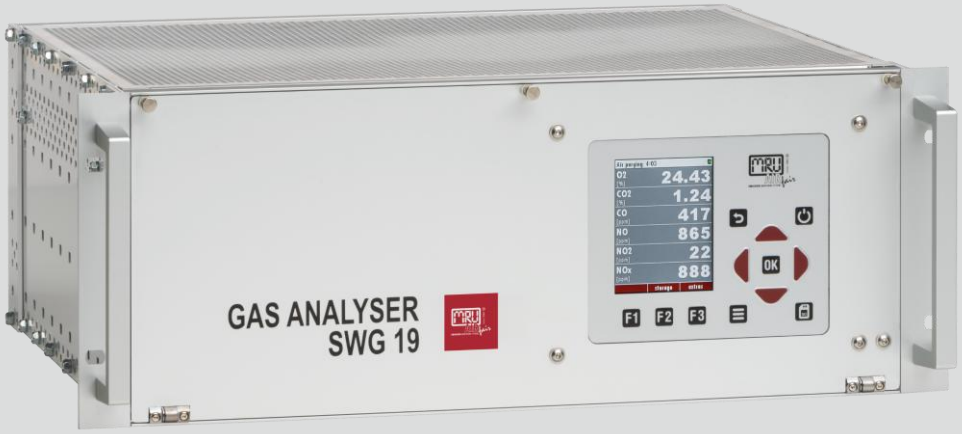
MRU AIR fair
seit 1984 ®
EMISSIONSMESSTECHNIK

SWG 19

USER MANUAL



1632EN

MRU Messgeräte für Rauchgase und Umweltschutz GmbH
Fuchshalde 4 + 8 + 12
74172 Neckarsulm-Obereisesheim
Fon 07132 99620 · Fax 07132 996220
info@mru.de · www.mru.eu

The products described in this manual are subject to continuous development and improvement. We therefore welcome any customer feedback, comments and suggestions regarding our product and its operating instructions that help to improve the product, service or documentation.

You can reach us:

MRU GmbH
Fuchshalde 4 + 8 + 12
74172 Neckarsulm / Obereisesheim
GERMANY

Fon (+49) 71 32 99 62 0 (Reception)
Fon (+49) 71 32 99 62 61 (Service)
Fax (+49) 71 32 99 62 20
Email: info@mru.de
Homepage: www.mru.eu

MRU GmbH is not liable for damage or injury resulting from the incorrect interpretation of information in this manual or from the incorrect use of this manual.

FOR MORE INFORMATIONS ABOUT COMPANY MRU PLEASE VISIT OUR WEBSITE www.mru.eu

Legal information / Copyright notice

Original operating instructions

Version of these instructions: V1.03.EN

Date: 07.07.2026

1 Table of contents

2 Introduction and basic conditions

W002

These instructions enable safe and efficient use of the product.

The user must read and understand these instructions carefully before starting work.

The basic prerequisite for safe working is compliance with all the specified safety instructions.

2.1 Where to store the instructions

The instructions are an integral part of the product and must be kept in the immediate vicinity of the product and accessible to personnel at any time.

2.2 General information on the manual

- This manual will enable you to understand and safely operate this MRU analyser.
- Please read this manual carefully.
- Familiarise yourself with the product before using it.
- This analyser may only be used by qualified personnel and only for its intended purpose.
- Please observe all safety instructions and warnings to avoid injury and damage to the device.
- Hand over all documents if you pass the analyser on to third parties.

2.3 Safety signs

These safety instructions are based on the “SAFE principle” and are used throughout this manual:

Symbol

⚠ DANGER Signal word and color

Specific the type and source of the hazard

Specific consequences of non compliance

- ➢ Measures to avoid the hazard

⚠ DANGER

Refers to an imminent danger that will lead to serious physical injury or death if ignored.

⚠ WARNING

Indicates an imminent danger which, if ignored, can lead to serious physical injury, damage to property or death

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor injury.

ATTENTION

Indicates a potentially hazardous situation which, if not avoided, may result in damage to the device or its surroundings.

NOTE

Indicates application tips and other particularly important information.

2.4 Symbols

Symbols help to identify a danger and escape that danger. You will find the following symbols in these instructions:

Warning symbol	Figure number	Meaning
	W001	General warning symbol to identify a danger
	W012	Warning of electrical voltage
	W023	Warning about corrosive substances
	W028	Warning about fire-promoting substances
	W071	Warning about substances or mixtures that are hazardous to health

Mandatory symbol	Figure number	Meaning
	M002	Observe the operating instructions
	M004	Use eye protection
	M008	Use foot protection
	M009	Use hand protection

2.5 General important information for the operator of the measuring device

MRU measuring devices are developed and manufactured in accordance with the applicable standards. Nevertheless, a failure or malfunction of individual device components is possible within the service life of the device. It is the responsibility of the operator to consider and assess the effects of malfunctions on the device and, if necessary, to limit them by taking external measures.

CAUTION

Effects of device malfunctions

Unrecognised effects on the application of the measuring device operator may arise due to device malfunctions.

- ➢ The system operator must assess the effects of device malfunctions and, if necessary, limit them by taking external measures.

Every system operator, user and technician who operates or maintains the device must be aware of the potential dangers associated with the use of the device. These dangers are explained in this manual. The information and instructions in this manual must be observed. Only trained and qualified personnel are authorised to use MRU measuring devices.

CAUTION

Non-compliance with local regulations, provisions and standards

This may result in an inadequate risk assessment.

- ➢ Always ensure that the MRU measuring device is installed and operated in accordance with local regulations, provisions and standards. Hazards must be identified and suitable countermeasures taken as part of a risk assessment.

When using the MRU measuring devices to measure other devices or systems, the manufacturer's documentation of the system or device manufacturer must be observed.

CAUTION

Non-intended use

The warranty becomes void

- Only use the MRU measuring device for its intended purpose and observe the local regulations, provisions and standards. Only use your MRU measuring device within the limits of use specified in the technical data.

2.6 MRU warranty conditions

For the warranty conditions for your analyser, please consult MRU's general terms and conditions.

2.7 Disposal take-back guarantee

MRU undertakes to take back all contaminated parts supplied by us that cannot be disposed of in the "normal" way.

The return delivery must be free of charge for us. Parts containing hazardous substances are: e.g. electrochemical sensors.

2.8 Return of devices

MRU GmbH is obliged to take back all analysers delivered after 13 August 2005 for proper disposal. The device must be returned to MRU with postage prepaid.

2.9 Packaging

Keep the original carton and packing material to avoid damage in transit if you need to return the analyser to the factory.

2.10 Taking back parts containing harmful substances

MRU GmbH undertakes to take back all parts supplied by us that contain hazardous substances and cannot be disposed of in the normal way.

Parts containing hazardous substances are e.g. electrochemical sensors, batteries and accumulators.

The return delivery must be free of charge for MRU.

2.11 The company MRU GmbH

From left to right: Production - Sales, administration and development - Customer service

The measuring device is manufactured by MRU GmbH in Neckarsulm-Obereisesheim, a medium-sized company that has specialised in the development, production and sale of high-quality emission analysis systems since 1984. MRU manufactures both standard types and customised special versions.

3 Notes on device and safety

3.1 Safety manual

The safety manual contains safety instructions for your measuring device. Like the operating instruction, it is also part of the procut and must be kept in the immediate vicinity of the product and accessible to personnel at all times.

You can reorder the safety manual at any time under item number **1134DE-EN**.

Read the safety manual carefully before using the device and observe the safety instructions.

3.2 Instructions on the safe operation of the device

3.2.1 Visual inspection

Before switching on the device, carry out an overall visual inspection of the device and, where appropriate, the optional attachment parts.

CAUTION

Damaged parts

Unstable operating state

- ➢ Do not put the device into operation if it is damaged. Examples of parts which can be damaged by external influences, such as unintentional damage, animal bites or weather influences are:
  - Housing and inspection glass
  - Power supply unit
  - Power supply
  - Gas feed line
- ➢ Protect the device from access by unauthorised persons.

3.2.2 Maintenance work

The faultless operation of your device is only guaranteed with the correct maintenance.

CAUTION

Incorrect maintenance

Unreliability of the device during operation

- ➢ Only carry out maintenance work and repair work that is described in the operating instructions.
- ➢ Only use original spare parts.
- ➢ Only operate the device with the power supply unit supplied.
- ➢ Do not store the device together with solvents, acids or other aggressive substances.

3.3 Data security

MRU uses internationally available standard transmission systems for data transfer.

Compliance with the local general data protection conditions must be guaranteed and is the responsibility of the user of the device.

The use of electronic safeguarding measures to maintain data security is the responsibility of the system user based on his risk assessment.

3.4 Qualification

The qualification matrix shows the activities during the life cycle of the device. Each activity is assigned a qualification level,

1. Instructed person: The person has been instructed in their task an informed about the risks and involved in carrying it out.
2. Trained specialist: The person has received training that enables them to fulfil their tasks. They are informed about all the risks involved in their work, are able to recognise risks themselves when carrying out their work and have a suitable switching authorisation.
3. You can contact the MRU service for repairs, calibrations, retrofitting and disposal issues.

Qualification \ Activity	Instructed person	Trained specialist	MRU service
Transport	**X**		
Unpacking	**X**		
Take measurement results	**X**		
Adjust settings		**X**	
Mounting		**X**	
Commissioning		**X**	
Routine maintenance		**X**	
Repair			**X**
Modification			**X**
Decommissioning		**X**	**X**

Qualification matrix

4 Description of services

4.1 Basics of Analyzer Technology

4.1.1 Sampling

The device is a stationary measuring gas device. The device measures gas components and the component concentrations. For this, the device requires upstream gas processing within the scope of the technical data.

