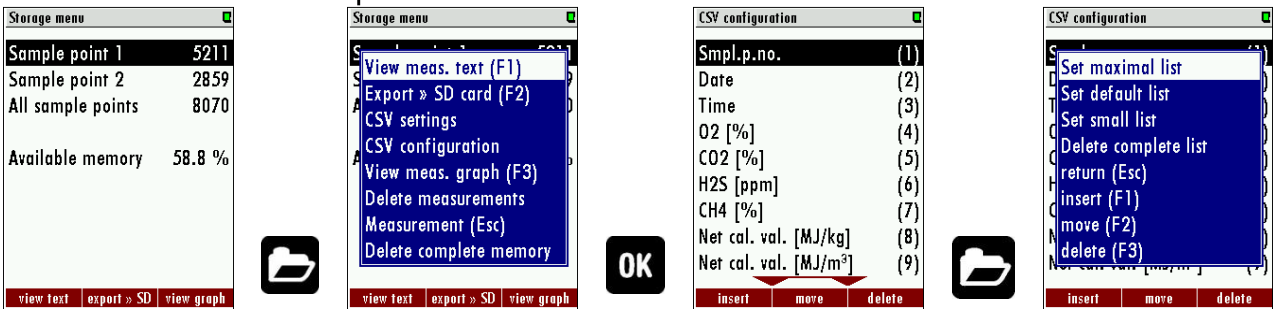
- Open the context-menu in the store-menu. Select the menu-point “CSV-configuration” in the context-menu.



- It appears a list of all configured csv-datas. With the keys F1, F2 and F3 the user can navigate through the configuration-menu. The single keys mean:
- F1=insert: Insert an entry below the cursor-position.
- F2=move: Move the entry from the cursor-position to an-other one.
- F3=delete: Delete the entry from the list.

- Inside the CSV-configuration, the user can change between three predefined lists. To open the selection of these, open the context-menu inside the CSV-configuration-menu and select one of the lists. The lists get the follow features

- Set maximal list: In this list all available measurement values and all 9 asset lines are pictured.
- Set default list: In this list all available measurement values and 2 asset lines are pictured.
- Set small list: In this list the general measurement values are pictured.

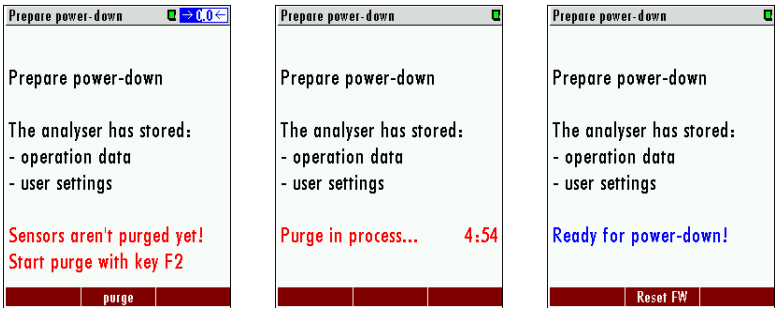


Power-Down of analyser

Before the analyser is disconnected from mains, it should be prepared for the Power-Down, because

- operational data should be stored
- eventually changed user settings should be stored
- the sensors should be purged with fresh air

Press the OFF key in any menu in order to prepare the analyser for the Power-Down. The analyser will store operational data and user settings and will offer to start a sensor purge cycle:



Start the purge cycle with the F2 key (PIN code requested). The analyser will purge the sensors with fresh air and will indicate a count-down. Then the analyser will be ready for power-down.

Now it is not possible anymore to directly continue the ordinary measurement process. Only power-down by disconnecting mains or a software restart by pressing F2='Reset FW' is offered.

Note:
You also may enter this menu by pressing the OFF key and leave it by pressing the ESC key (without starting the purge cycle) , when you just want to store operational data and user settings.

Backup/restore all individual user-settings

It's a quite amount of work to configure the analyser, especially when the analyser provides several sample point and several IO-modules and when the analog ouputs are used. Therefore we recommend to backup all your found settings on the SD card.

In order to backup the settings, do the following:

- use the menu EXTRAS.
- insert an SD card (without write-protection)
- press the menu key and select the function 'Export user settings'

The analyser will write the backup file 'settings.usr' to the SD card.

In order to restore the settings, do the following:

- use the menu EXTRAS.
- insert an SD card containing the backup file 'settings.usr'
- press the menu key and select the function 'Import user settings'

The analyser will replace the current settings by the settings from the backup file.

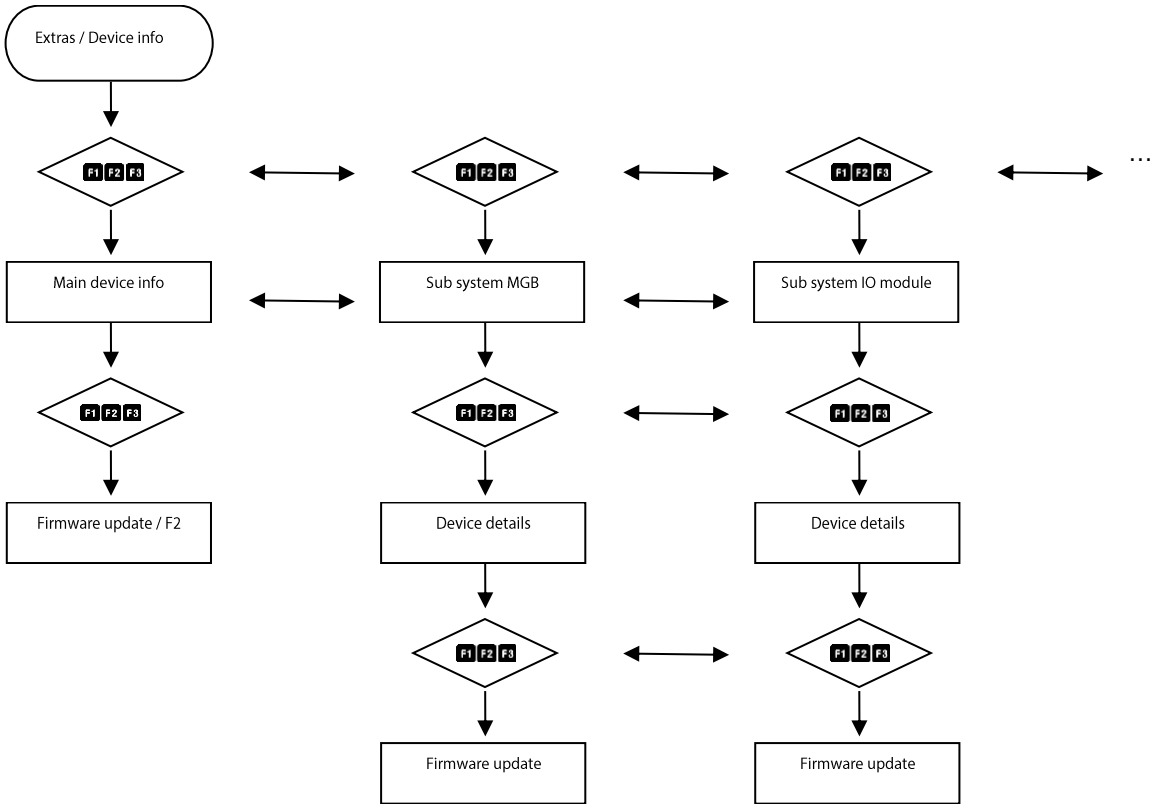
8.3. Update the firmware

The analyser and different installed options can be updated, if it is necessary. Following options can be updated:

- The firmware from the analyser.
- The firmware from the pcb- mainboard.
- The firmware from the NDIR-bench.
- The firmware from the installed I/O modules.

Overview: Device update

The structure below shows the princip of the menu. In this menu new updates / firmwares can be executed.



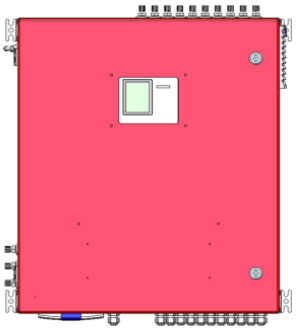
The analyser has a bus-systems of different independent pcb. All these pcbs can be selected and updated here. The screenshots show an example of one update menu.

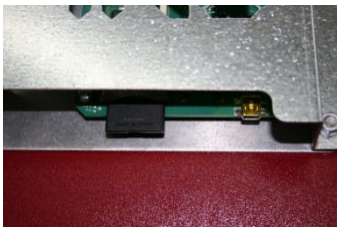
Reference:
1. Name of the updateable device. In this example the multi gas bench (MGB).
2. FW update.
The chart below shows the different updateable systems.

Number	Device
1	MGB (multi gas bench)
2	IO module
3	MCM (Measurement control modul)
4	Valve control module
5	Condensate pump module
6	Gas cooler module
7	ECM (ele ctrochemical module)
8	Broadcast (virtual)

General steps for the firmware-update

- Copy the actual firmware for the analyser or the firmware from the option on a SD-card. Be sure, that the firmware is in the mean root of the SD-card. All firmware updates have the ending “fwb”.
- Put the SD-card on the card slot on the operation unit. The card slot can be found inside the door (see sketch below).

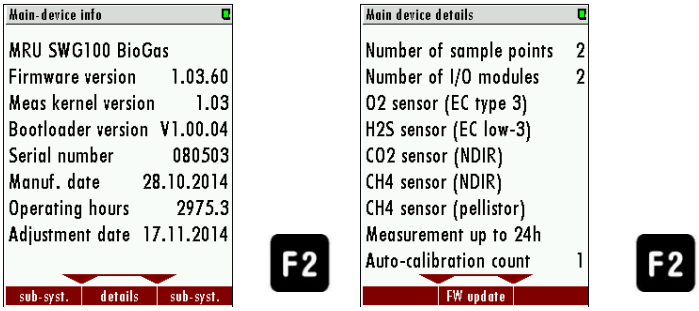




- If the SD-card is recognized, the analyser will make a noise.
- Open the path: EXTRA/DEVICE INFO. Dependent from the firmware update it can be necessary to open the different submenus.

Update the analyzer (Firmware-Updates with filename "1106.fwb")

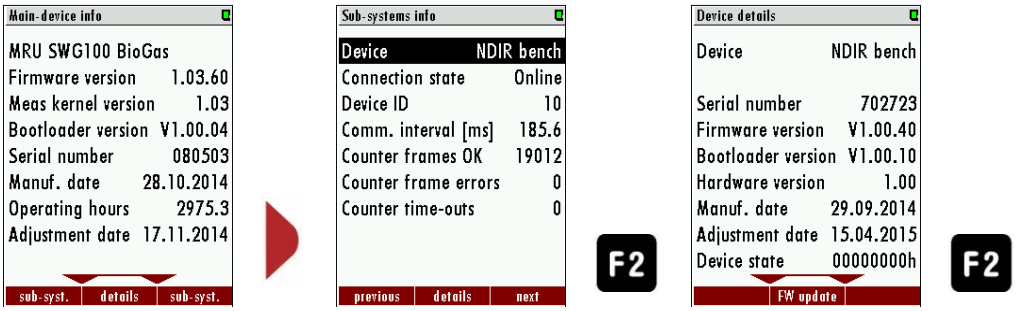
- Open the path: EXTRAS/DEVICE INFO



- Press F2 = details to open the details for the main device menu.
- Press F2 = FW update. The analyser will start the update from the SD-card.

Update the pcb-mainboard (Firmware-Update with filename "1106mb.fwb")

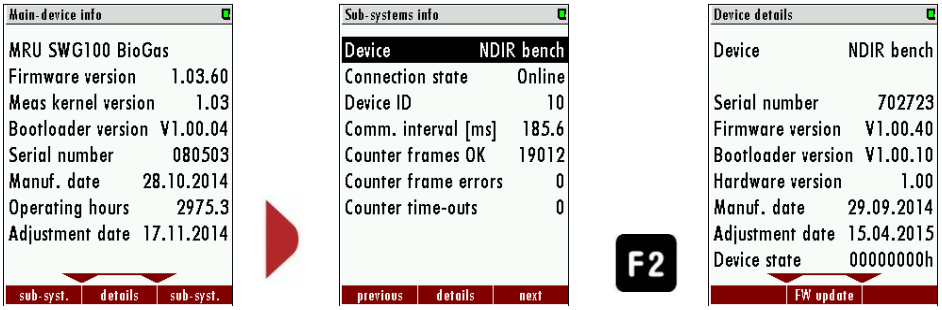
- Open the path: EXTRA/DEVICE INFO



- Press F3 = sub.syst. to open the menu "SUB SYSTEMS INFO".
- Press F2 = details, to open the details from the mainboard. Be sure, that the device is "Mainboard" to update the pcb-mainboard.
- The Update will start from the SD-card, if a firmware with the filename "1106mb.fwb" is at the SD-card.

Update the NDIR-bench (Firmware-Update with filename "1106ndir.fwb")

- Open the path: EXTRA/DEVICE INFO

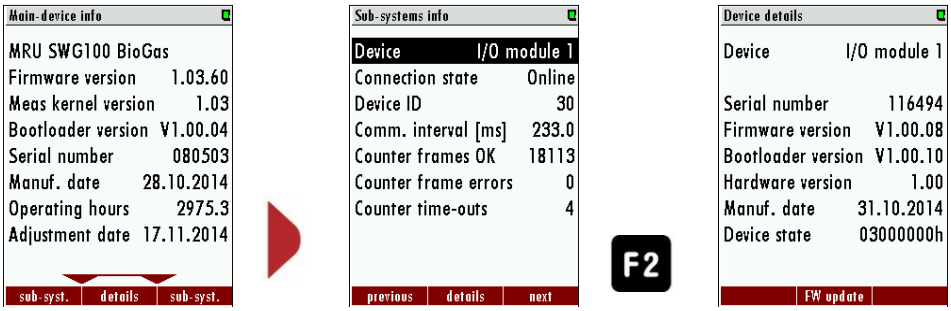


- Press F3 = sub.syst. to open the menu "SUB SYSTEMS INFO".

- Press F2 = details, to open the details from the NDIR bench. Be sure, that the device is “NDIR bench” to update the NDIR-bench.
- The Update will start from the SD-card, if a firmware with the filename “1106ndir.fwb” is at the SD-card.