4.1.2 Gas conveyance

To analyse the gas, the device aspirates gas that is supplied via measuring gas lines by means of a measuring gas pump. The flow rate of the measuring gas is controlled by means of the pump. The device requires a specific primary pressure that must be ensured by the operating company.

4.1.3 Applied methods of gas analysis

Depending on the configuration, the following measuring principles are used in the measuring device:

1. O2 is measured by means of an electrochemical sensor or a paramagnetic sensor
2. If this is supported by the configuration, CO, CO2, NO, NO2, N2O, SO2, C3H8, and CH4 are measured by means of non-dispersive infrared absorption measuring technology (NDIR)
3. Depending on the configuration, NO, NO2, SO2, CO, H2 are measured by means of an electrochemical sensor
4. Depending on the configuration, H2 is measured by means of a TCD (thermal conductivity detector).

4.2 Zero point calibration (zeroing)

All gas analysis methods used are subject to a short-term drift at zero point. Even without target gas content in the measuring gas, this drift leads to deviations at the zero point.

In order to correct this, the measuring device performs a zero point calibration at a time interval to be defined. In the process, all sensor modules are rinsed with fresh air (zero gas) and subsequently the display value of all sensors is set to zero (or: 20.96 % by volume for oxygen). The air to rinse the sensor is obtained from the inside of the housing. The air for zeroing is aspirated from the measuring gas port.

The size of the zero point drift is influenced by various factors, such as changes in temperature, physical or chemical changes of the sensors and the properties of the measuring gas.

The user must adapt the time interval for zero point calibration in terms of the size of the zero point drift and the required measuring accuracy. Typical intervals for zeroing range from a few hours to maximum one day.

4.3 Device calibration

The sensitivity of each gas sensor is subject to a long-term drift that can lead to deviations from the setpoint. The causes for this drift can be general ageing effects or wear.

To correct this, a calibration of the measuring technology should be carried out at regular intervals with the aid of test gases of known concentration. This can be done manually by the user.

The time interval for the calibration must be determined by the user depending on monitored deviation and required accuracy.

Calibration gas that is aspirated through the measuring gas inlet is used for calibration.

4.4 Intended use

Depending on the installed option, the most important gases can be identified and their concentration determined. Measurable gases are:

- Carbon monoxide (CO)
- Carbon dioxide (CO2)
- Oxygen (O2)
- Hydrogen (H2)
- Hydrogen sulphide (H2S)
- Nitrogen monoxide (NO)
- Nitrogen dioxide (NO2)
- Nitrous oxide (N2O)
- Sulphur dioxide (SO2)
- Propane (C3H8)
- Methane (CH4)

The measurement data can be read out at the device or stored. The data can be transmitted to central control centres via optional

electronic transmission paths. This can be done via the following transmission technologies:

- I/O modules - analogue outputs 4-20 mA
- RS485 Ethernet (Modbus RTU)
- RS485 Profibus (Modbus RTU)
- RS485 Profinet (Modbus RTU)
- RS485 USB (Modbus RTU)

The adjustment of the device is entirely done via the input panel on the device itself. As an option, the device can also be electronically remote-controlled.

The SWG19 is available in three versions that use different gases for the analysis:

- Syngas – for the analysis of synthetic gases
- CEM – Continuous Emission Monitoring, i.e. for emission measurement
- COA – Combustion Analyzer, i.e. for combustion analysis

The measuring technology facilitates the measuring of flammable gases such as H2 and CH4. The device is tubed with Viton tubes in the gas circuit. The system operator is responsible for ensuring a gas concentration below LEL, otherwise he is obliged to install forced ventilation, nitrogen rinsing or a safety concept with equivalent properties. The safety concept must have an adequate capacity to prevent the development of flammable concentrations of the gases and the formation of gas pockets.

Any other use is **not** in accordance with the intended use. MRU is not liable for this. Any guarantee or warranty is void.

Non-compliance with the operating instructions is **not** in accordance with the intended use.

Improper installation and commissioning is **not** in accordance with the intended use.

Improper maintenance or failure to carry out maintenance is **not** in accordance with the intended use.

Modifications to the device are not permitted; retrofitting must be carried out in consultation with MRU.

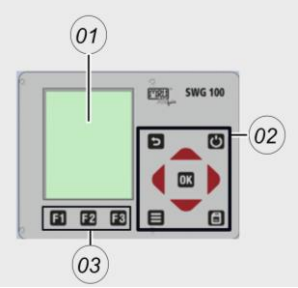
Improper disposal is **not** in accordance with the intended use. Observe the legal regulations of the country in which the device is disposed of.

The device must **not** be used as a safety-determining component whose measurement results could jeopardise the safety of persons, the system or parts thereof.

5 Description of the device

5.1 Control panel

The control panel is used to operate the device.

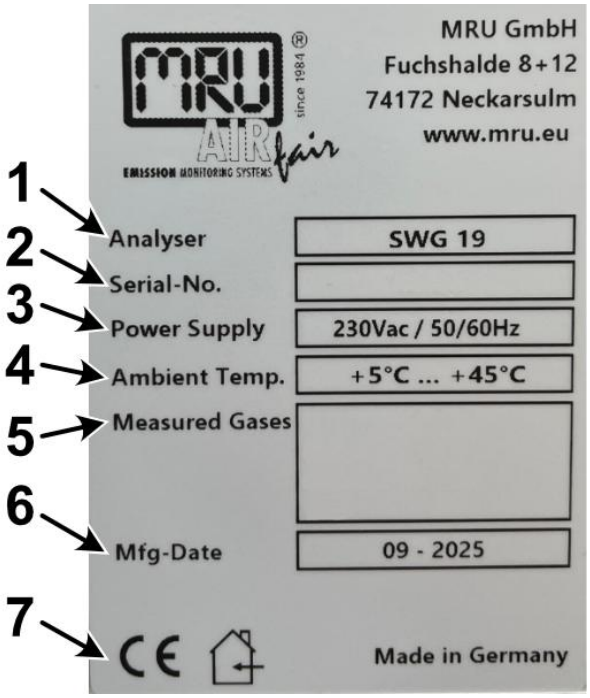


Control elements display

#	Description
1	TFT display
2	Keyboard
3	Function keys

5.2 Rating plate

The respective configuration of your device can be read off the rating plate.



Rating plate

#	Description
1	Product name
2	Serial number
3	Voltage supply
4	Permitted ambient air temperature
5	Detectable measuring range
6	Date of manufacture
7	Labels

6 Installation MRU measuring device

6.1 Unpacking the device

M008

⚠ CAUTION

Weight of the device

Impact and crushing injuries

- ➢ Always put the packaged device down safely.
- ➢ Unpack the device in a location where you are undisturbed.
- ➢ Observe the weight and the dimensions of the device; in case of doubt, lift the device with two persons or use a lifting device.

▶ Take the packaged device as closely as possible to the intended point of use of the device.

NOTE

Do not unpack the device in ex zones.

▶ Unpack the device. Avoid damaging the filling material.

▶ Retain the original packaging so that you can transport the device safely.

▶ Check the delivery for completeness.

CAUTION

Falling of the device

Damage to the device

- ➢ If the device falls down during use, send the device to the MRU customer service to check the device safety.

⚠ WARNING

Corrosive liquid

Chemical burns to the hands

- ➢ Before starting up, check whether there is any liquid visible on the housing.
- ➢ Remove the liquid.
- ➢ If the liquid is coming from inside the device, do not use the device. Contact your MRU service center.

6.2 General installation rules

Here you learn how to correctly assemble and install the device. Assembly and installation work includes:

1. Unpacking the device
2. Assembling the device
3. Connecting the device electrically
4. Connecting the measuring gas inlet and the measuring gas outlet

A suitable installation location for the device must meet the following criteria:

1. The device is intended for installation in a 19 inch rack. Other places of installation that give rise to the same ambient conditions and conditions of use and that ensure the safe and intended use are permitted.
2. The installation location must be protected from direct solar radiation.
3. The installation location must be protected from direct rainfall.
4. The installation location must protect the SWG 19 from dripping water and condensation.
5. The installation location must be easy to access.
6. The installation location must be well ventilated.
7. The installation location must offer adequate space for assembly work and operation.
8. Special requirements must be taken into account when measuring flammable gases. Per design, the device is equipped with Viton tubes. In some cases, gases can escape from the tubing.
9. To protect the electronic components, the installation location must be protected from industrial dusts and large amounts of domestic dust by means of suitable filtering.

W002

⚠ DANGER

Explosive substances

Burns and injuries due to flying parts

- Design your gas processing so that no gas in flammable concentration arrives at the device.
- If that is not possible, install a forced ventilation. The forced ventilation must have an adequate capacity, prevent flammable concentrations of the gas from arising and prevent the formation of gas pockets.
- Integrate the system in your safety system for explosion protection and integrate the measurement of flammable gases in your risk assessment.

6.3 Interfaces

The SWG 19 slot is equipped with various interfaces:

- electrical interfaces
- gas inlet / gas outlet

To start with, we present diagrams for the electrical integration and for integration into the gas circuit.

After that, we present in detail the interfaces facilitating the integrations.

6.3.1 Electrical interfaces, connection diagram

Power supply

The power supply is ensured via the cold device plug on the rear of the device.

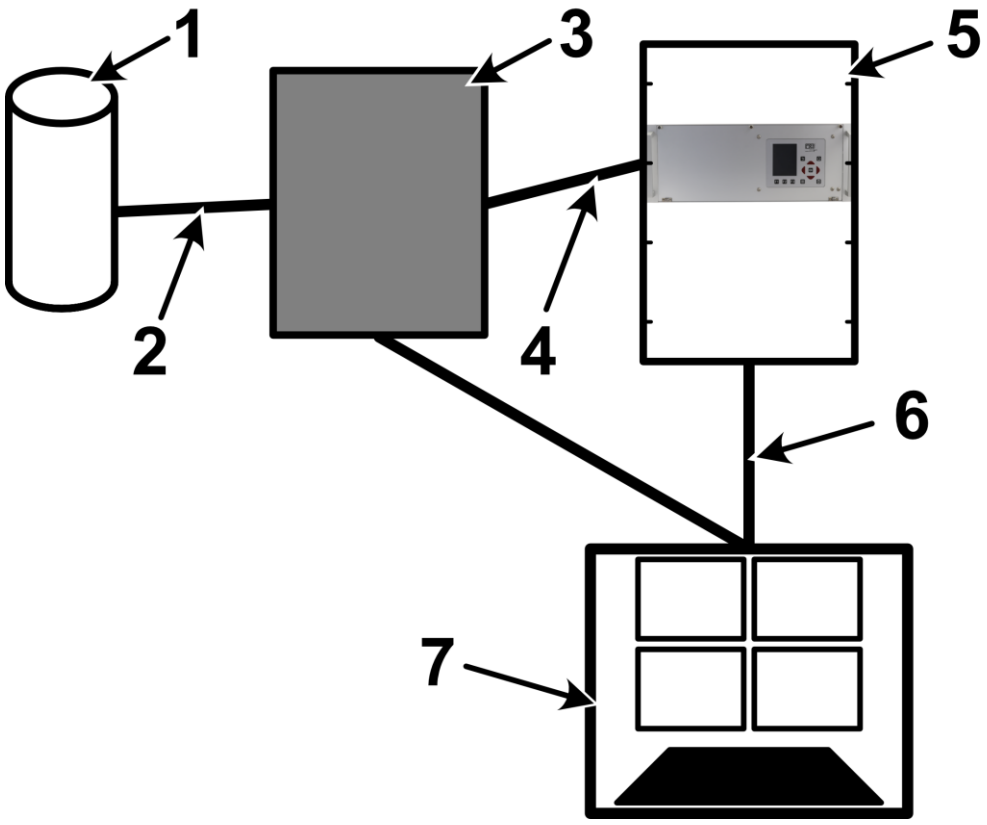
Communication modules

The following technologies are available (as an option) as communication modules:

- I/O module
- Alarm output
- RS485

1. Ethernet
2. Profinet
3. Profibus

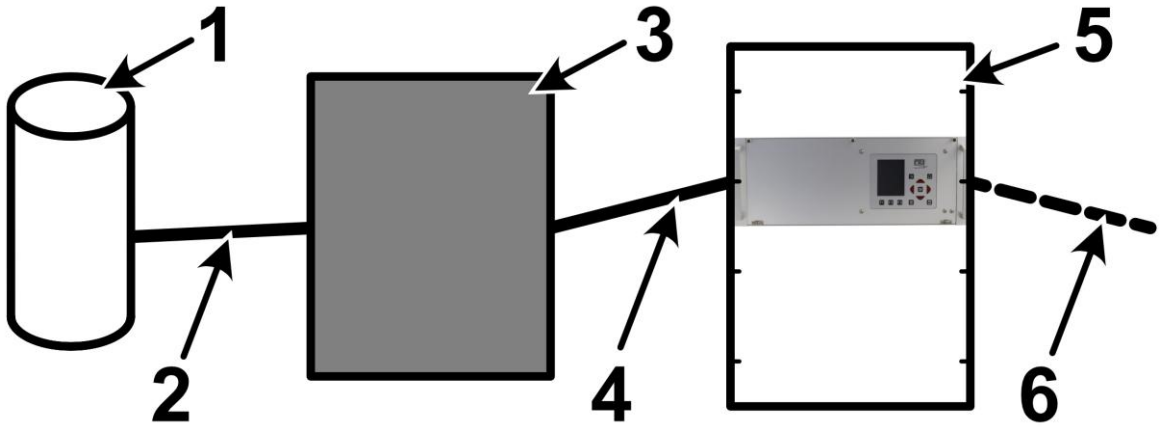
The following connection diagram shows by way of example how the device can be integrated into the existing system:



Example connection diagram (electrical)

#	Description
1	Measuring point
2	Gas extraction
3	Gas processing
4	Electrical connection measuring gas processing and MRU device
5	19" rack with MRU measuring device
6	Electrical connection MRU device and control room
7	Electrical connection gas processing and control room
8	System control room

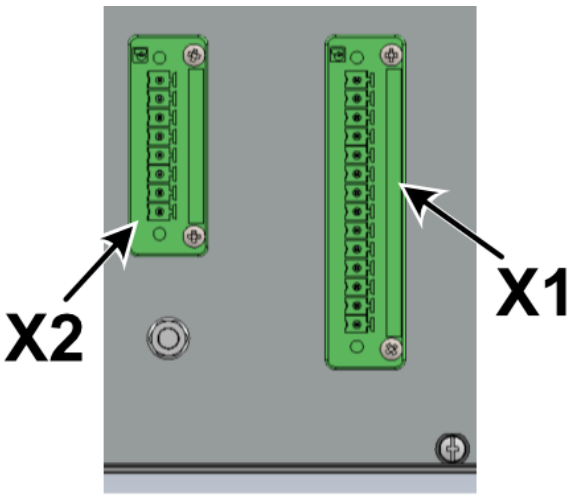
6.3.2 Gas inlet and outlet, connection diagram



Example connection diagram (gas)

#	Description
1	Measuring point
2	Gas extraction
3	Gas processing
4	Gas inlet processed measuring gas
5	19" rack with MRU measuring device
6	Gas outlet measuring gas

6.4 Electrical interfaces



View electrical connection at the rear

#	Description
X1	Pin assignment: 1. sample / zero gas sol. valve 2. calibration gas 1 sol. valve 3. calibration gas 2 sol. valve 4. calibration gas 3 sol. valve 5. calibration gas 4 sol. valve 6. GND 7. reserve 8. reserve 9. reserve 10. reserve 11. external ready relay input 12. external ready relay input 13. system alarm relay output (potential, max. 24VDC, 1A) 14. system alarm relay output (potential, max. 24VDC, 1A)
X2	Pin assignment: 1. RS485 (ext.) A 2. RS485 (ext.) B 3. GND (ext.) 4. RS485 (int.) A

	5.	RS485 (int.) B
	6.	12VDC (int.)
	7.	GND (int.)
	8.	PE / shield

More detailed information can be found in the appendix, in the wiring diagram SWG 19, page 2 chapter Main PCB.

The electrical control takes place via the pins at the rear.

After the device start, the SWG 19 waits for the external ready signal (X1, pins 11, 12), quits the self-test and transitions to the subsequent zeroing. After zeroing, the device starts measuring according to a measuring cycle preset by you. If the external ready signal is lost during the measuring cycle, the SWG 19 triggers an alarm message, the measurement is stopped and an alarm is output via the system alarm relay (X1, pins 13, 14).

How to adjust the measuring cycle and further information can be found on page 62 - Adjusting the measuring cycle.

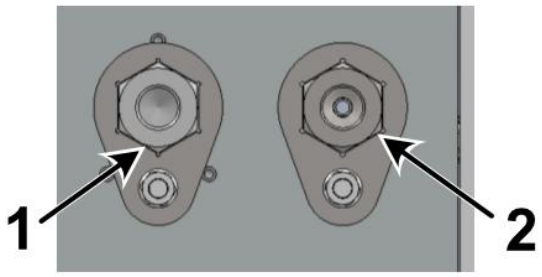
An example for a recommended measuring cycle can be found in one of the subsequent chapters.

NOTE

To protect the measurement technology and achieve the most accurate measurement results possible, add a flushing phase after each measurement phase.

6.5 Integration of the SWG 19

6.5.1 Integration of the gas inlet and gas outlet



View rear gas inlet, gas outlet

#	Description
1	Gas inlet G1/8
2	Gas outlet G1/8

The gas must be processed before it is measured in the device. The system operator is solely responsible for processing.

The gas must be **dried** (4° dew point). The gas must be **free of oil** and **free of acid**.

Further information can be found in the gas flow diagram in the appendix.