Update the IO modules (Firmware-Update with filename “1106iom.fwb”)

1.Open the path: EXTRA/DEVICE INFO



- Press F3 = sub.syst. to open the menu “SUB SYSTEMS INFO”.
- Press F2 = details, to open the details from the I/O module. Be sure, that the device is “Mainboard” to update the I/O module.
- The Update will start from the SD-card, if a firmware with the filename “1106iom.fwb” is at the SD-card.

9 Service and maintenance

For a reliable function and high measurement quality it is necessary to inspect and service the analyser regularly.
Besides the regular routine control by the operator (see chapter 8.1) the producer recommends a regular half year maintenance, which must carried by a qualified specialist.

9.1. Preparing and information about the maintenance

It is important to power off the mains supply before the maintenance can be started. Even if the main fuse is powered off, dangerous voltage is present.
It can be required to cut off the electric supply and safe this from an accidental switch-on.
By maintenance works on the gas analyser dangerous and toxic gases may leak. The gas supply must be cut-off.
It is important to comply with the national directives, which are the country specific.

9.2. Regular maintenance works by the operator

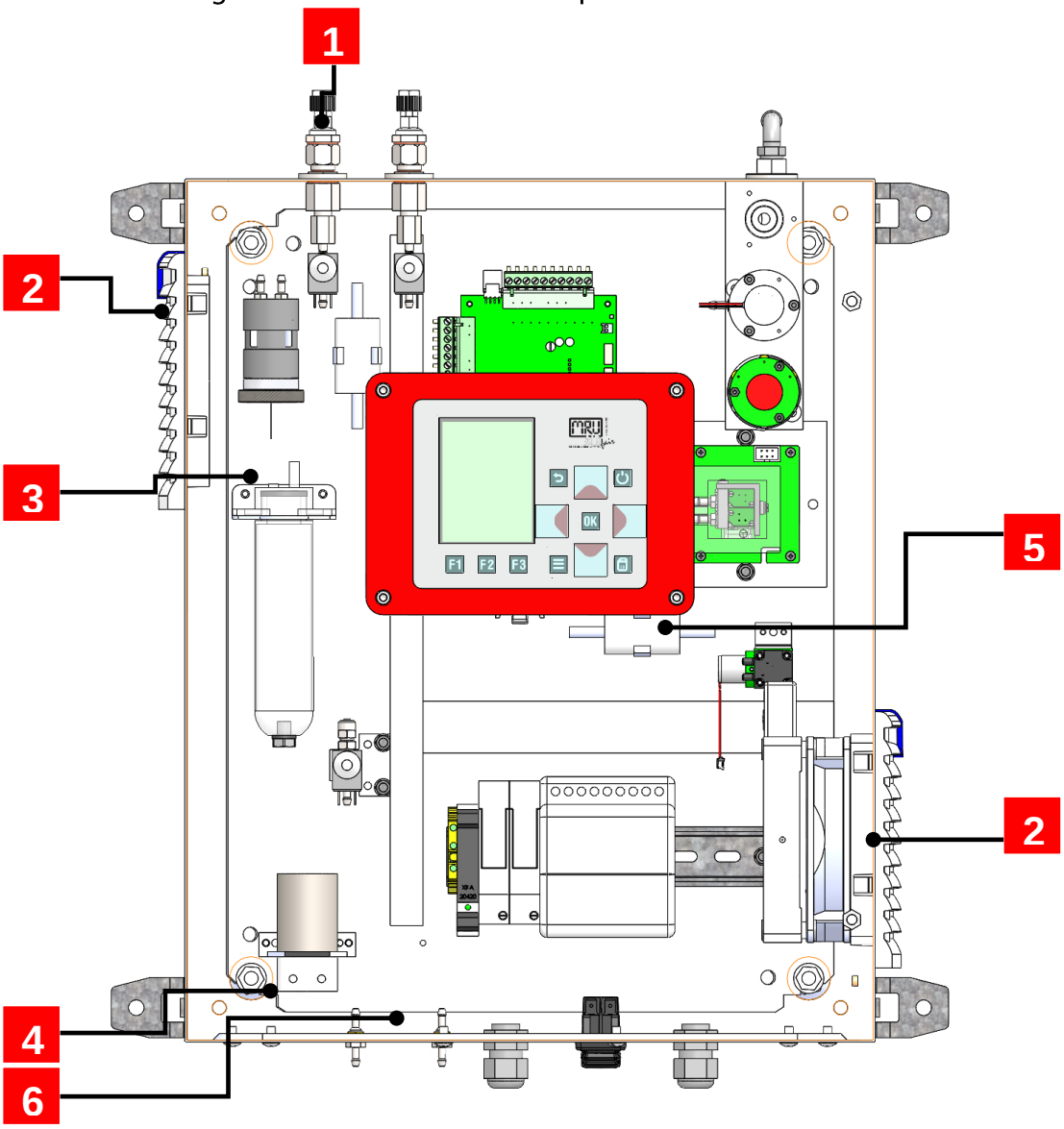
All inspections- and maintenance works are dependent from individual oper-ating conditions, and site. The specified intervals below are only benchmarks.

Review	Recommended intervals	Actions
Moisture in the analyser.	Weekly	Remove the moisture. Call vendor specialist.
Dirt and depositions in analyser.	Weekly	Remove the dirt, prevent further penetration of dirt.
Dirt and moisture in the filter- unit	Weekly	Exchange the filter- unit.
Testing the gas pipes of leakage with “sniffer”	Weekly	Tighten or exchange the gas pipe if it is necessary
Inspecting the conditions of the gas filters	Every month	Exchange if necessary

In the follow chapters there will be introduced some service parts, which are important for the reliable operation. These parts are independent from the regular checks and must be replaced in a regular interval of minimum 6 month.

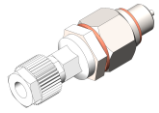
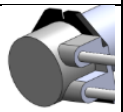
9.3. Description of the analyser

The sketch below shows the positions of all spare and consumable parts in the analyzer. The parts, marketed with a red circle is a spare part, the parts, market-ed with a green circle is a consumable part.



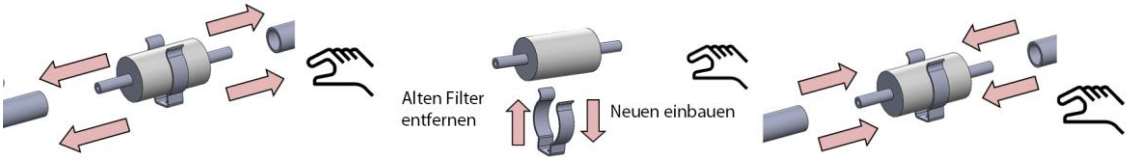
Content of the service-set (#

#	Quantity	Article-number	Article name
1	1	11525	Reducer unit
2	5	60320	Filter mat
3	1	65533	Dust filter
4	1	60421	Condensate pump (head)
5	1	66088	Dust filter
6	1	65884	Zero gas filter

1	2	3	4	5	6
					

Dust- and particle filter (#65533 and #66088)

- Pull the viton-tubes from the filter unit with the hand. If it is necessary, pliers can be used to solve the tubes from the fil-ter unit.
- Remove the exhausted filter unit from the clip.
- Plug the viton tubes on the filter unit. Push the filter unit on the clip.



Filter mats (#60320)

- Open the filter-unit by pulling the blue lash.

- Replace the exhausted filter mat through a new one.

- Close the cover from the filter unit.