CAUTION

Inadequate gas processing

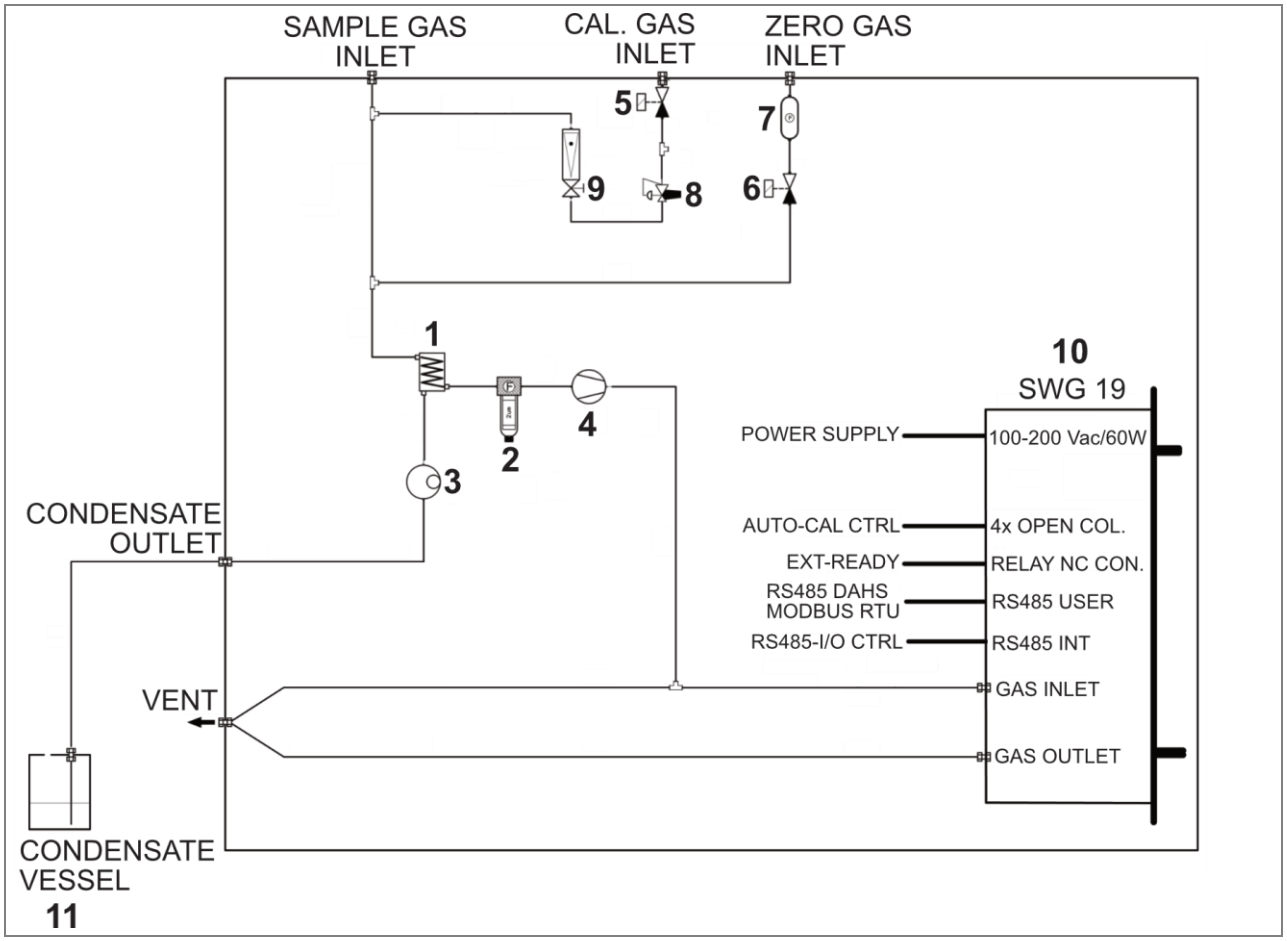
Damage to the measuring device

- ➢ Install a gas processing system that is adequately dimensioned for the measuring task.
- ➢ Please contact the MRU Service in case of queries.

After the measurement, the gas must be discharged. It must not be discharged into the analyser cabinet or into the ambient air directly at the place of installation. To ensure that the measuring technology continues measuring accurately, no backpressure must arise at the gas outlet. Long lines or lines with a very narrow diameter would

generate backpressure. The maximum length of the gas outlet tube thus depends on the diameter. The system operator is solely responsible for the gas discharge.

6.6 Example integration



Minimum configuration

#	Description
1	Gas cooler
2	PTFE filter
3	Condensate pump
4	Sample gas pump
5	Cal. gas valve
6	Zero gas valve
7	Activated carbon filter
8	Pressure regulator
9	Needle valve
10	SWG 19 Gas Analyser
11	Condensate vessel

The illustration shows a general overview of the minimum components required and a suggested tubing configuration. For more detailed technical information on electrical wiring, please refer to the wiring diagram in the appendix. Systems with minimum and maximum equipment are shown here.

NOTE

The device expects an external ready contact. This must be provided by the system integrator.

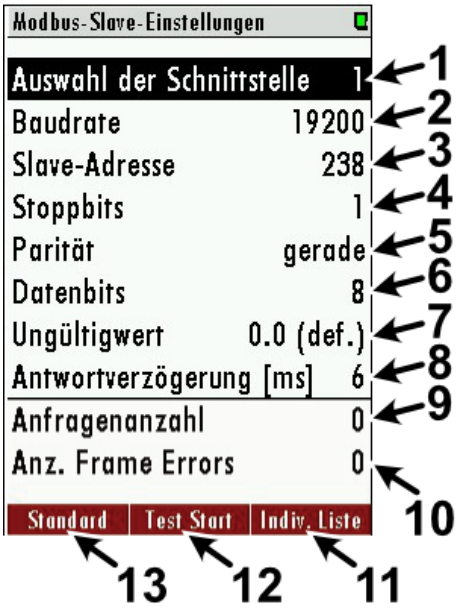
If the external ready input is not energised, a system alarm is triggered. The gas pump stops.

Perform a calibration of the measurement technology after integrating SWG 19 into your server cabinet in order to obtain the most accurate measurement results possible.

6.7 Setting up the alarm relay software

▶ Set the baud rate and the further parameters in the EXTRAS/GENERAL SETTINGS/MODBUS menu such that the device corresponds to your system.

ⓘ The number of queries increases in case the connection is established correctly.



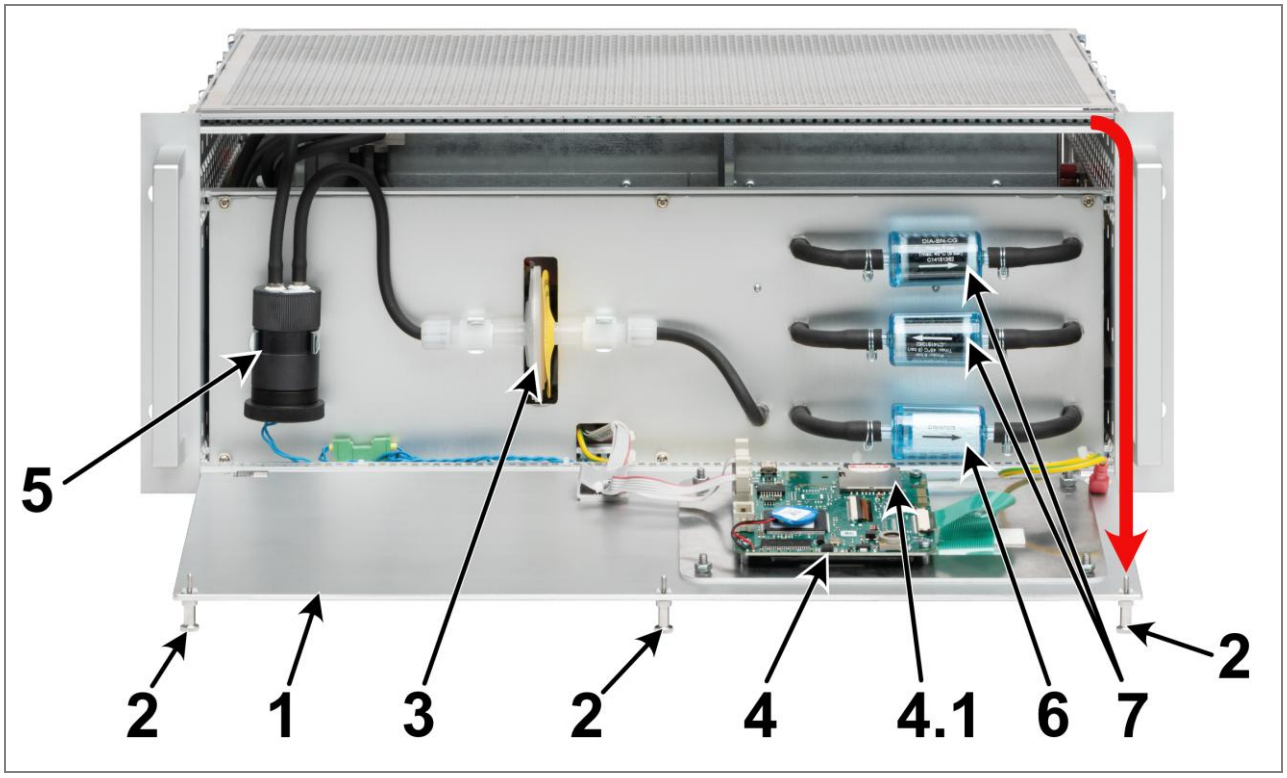
Modbus slave settings menu with

#	Description
1	**Selection of interface:** Interface 1 provided ex works Interface 2 is intended for retrofitting or for master applications
2	**Baud rate:** Pay attention that the baud rate of the device corresponds to the master of the bus of your system.
3	**Slave address:** Address of the device in the bus of your system
4	**Stop bits:** Pay attention that the settings of your device correspond to the master of your system.
5	**Parity:**

	Pay attention that the settings of your device correspond to the master of your system.
6	**Data bits:** Presetting, cannot be changed
7	**Invalid value:** You can choose which value you want to output to suit your system.
8	**Response delay:** You can adapt the response of the device to the speed you can receive with your system control.
9	**Number of requests:** The number of requests grows if the connection is successfully established
10	**Number of frame errors:** The number increases in case of errors in the connection
11	**Default:** You can reset all values to the default value at the time the device was delivered from the factory
12	**Test start:** Offers a diagnosis option to test the bus functionality
13	**Individual list:** The list stores the currently entered values of the measuring window

✔ The software is set up and the device can communicate via the RS-485 interface.

6.8 Service flap



Service flap front

#	Description
1	Service flap
2	Screws to open the service flap
3	Water stop filter
4	Operating element with display
4.1	SD card connection at the operating element
5	Condensate monitoring How to empty the condensate monitoring is described on page 107 - Condensate monitoring.
6	Pre-filter The change intervals for the filters can be found in the chapter Maintenance, see page 106 - General notes.
7	Activated charcoal filter

You can open the service flap without tools.

▶ Loosen the three **screws (2)**.

▶ You can open the **service flap (1)**.

✔ You have access to the most important service points.

7 Operation

7.1 Screen keypad

In this chapter you learn how you can operate the device and make different settings.

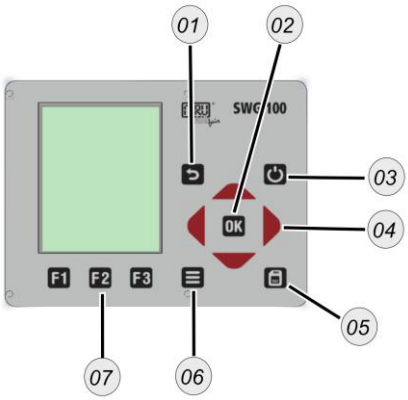


Fig. 1: Screen and keypad

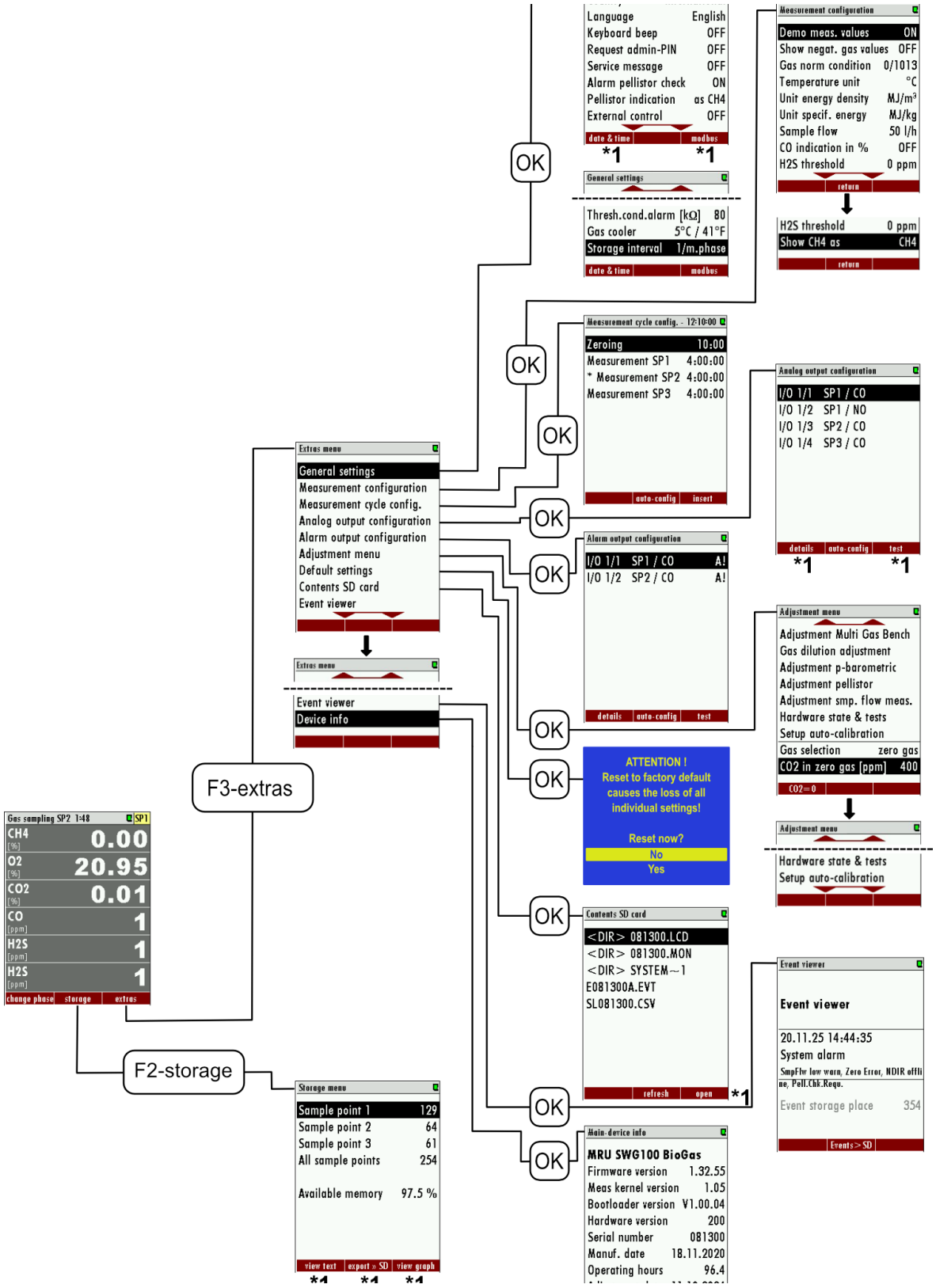
#	Symbol	Description
1		**ESC:** Quit or one menu level back.
2	OK	**OK:** Acknowledgement key.
3		**Switching on and off:** Press this key before disconnecting the device from the mains. The device stores changed user settings and other operating data and cleans the sensors.
4		**Arrow keys:** context-dependent functions, e.g. scrolling between lines, changing values, changing the view.
5	SD	**Screenshot:** Press this key to store a screenshot of the current screen content on the SD card.
6		**Context menu:** All additional functions of a menu are listed in a blue context menu.
7	F1 F2 F3	**Function keys:** Activates the functions shown on the display.

7.2 Menu structure

After it is switched on, the device carries out a self-test. When the self-test has been successfully completed, the **Measuring menu** is displayed.

- The **function key** F2 takes you to the **"Memory menu"**.
- The **function key** F3 takes you to the "**Extras menu"**.
- You can use the **arrow keys** ◀ ▲ ▼ to navigate through the menus.
- With **OK** OK you can open the selected menu or confirm changes to settings.

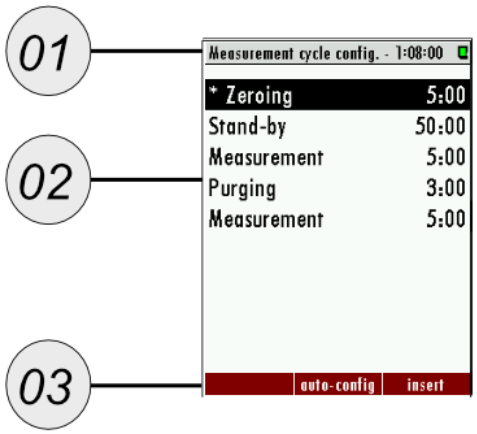
The following page shows the basic schematic structure of the menu guidance:



Overview menus

*1 Further submenus

7.3 Measuring menu structure

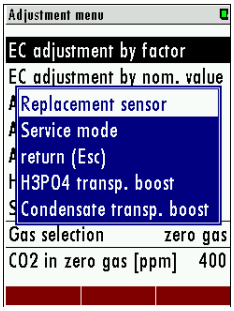


Measuring menu

#	Designation
1	The **menu bar** displays: • Status of the current measuring cycle • SD card inserted / removed
2	Display field of the measured values entered in the **Measured value window**
3	The **function bar** permits: • Navigation via the F1-F3 keys • Selection and deselection of settings

7.3.1 Opening the context menu

Many menus are accompanied by a context menu. The context menu offers additional functions or settings.



▶ Navigate to the desired menu. In this case, the Calibration menu. The menu can be found in the path: **Extras / Calibration menu**.

▶ Press **Context menu** ☰.

A blue window with further menu items opens. The blue window is the submenu.

The menu can be found in the path: **Extras / calibration menu.**

✔ You have called up the context menu for the Calibration menu.

7.4 Setting possibilities Measuring menu

You can carry out the following actions in the measuring window.

- Changing the display mode: Zoom / default
- Changing the measuring page.
- Displaying the last measuring point values
- Individual configuration of the measuring window content.

7.4.1 Changing to the display mode zoom/default

Comparison: Default and zoom view

▶ Press the **menu button** ☰ in the measuring window.

Submenu opens.

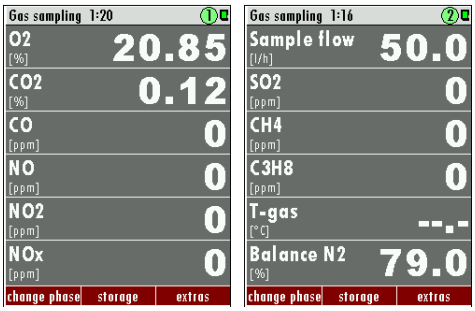
▶ Select between zoom view and default view.

✔ The view is selected.

NOTE

For devices with only one measuring point, switchover is also possible with the **up/down arrow keys** (↔) .

7.4.2 Changing the measuring page



▶ Press the **left/right arrow key** (◂▸).

✔ The page is changed. The page number is displayed in the title bar.

7.4.3 Displaying the last measuring point values

You can have the last values of the non-active measuring points displayed.

PREREQUISITE:

☑ Your device is equipped with several measuring points.