10Adjustment: NDIR-bench (MGB-Module)

ATTENTION

Close door

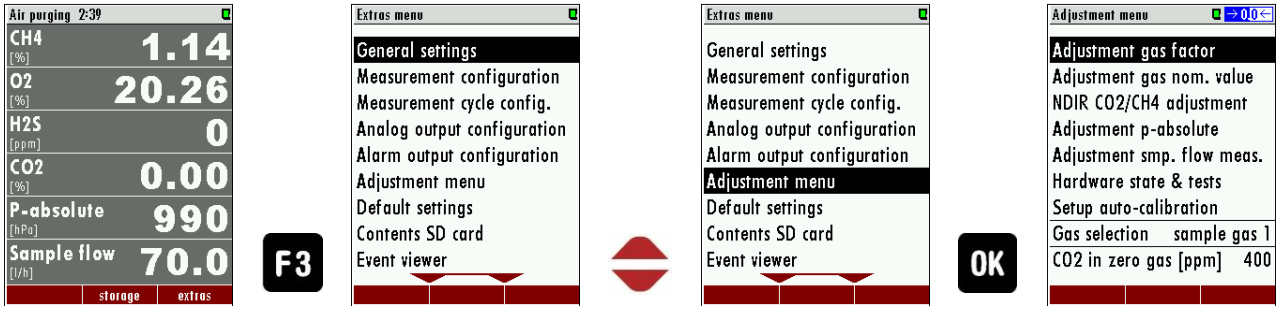
During the entire adjustment, the cabinet door must be closed.

ATTENTION

The PIN-Code is: F1 - F1– F3 – F2 – F2 – UP - DOWN

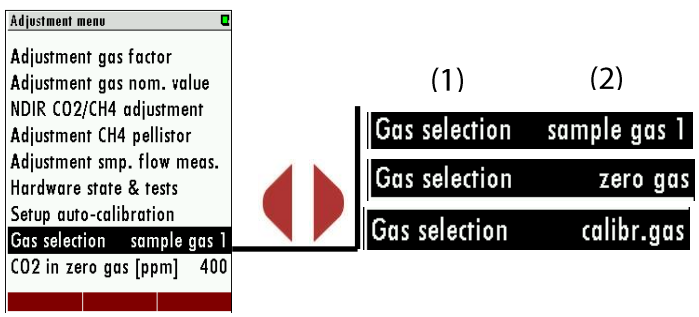
- Select the menu: EXTRAS/ADJUSTMENT MENU and input the 6 symbols password.

→0.0← Zero point: If this symbol appears, just wait until it disappears



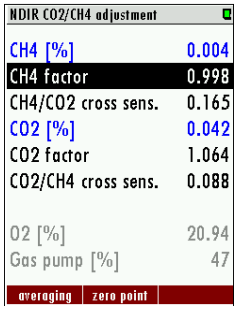
- Select the menu point "*gas selection (1)*": Here the user can choose between:
  - Zero gas inlet.Sucks gas from zero-gas inlet, if activated.
  - Calibration gas inlet.Sucks gas from calibration gas inlet, if activated.
  - Sample gas.Sucks gas from sample-gas inlet, if activated.

The screenshot below shows the different gas inlets and their position at the analyser.



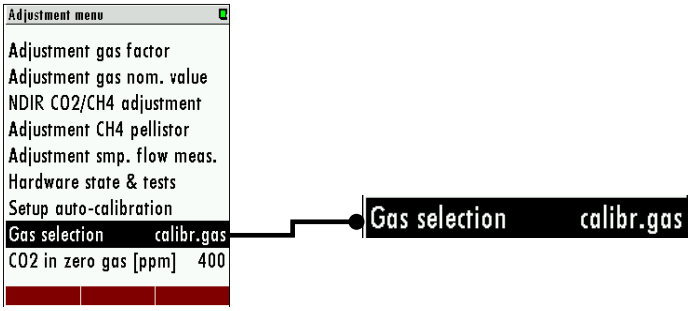
Adjustment steps

- First select "Zero gas (1)" at the menu point "Gas selection (2)". The analyzer will suck the zero gas inside the analyzer. Be sure, that the tube, from the gas cylinder is not plug to the zero gas inlet.
- Select the menu point "NDIR CO2/CH4 adjustment". The follow screen appears.



In this menu the user can see the actual gas values, from the installed electro-chemical sensors. Wait until all values are stable.

- Select the menu point “NDIR CO2/CH4 adjustment”. Wait until the values are around zero and the values are stable. Then press F2=zero point.
- Supply the NDIR bench with gas.
- Get back in the “Adjustment menu” and select the menu-point “Gas selection (1)”. Furthermore select the gas inlet “Calibr. Gas (2)”. The analyzer will suck the mixed gas from the connected mixed gas cylinder. Connect the calibration gas cylinder to the zero / cal. Gas inlet.



- Select the menu point “Adjustment gas factor”. Wait until the gas concentration will not change anymore. It should be shown the set-point of the adjustment gas cylinder.
- Push the left/right arrow keys until the CH4 (or CO2) concentration at the display is stable. In this example 40 Vol.%.
- Select CH4-factor and change the factor (with the right/left arrow key) until the actual CH4 value is the set-point of the calibration gas mixture.
- Select the CO2-factor and change the factor (with the right/left arrow key) until the actual CH4 value is the set-point of the calibration gas mixture.

11 Specification Modbus via RS485 specification

11.1. General information

The Modbus (slave function) requires the firmware version V1.01.70 dated 17.11.2014 or later.
The analysers are able to work as modbus slave using the RS232 or RS485 port (possibly with external RS232/RS485 adapter)
supports RS485 interface with 2/4 wires (half/full duplex)
supports only the binary Modbus protocol (RTU)
supports modbus command Read Holding Register (command no 3)
supports modbus command Read Input Register (command no 4)
the slave modbus address is user definable from 1 to 238
communication parameter are user definable as follows:

- 9600 baud
- 19200 baud
- even parity and 1 stop bit
- no parity and 2 stop bits

Multi byte values are transmitted in Motorola® byte order (Big-Endian). Only the CRC16 at the end of each frame is transmitted in Intel® byte order (Little-Endian).
In case you need Little-Endian byte order in the master's system:

- 16bit values (occurs only in the frame): swap bytes 0<=>1
- 32bit values (occurs only in the data): swap bytes 0<=>3 and swap bytes 1<=>2

All adresses written in this document are decimal (not hexa-decimal)
All readable data are 32bit values, therefore the analyzer only accepts even addresses end even number of registers to be read.
The maximal number of 32bit-values to be read with one single read command is 63
(126 modbus registers)
Data types (used in table below):
U3232 bit unsigned integer value (0…4.294.967.295)
FL32 bit floating point value (reads -1E38, when not available).