ⓘ The active measurement is not interrupted by this. However, you are able to view the last values of the last measuring points. This has no influence on the currently active measurement.

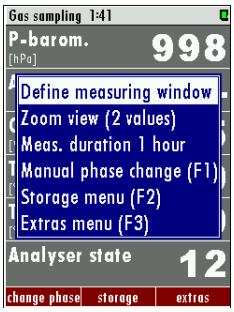
STEPS:

▶ Press the **up/down arrow keys** (◂▸).

✔ The menu shows the values of the next measuring point.

7.4.4 Configuring measuring windows

You can change the order of the displayed measured values in the measuring window.



▶ Press the **Menu button** ☰ in the measuring window.

The blue submenu appears.

▶ Select "DEFINE MEASURING WINDOW".

The measuring window is active again.

▶ Use the **up/down arrow keys** (◂▸) to highlight the position to be changed.

▶ Use the **left/right arrow key** (⇠⇢) to select the desired display value.

▶ Press the OK **button** to confirm the display value.

The selected display appears in the desired position.

▶ Confirm the change.

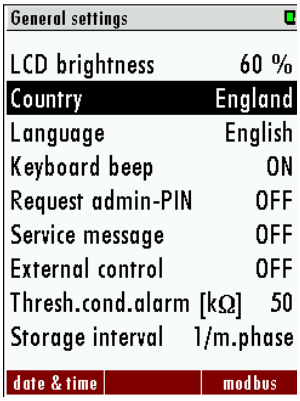
✔ The display value in the measuring window is adapted.
✔ Repeat the procedure if desired.

NOTE

Using the function “Measuring window auto configuration” in the context menu, the measuring device can also make an adjustment autonomously, which is usually a reasonable approach.

7.5 Menu: Extras

7.5.1 General settings



Menu path: EXTRAS / GENERAL SETTINGS

NOTE

All screenshots display an exemplary menu structure, which can slightly vary depending on the device configuration.

▶ You can adapt your desired settings directly in the Values menu.

Adjustment	Operation
Change unit	**Arrow keys** (◀ ▶)
Date & time	**F1**
modbus	**F3**

ⓘ The device automatically stores measured values including time stamp. The system clock of the device must therefore be set correctly.

▶ Open the menu: Setting the date & time: Extras / General settings F1. The Setting the date & time menu window opens.

▶ Set the date and the time. Press the **function key** F2 to do so.

▶ Quit the menu.

▶ Confirm the stored values.

✔ Date and time are set.

NOTE

The device automatically changes the daylight saving time in spring and autumn depending on the selected country. This function is active for most of the European countries. When daylight saving time is active, an "*" is displayed in the menu time bar, i.e. 'Time *' instead of 'Time'.

Checking the set country and device language:

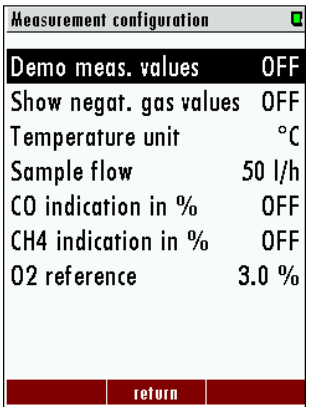
NOTE

Setting the language

If the device displays an unintelligible language, it is possible to change to English by pressing the menu key and selecting “Set English language”.

The device automatically specifies some country-typical items such as language, date format, temperature unit, daylight saving time function and the CSV export settings.

7.5.2 Configuration of the measurement

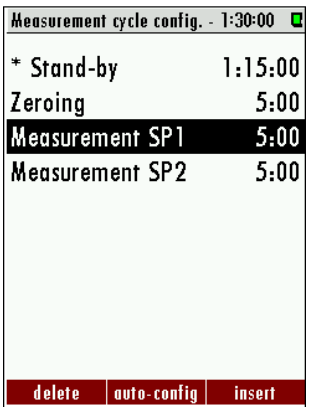


In this menu, you can set the temperature unit used and the flow rate.

Menu path: EXTRAS / CONFIGURATION OF MEASUREMENT

Setting	Operation
Change Unit	**Arrow keys** (◀ ▶)
Back	**F2**

7.5.3 Configuration measuring cycle

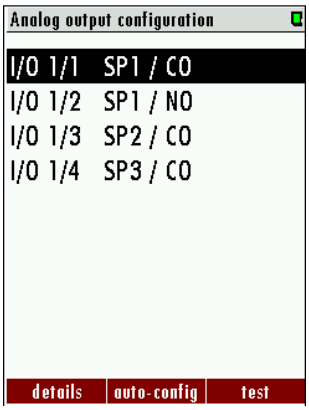


In this menu you can set a measuring cycle with different phases.

Menu path: EXTRAS / CONFIGURATION MEASURING CYCLE.

Setting	Operation
Change Unit	**Arrow keys** (◀ ▶)
delete	**F1**
auto config	**F2**
insert	**F3**

7.5.4 Configuration analogue outputs (optional)



Here you can configure 4-20 mA outputs.

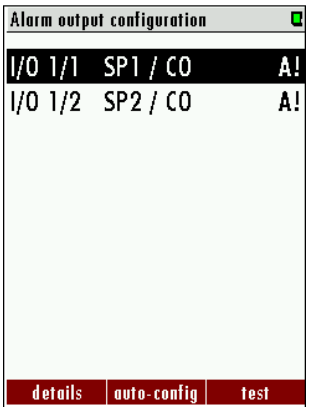
Menu path: EXTRAS / CONFIGURATION ANALOGUE OUTPUTS.

NOTE

This option is only available if you own the IO module option.

Setting	Operation
details	**F1**
auto config	**F2**
test	**F3**

7.5.5 Configuration alarm outputs



Here you can configure alarm outputs.

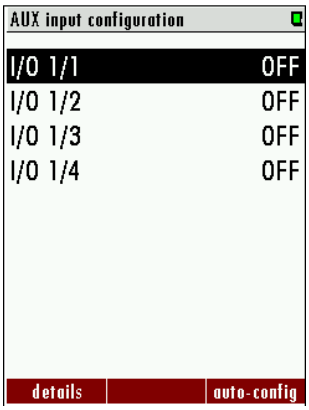
Menu path: EXTRAS / CONFIGURATION ALARM OUTPUTS.

NOTE

This option is only available if you own the IO module option.

Setting	Operation
details	**F1**
details	**F1**
test	**F3**

7.5.6 AUX input configuration



Here you can configuration the AUX input.

Menu path: EXTRAS / AUX INPUT CONFIGURATION

Einstellung	Bedienung
details	**F1**
Auto-config	**F3**

7.5.7 Calibration menu

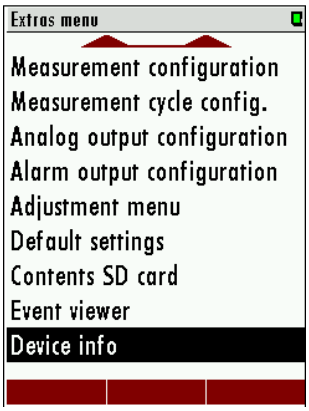
In this chapter you find all kinds of calibration options. Here you also find a **Hardware status & tests** menu.

Menu path: *EXTRAS / CALIBRATION MENU.*

NOTE

How to use the individual Calibration menus is described in the respective measuring technology chapters.

7.5.8 Factory settings



With this menu item you can reset all settings to **factory settings**.

CAUTION

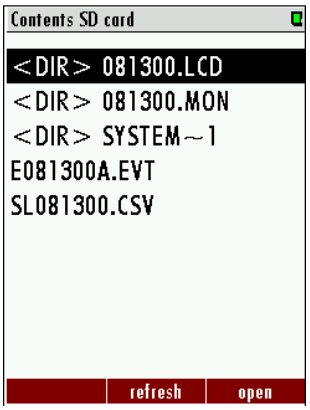
All stored data are lost

Failures of connected systems

- ➢ Only reset the device to factory settings if you are sure that this will not interfere with the operating procedures of the system and operator of the device because of data loss.

Menu path: EXTRAS / FACTORY SETTINGS.

7.5.9 Content SD card



This menu item shows the content of your SD card.

Menu path: EXTRAS / CONTENT SD CARD.

Einstellung	Bedienung
refresh	**F2**
open	**F3**

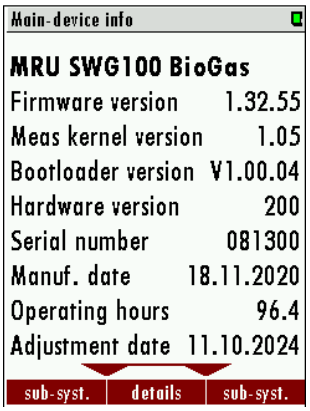
7.5.10 Event display

In this menu you can view various events, e.g. the times of zero point calibrations or error messages.

Menu path: EXTRAS / EVENT DISPLAY.

Einstellung	Bedienung
Events to SD-card	**F2**

7.5.11 Device information



In this menu you can get general information about your device. Here you can also update the various modules you have installed.

Menu path: EXTRAS / INFO MAIN DEVICE.

Einstellung	Bedienung
refresh	**F1**
Details	**F2**
sub-syst.	**F3**

7.6 Menu: Storing

7.6.1 Data storage

The measured values are internally stored in the device.

- The device is able to store several thousand measured values internally, depending on the sensor configuration.
- The device stores the current measured values for each measuring point at the end of the measuring cycle.
- As soon as the storage space is full, the device overwrites the oldest measured values (circular buffer principle).

In addition, the device is always delivered with an SD card. Several tens of thousand measured values can be additionally stored on this card.