Defined registers to be read by the master

proto-col address	data type	numb. of registers	register content
			Status & Device info
0	U32	2	Analyser Status (more details read below)
2	U32	2	System Alarm (more details read below)
4	U32	2	Serial number
6	U32	2	Analyser type (11060 = SWG100biogas)
8	U32	2	Firmware version (e.g. 12345 = V1.23.45)
10	U32	2	Elapsed seconds since Power-On
12	U32	2	Counter Modbus Frame Error
14	FL	2	CH4 amb. [%]
16	FL	2	CH4 amb. [% LEL]
18	FL	2	T-sensor [°C/°F] (unit depends on user settings)
20	FL	2	Sample Flow [l/h]
22	FL	2	T-gascooler [°C/°F] (unit depends on user settings)
24	FL	2	Case fan rotations [rpm]
26	FL	2	Gas pump rotations [rpm]
28	FL	2	P-absolute [hPa] (=[mbar]) (firmware V1.04.60 or later)
30	FL	2	P-absolute [inchHG] (firmware V1.05.01 or later)
32	U32	2	T-hose [°C/°F] (unit depends on user settings)
34	U32	2	T-probe [°C/°F] (unit depends on user settings)
36	U32	2	not (yet) defined (read zero)
38	U32	2	not (yet) defined (read zero)
			Status & current measurement values (live values!)
40	U32	2	Analyser Status (more details read below)
42	U32	2	System Alarm (more details read below)
44	FL	2	O2 [%]
46	FL	2	CO2 [%]
48	FL	2	CH4 [ppm]
50	FL	2	H2S [ppm]
52	FL	2	H2 [ppm]
54	FL	2	CO [ppm]
56	FL	2	NO [ppm]
58	FL	2	SO2 [ppm]
60	FL	2	NO2 [ppm]
62	U32	2	T-gas [°C/°F] (unit depends on user settings)
64	U32	2	v-gas [°C/°F] (unit depends on user settings)
66	U32	2	Flow vol. (unit depends on user settings)
68	U32	2	not (yet) defined (read zero)

protocol address	data type	numb. of registers	register content
			AUX-values (read by up to 10 IO-modules)
190	FL	2	AUX-value read by IO-module 1 - Input 1
192	FL	2	AUX-value read by IO-module 1 - Input 2
194	FL	2	AUX-value read by IO-module 1 - Input 3
196	FL	2	AUX-value read by IO-module 1 - Input 4
198	FL	2	AUX-value read by IO-module 2 - Input 1
200	FL	2	AUX-value read by IO-module 2 - Input 2
202	FL	2	AUX-value read by IO-module 2 - Input 3
204	FL	2	AUX-value read by IO-module 2 - Input 4
206	FL	2	AUX-value read by IO-module 3 - Input 1
208	FL	2	AUX-value read by IO-module 3 - Input 2
210	FL	2	AUX-value read by IO-module 3 - Input 3
212	FL	2	AUX-value read by IO-module 3 - Input 4
214	FL	2	AUX-value read by IO-module 4 - Input 1
216	FL	2	AUX-value read by IO-module 4 - Input 2
218	FL	2	AUX-value read by IO-module 4 - Input 3
220	FL	2	AUX-value read by IO-module 4 - Input 4
222	FL	2	AUX-value read by IO-module 5 - Input 1
224	FL	2	AUX-value read by IO-module 5 - Input 2
226	FL	2	AUX-value read by IO-module 5 - Input 3
228	FL	2	AUX-value read by IO-module 5 - Input 4
230	FL	2	AUX-value read by IO-module 6 - Input 1
232	FL	2	AUX-value read by IO-module 6 - Input 2
234	FL	2	AUX-value read by IO-module 6 - Input 3
236	FL	2	AUX-value read by IO-module 6 - Input 4
238	FL	2	AUX-value read by IO-module 7 - Input 1
240	FL	2	AUX-value read by IO-module 7 - Input 2
242	FL	2	AUX-value read by IO-module 7 - Input 3
244	FL	2	AUX-value read by IO-module 7 - Input 4
246-261	FL	16	8 AUX-values read by IO-modules 8 & 9
262	FL	2	AUX-value read by IO-module 10 - Input 1
264	FL	2	AUX-value read by IO-module 10 - Input 2
266	FL	2	AUX-value read by IO-module 10 - Input 3
268	FL	2	AUX-value read by IO-module 10 - Input 4

Analyser Status (address 0 and some mirror addresses)

The Analyser Status is a 32bit-word and must be interpreted bitwise.

Bit	Description
0	Power-On (until the first zeroing has been done)
1	System-Alarm, see table below
2	Air Purging (zeroing)
3	Gas Sampling (preparing measurement, not measurement!)
4-7	Currently sampled sample point number (1..10, reads 0 while air purging)
8-31	reserved for later applications (read zero)

Some status examples:
Binarystate

Decimal	Hexadecimal	Binary	description
1	10001h	0000 0001	Power-On (self-test)
5	50005h	0000 0101	First Air Purging (Power-On + Air Purging)
24	240018h	0001 1000	Preparing meas. smp.pt.1 (Gas Sampling + smp.pt.1)
16	160010h	0001 0000	Measuring sample point 1
32	320020h	0010 0000	Measuring sample point 2
48	480030h	0011 0000	Measuring sample point 3
18	180012h	0001 0010	Measuring sample point 1 + System-Alarm

Analyser System Alarm (address 2 and some mirror addresses)

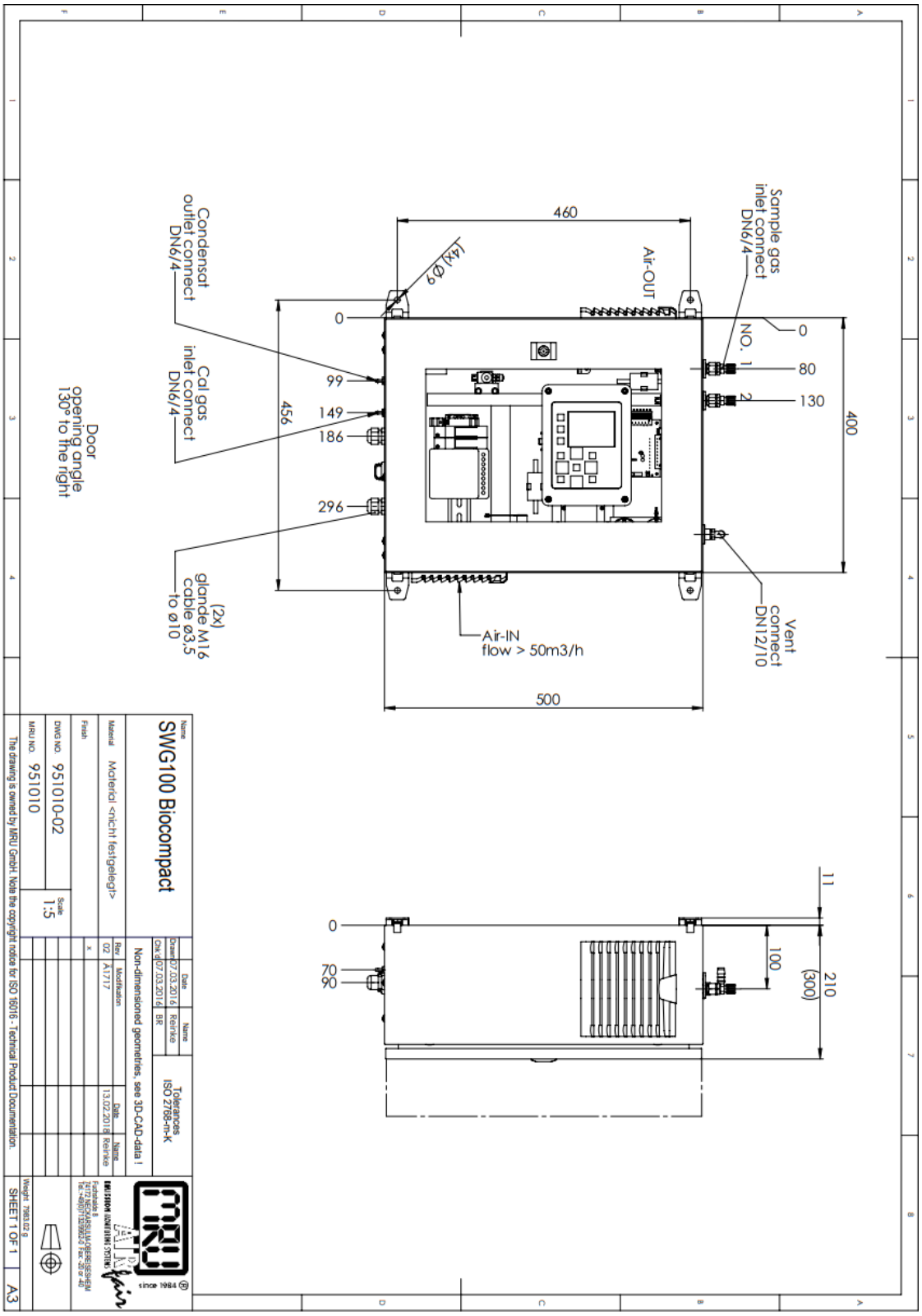
The Analyser System Alarm is a 32bit-word and must be interpreted bitwise.

Bit	Description	Meas. halted
0	Mainboard Offline (some communication problems)	YES
1	Mainboard is in bootloader mode	YES
2	CH4 ambient > threshold value	YES
3	Condensate	YES
4	Sample flow < 20 l/h	-
5	Case fan rotations < 900 rpm	-
6	T-gascooler > 10°C	-
7	T-gascooler < 2°C	-
8	T-Sensor > 55°C	-
9	T-Sensor < 5°C	-
10-31	reserved for later applications	

Some system alarm examples:

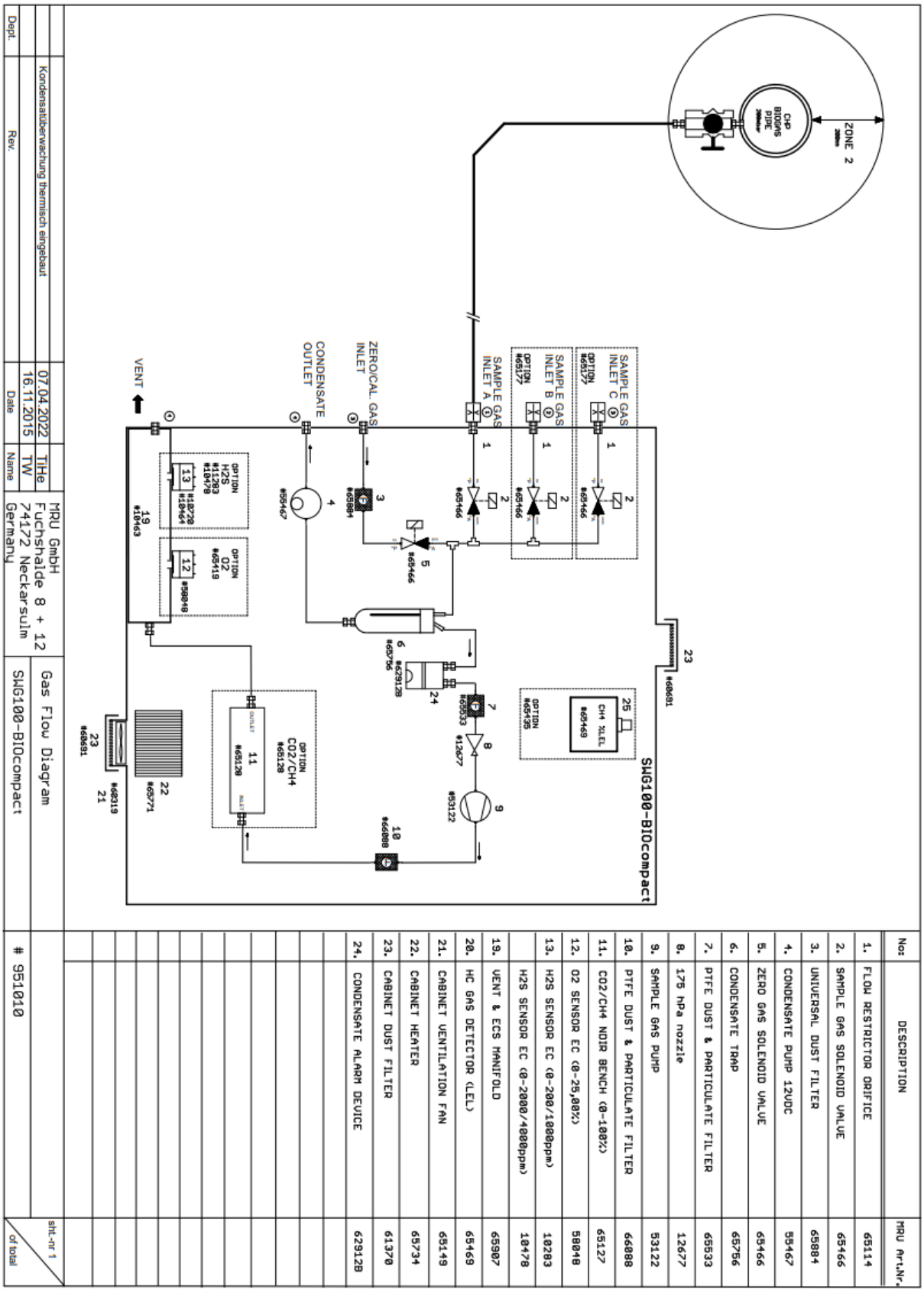
Decimal	Hexadecimal	Binary	Description
1	0001h	10000 0001	Mainboard is offline, measurement is halted
8	0008h	0000 1000	Condensate Alarm, measurement is halted
80	0050h	0101 0000	Sample flow < 20 l/h and T-gascooler > 10°C.

12 Appendix


460
Air-OUT
Sample gas inlet connect DN6/4
Condensat outlet connect DN6/4
Cal gas inlet connect DN6/4
Door opening angle 130° to the right
NO. 1
2
0
80
130
400
456
99
149
186
296
(2x) glande M16 cable ø3.5 to ø10
Air-IN flow > 50m3/h
Vent connect DN12/10
500
11
100
210
(300)
70
90
SWG100 Biocompact
Non-dimensioned geometries, see 3D-CAD-data !
Tolerances ISO 2768-mK
951010
951010-02
1:5
A3
SHEET 1 OF 1