To use this card, the device is equipped with two data storage strategies:

- If 99 % of the memory is used, the oldest 20 % of the measurements is automatically stored on an SD card in CSV format and then deleted from the memory in the analyzer.
- If the export to the SD card fails (SD card missing or write-protected) only 4 % of the old measurements are deleted. The file name shows the date of the last measurement exported from the file, e.g. “20141031.csv”.

NOTE

Example:

A device with 2 measuring points and a configured measuring cycle of 32 minutes stores 2 * 24 * 60/32 = 90 measurements per day (45 per measuring point). The internal memory of the device allows the measuring data of approx. 6 months of use to be stored; this is extended to several years by the SD card

7.6.2 Calling up the Data storage menu

In the Data storage menu, the following is possible with your stored data:

- View
- Export
- Transfer to other data formats.

▶ Go to the measuring window.

▶ Press the **function key** F2 in the measuring window.

✔ You are in the Data storage menu.

7.6.3 Displaying stored values in text mode

Follow the steps below to read stored messages in text mode:

▶ Call up the **Data storage menu**.

▶ Press the **function key** F1 = "**Display text"**.

The last message that was stored is displayed.

▶ Use the **left/right arrow keys** to navigate through the measurements until you have found the desired measurement.

NOTE

The **function key** F3 takes you to the last measurement.

✔ You can continue to navigate with the steps listed above.

7.6.4 Displaying stored values in the graphics module

Follow the steps below to read stored measurements in graphic mode:

▶ Call up the **Data storage menu**.

▶ Press the **function key F3 "Display graphics"**.

The last message that was stored is displayed.

▶ Use the **left/right arrow keys** to navigate through the measurements until you have found the desired measurement.

NOTE

The **function key F3** takes you to the last measurement.

✔ You can continue to navigate with the steps listed above.

7.6.5 Exporting measurements to the SD card

You can export your measurements to an SD card as CSV file.

PREREQUISITE

☑ An SD card is inserted in the device.

☑ The SD card must not be write-protected.

NOTE

The CSV format is country-specific. The respectively valid CSV format is set via the General settings menu.

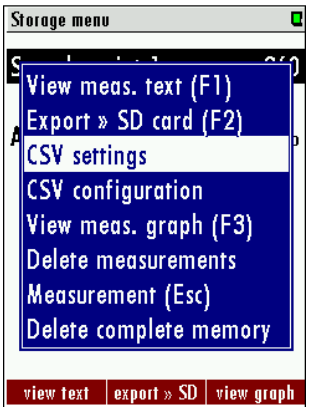
▶ Call up the **Data storage menu**.

▶ Press the **function key F2 "Export >> SD"**.

The CSV files are written to the SD card. A message is displayed once the procedure has been successfully completed.

✔ The data is stored on the SD card in CSV format.

7.6.6 Adjusting the CSV format



You can set the CSV format directly at the device.

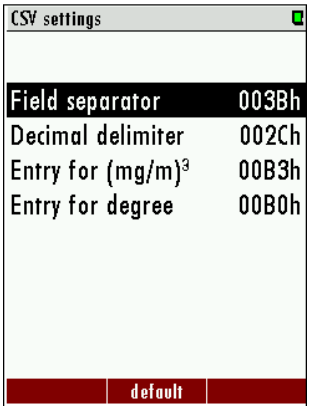
▶ Call up the **Data storage menu**.

▶ Press the **menu button** ☰.

The **submenu** opens (see picture below).

▶ Open the menu item CSV settings.

The **CSV settings** menu opens (see picture below).



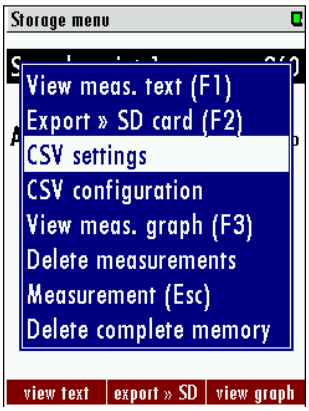
▶ Here you can make your individual adjustments.

▶ Quit the menu.

▶ Confirm the stored values.

✔ The CSV settings are changed.

7.6.7 Changing the CSV configuration



You can set the CSV format directly at the device.

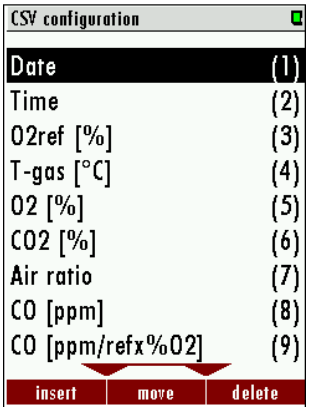
▶ Call up the **Data storage menu**.

▶ Press the **menu button** ☰.

The **submenu** opens (see picture below).

▶ Open the menu item CSV settings.

The **CSV settings** menu opens (see picture below).



CSV configuration menu

▶ Edit the CSV configuration. Use the **function keys** F1 F2 F3 to insert, move or remove CSV values.

Selecting a pre-defined CSV list

You also have the option to select 3 predefined lists for the CSV format. These are:

- Setting the maximum list length: With this, all available measured values and all 9 system lines are depicted.
- Setting the default list length: With this, all available measured values and 2 system lines are depicted.
- Setting the short list length: Only the basic measured values are depicted.

7.7 Adjusting the measuring cycle

You have the option of configuring an individual measuring cycle.

The following phases are available:

- Zeroing
- Rinsing
- Idle mode

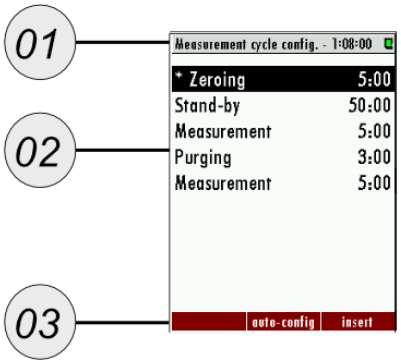
- Measurement M.St. x (M.St.x denominates an arbitrary configured measuring point)

7.7.1 Menu path and basic structure

Menu path: EXTRAS / KONFIGURATION MESSZYKLUS.

In this menu, you can see the currently active measuring cycle of your device.

The illustration below and the table show the meaning of the individual areas.



#	Designation
1	Duration of the entire measuring cycle
2	Configured phases of the measuring cycle
3	Function keys

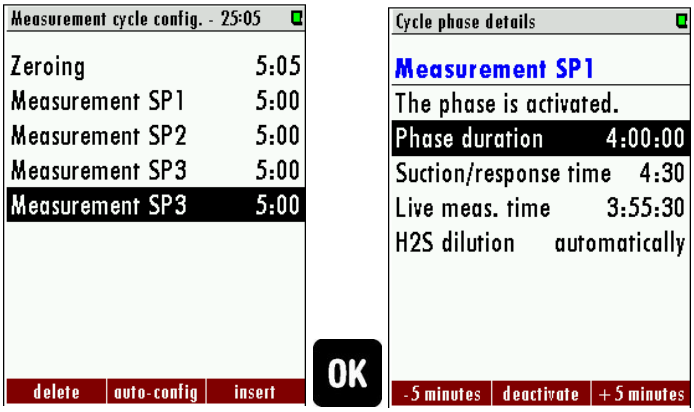
7.7.2 Navigating in the menu

You can set each phase individually. To do so, you must call up the Phase submenu.

▶ Use the **up/down arrow keys** to select the desired phase.

▶ Press the OK**-key**.

The Phase submenu of the phase appears. In the example below for zeroing.



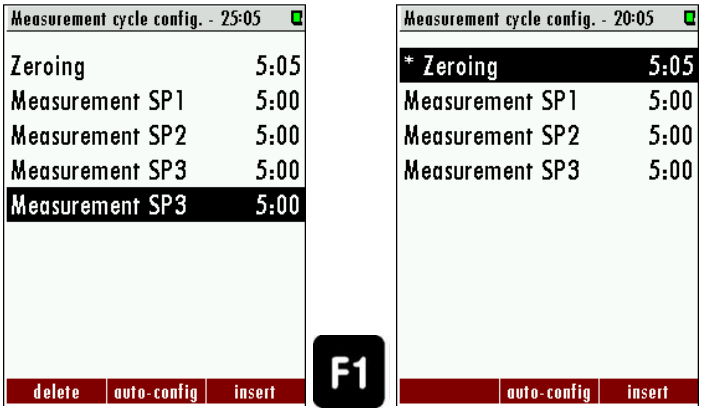
Here you can make individual adjustments. Refer to the following chapters.

7.7.3 Deleting a phase

▶ Use the up/down arrow keys to select the phase to be deleted.

▶ Press the **function key** F1 to delete the phase.

✔ You have deleted the phase.



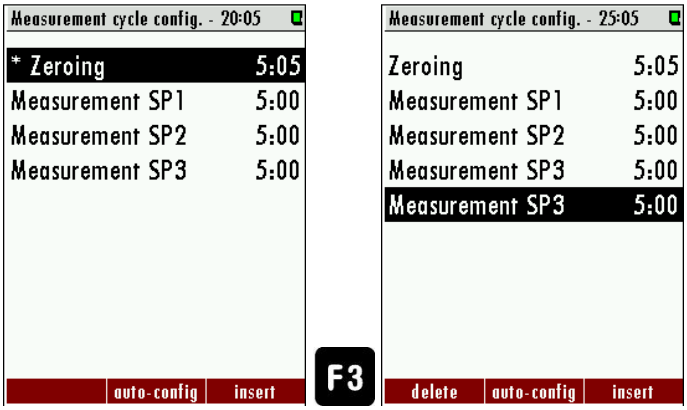
7.7.4 Inserting a phase

▶ Press the **function key** F3.