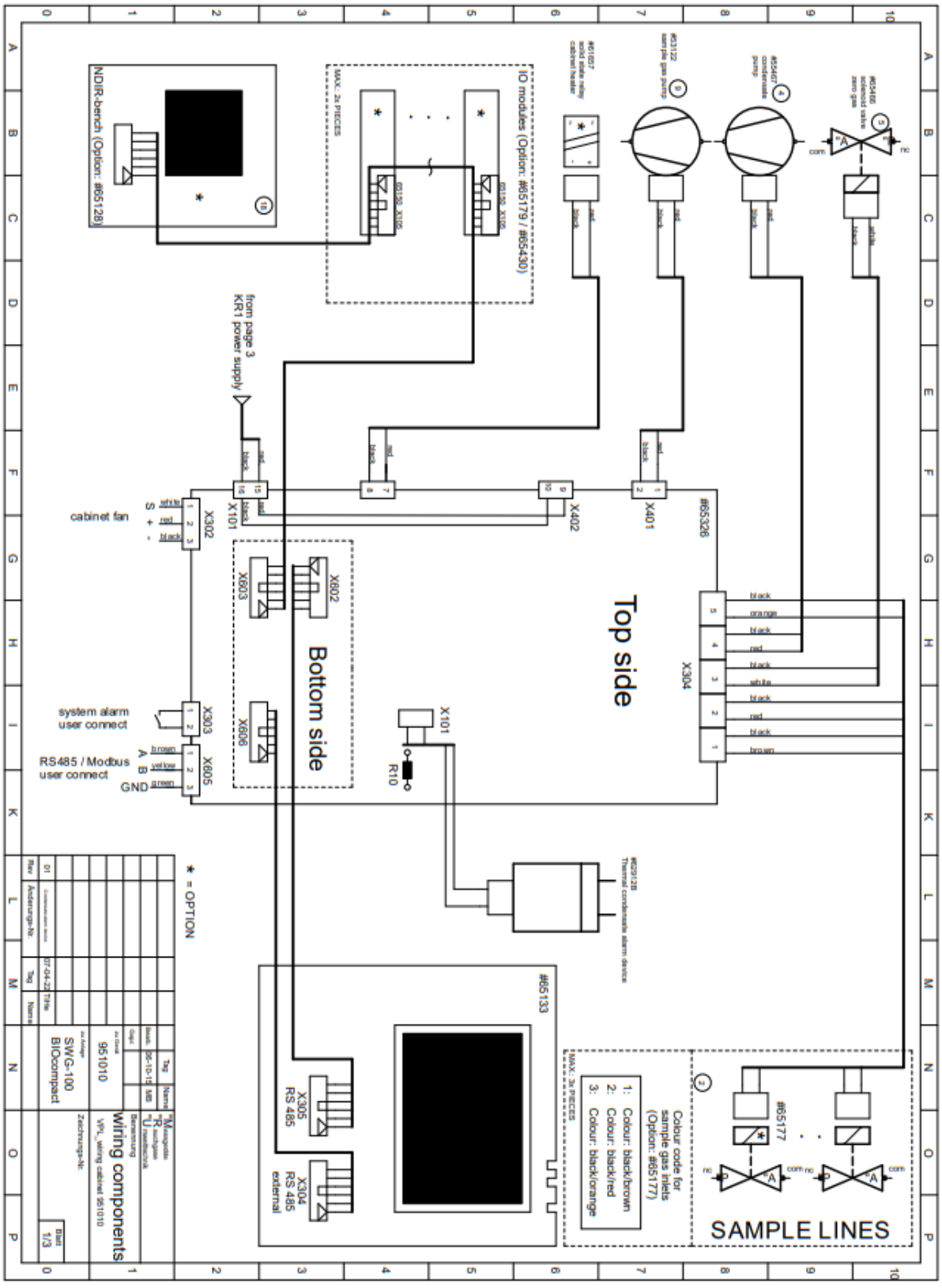
12.1. Mechanical dimensions

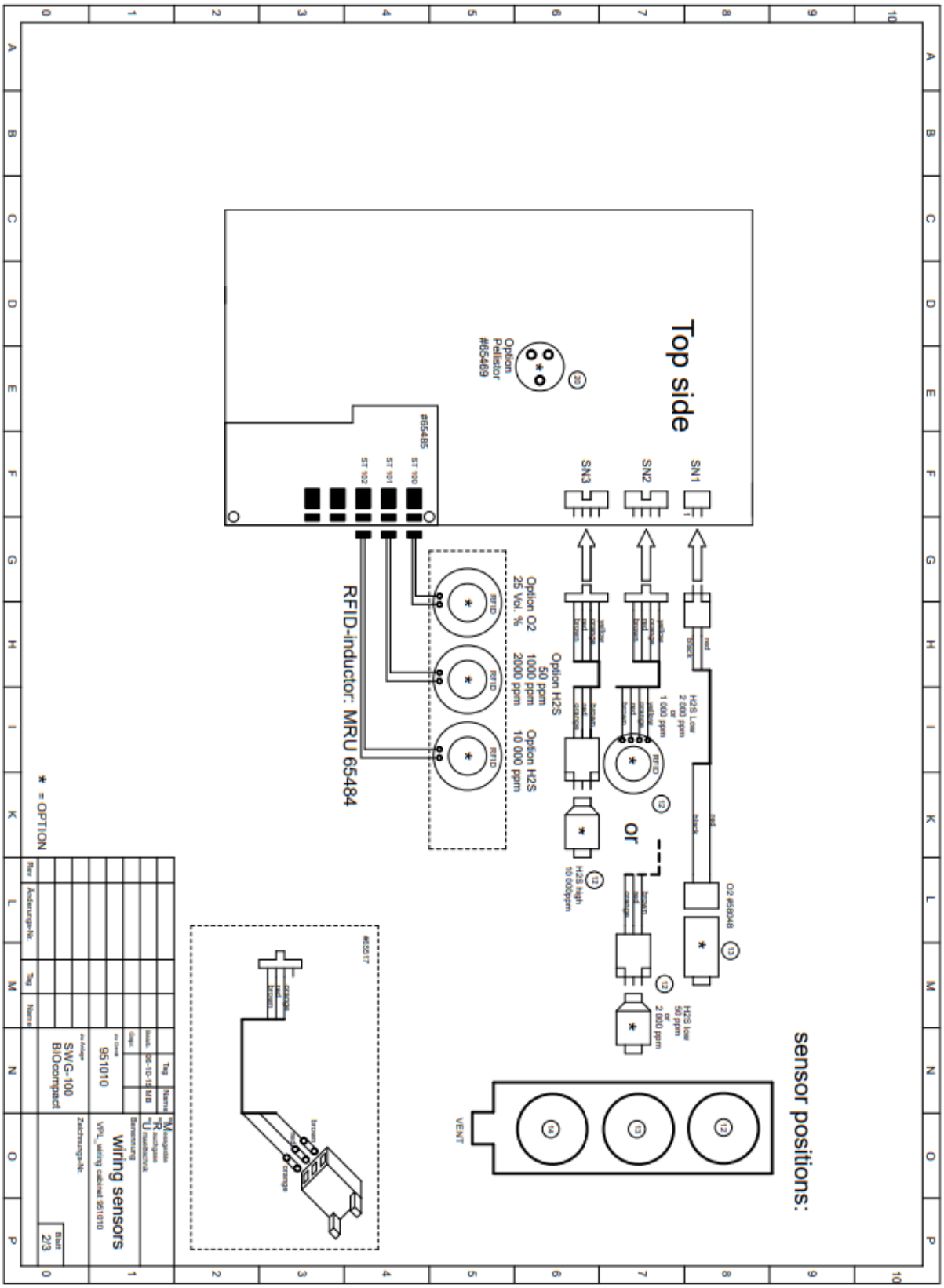
12.2. Tubing plan

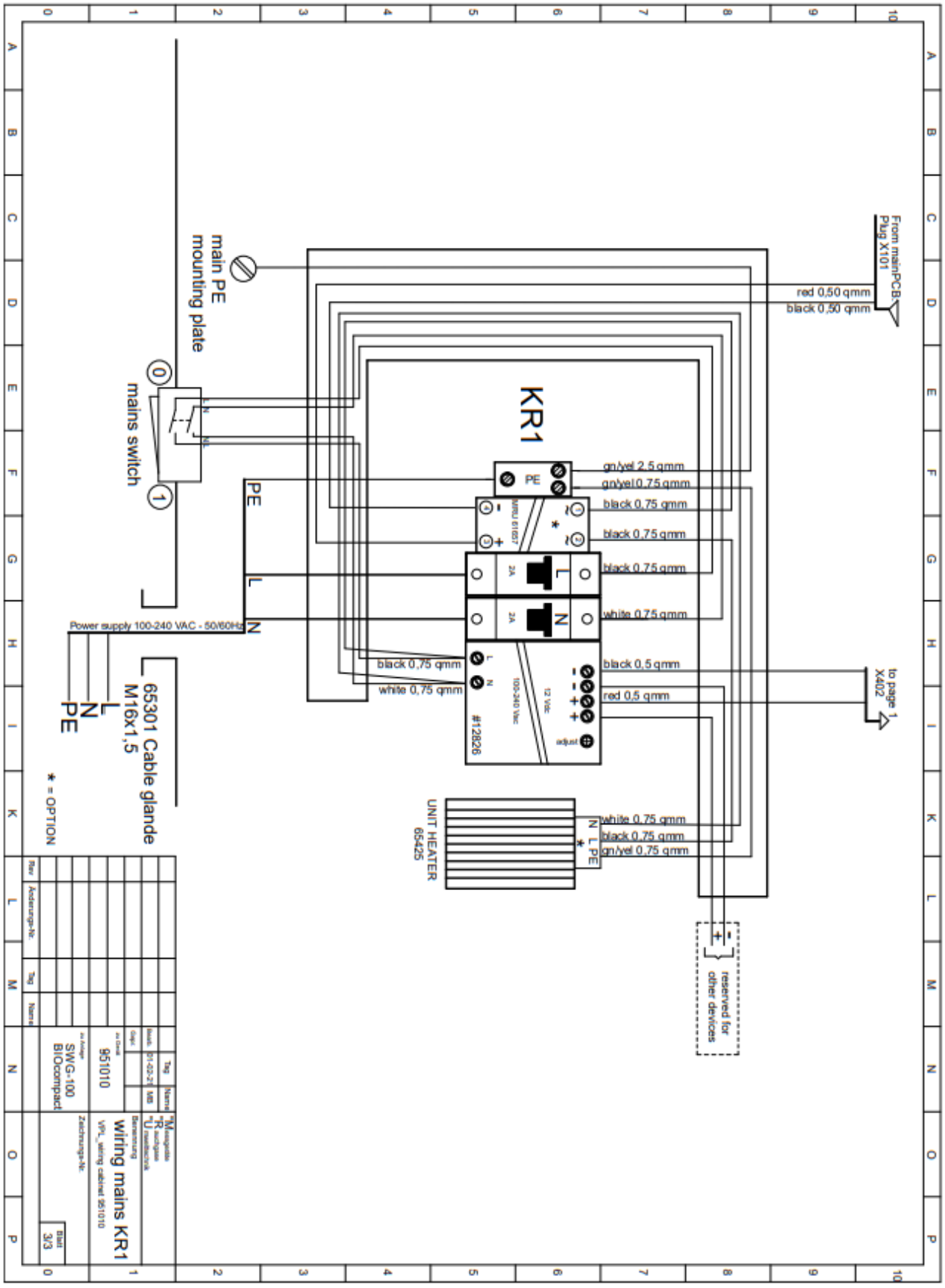


No:	DESCRIPTION	MRU Art.Nr.
1.	FLOW RESTRICTOR ORIFICE	65114
2.	SAMPLE GAS SOLENOID VALVE	65466
3.	UNIVERSAL DUST FILTER	65884
4.	CONDENSATE PUMP 12VDC	55467
5.	ZERO GAS SOLENOID VALVE	65466
6.	CONDENSATE TRAP	65756
7.	PTFE DUST & PARTICULATE FILTER	65533
8.	175 hPa nozzle	12677
9.	SAMPLE GAS PUMP	53122
10.	PTFE DUST & PARTICULATE FILTER	66888
11.	CO2/CH4 NDIR BENCH (0-100%)	65127
12.	O2 SENSOR EC (0-25,00%)	58048
13.	H2S SENSOR EC (0-200/1000ppm)	10283
	H2S SENSOR EC (0-2000/4000ppm)	10478
19.	VENT & ECS MANIFOLD	65907
20.	HC GAS DETECTOR (LEL)	65469
21.	CABINET VENTILATION FAN	65149
22.	CABINET HEATER	65734
23.	CABINET DUST FILTER	61370
24.	CONDENSATE ALARM DEVICE	62912B

12.3. Electrical connection plan




Top side
SN1
SN2
SN3
#65485
ST 100
ST 101
ST 102
Option
Pellistor
#65469
RFID-inductor: MRU 65484
RFID
Option O2
25 Vol. %
Option H2S
50 ppm
1000 ppm
2000 ppm
Option H2S
10.000 ppm
H2S Low
2.000 ppm
or
1.000 ppm
H2S high
10.000ppm
O2 #58048
H2S low
50 ppm
or
2.000 ppm
#65517
VENT
sensor positions:
* = OPTION
wiring sensors
SWG-100
BIOcompact
951010
VPL_wiring cabinet #51010


From mainPCB Plug X101
red 0,50 qmm
black 0,50 qmm
main PE mounting plate
mains switch
KR1
PE
gn/ye 2,5 qmm
gn/ye 0,75 qmm
black 0,75 qmm
black 0,75 qmm
black 0,75 qmm
white 0,75 qmm
black 0,5 qmm
red 0,5 qmm
to page 1 X402
Power supply 100-240 VAC - 50/60Hz
L
N
PE
65301 Cable glande M16x1,5
black 0,75 qmm
white 0,75 qmm
#12826
100-240 Vac
12 Vdc
adjust
UNIT HEATER 65425
white 0,75 qmm
black 0,75 qmm
gn/ye 0,75 qmm
N L PE
reserved for other devices
* = OPTION
wiring mains KR1
SWG-100 BIOcompact
951010
Blatt 3/3

13 Declaration of conformity

EU-Konformitätserklärung

Declaration of conformity

CE

MRU Messgeräte für Rauchgase und Umweltschutz GmbH

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Person authorized to compile the technical documents

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Straße / *street:*	Fuchshalde 8 + 12
Ort / *city:*	74172 Neckarsulm
Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung / *designation:*	Gasanalysator *Gas analyser*
Produktname / *name:*	SWG100 BIO compact
Funktion / *function:*	Gasanalyse / *gas analysis*

Hiermit erklären wir, dass das oben beschriebene Produkt allen einschlägigen Bestimmungen entspricht, es erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:

We declare the conformity of the product with the applicable regulations listed below:

- EMV-Richtlinie / *EMV-directive* 2014/30/EU
- Niederspannungsrichtlinie / *low voltage directive* 2014/35/EU
- RoHS-Richtlinie / *RoHS directive* 2011/65/EU (RoHS II)

Neckarsulm, 01.07.2016

Erwin Hintz, Geschäftsführer / *Managing Director*