A new phase appears.

▶ Press the **left/right arrow key** to select the desired phase.

✔ You have inserted a new phase.



7.7.5 Inserting auto configuration

Two default cycles are stored. You can insert the cycles with AUTO-KONFIG .

NOTES

The auto configurations only contain measurements and zero point calibrations. Other phases are deleted.

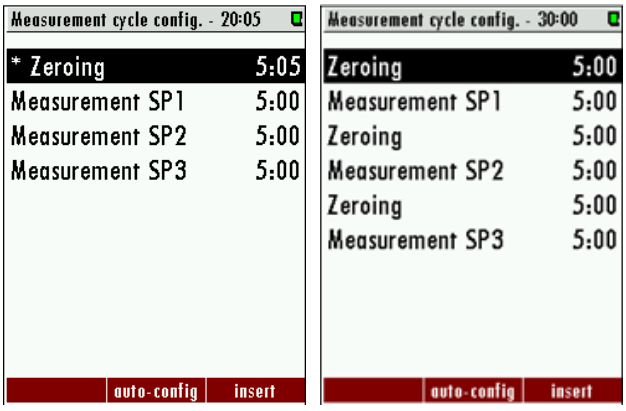
▶ Press the **function key** F3.

A zero point calibration is inserted at the beginning of the measuring cycle.

▶ Press the **function key** F3 agein.

A zero point calibration per measurement is inserted.

▶ Select a reasonable standard for your measuring application.

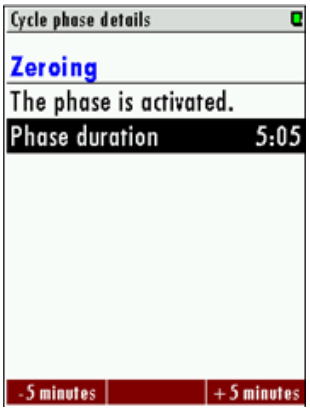


The two auto configurations in comparison.

7.7.6 Phase submenus Setting options

Here you learn which settings are possible in the Phase submenus.

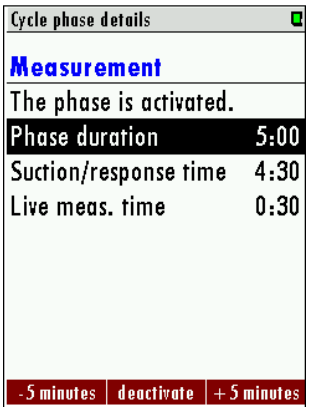
7.7.7 Zeroing (cycle phase details)



In this menu, the details of the cycle phase for zeroing can be viewed and changed where necessary.

Zeroing	
Measuring point valve	closed
Zeroing valve	open
Duration	Duration of phase: 2 min. to 24 h

7.7.8 Measurement MSt.x (cycle phase details)



In the cycle phase details, it is possible to change the measuring time and the aspiration time. Each individual measuring point can be adjusted individually.

Measurement MSt.X	
Measuring point valve	The measuring point valve of the current measuring point is open, all others are closed
Zeroing valve	Valve closed
Duration	Duration of phase: 2 min. to 24 h

7.7.9 Standby (cycle phase details)

Within this cycle phase, it is possible to set the rinsing time and the standby phase.

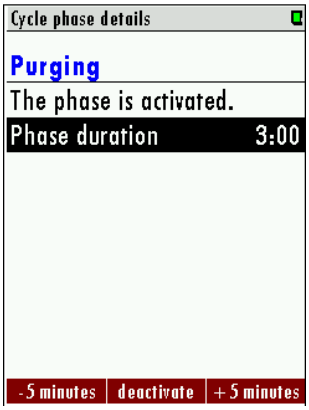
Duration of the time is the entire time, consisting of:

- Rinsing time: Rinsing the device with ambient air through the zero gas inlet.
- Idling time: The time during which the device is in standby mode.

The end of the standby is always followed by a zero point calibration.

Standby	
Measuring point valve	closed
Zeroing valve	closed
Duration	Duration of phase: 2 min. up to 24h
Rinsing time	30 sec. up to 1 h
Idling time	calculated

7.7.10 Purging (cycle phase details)

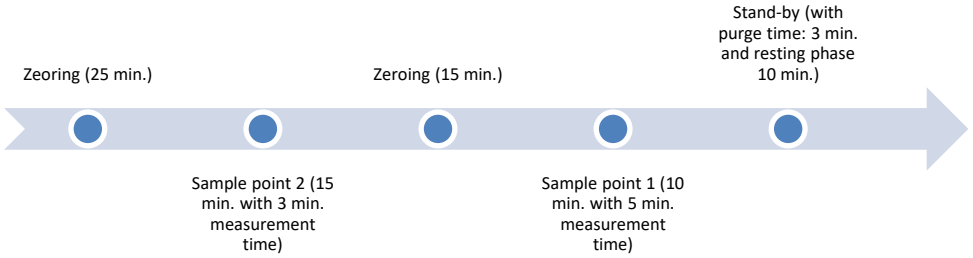


Purging is a separate configuration point to rinse the device with ambient air and to convey foreign gas from the lines and the measuring technology. This can be necessary if switching takes place between different measuring points that feature varying gases or gas concentrations.

Purging	
Measuring point valve	closed
Zeroing valve	open
Duration	30 sec. up to 1 h

7.7.11 Example for a measuring cycle configuration

This example serves to provide you with a detailed example of how you can adjust a measuring cycle.



▶ Open the path: EXTRAS / CONFIGURATION MEASURING CYCLE.

The default measuring cycle appears.

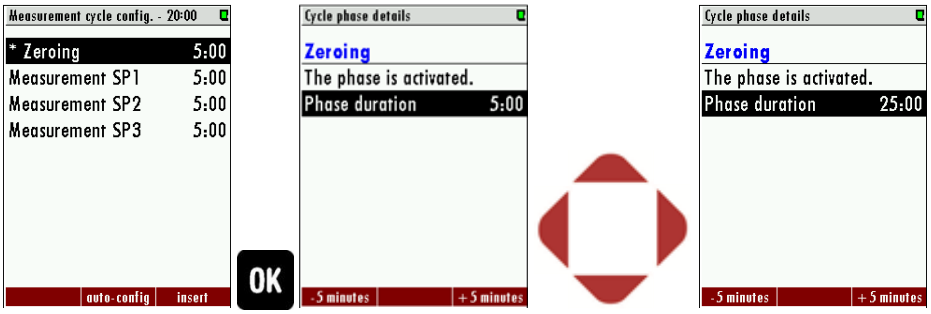
▶ Add a zero point calibration.

▶ Press the OK-**key**.

The Phase submenu opens.

▶ Set the zero point calibration to 25 min.

The zero point calibration was set to 25 min.



▶ Return to the Configuration measuring cycle menu.

▶ Insert the measurement M.St.2.

▶ Open the Phase submenu of measurement M.St.2.

▶ Change the settings.

▶ Proceed in the same manner with the items measurement M.St1 and idle mode.

✔ The measuring cycle is set.

7.8 Cycle timer: Capturing events

The cycle timer serves to capture an event of the measuring phase. In doing so, the idle phases or zero point calibrations are placed so that the event always falls within the measuring phase. An event can be, for example, the start-up of a system.

The cycle timer is characterised by the following:

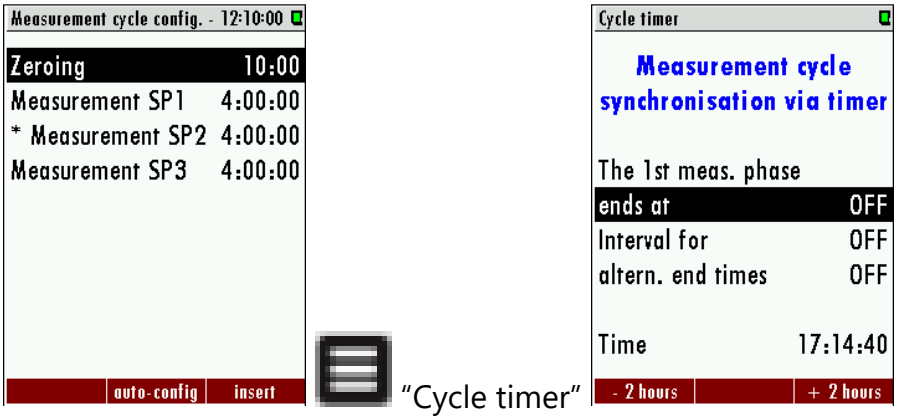
- Stands in the priority above the normally set measuring cycle.
- Is disabled in the basic settings.

7.8.1 Calling up the cycle timer

The Cycle timer menu is called up as follows:

1. Menu path: EXTRAS / CONFIGURATION MEASURING CYCLE / CONTEXT MENU / CYCLE TIMER

The “Cycle timer” menu window appears.

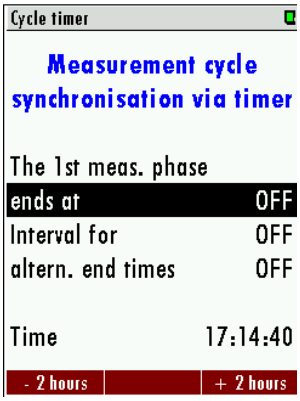


“Cycle timer”

7.8.2 Menu structure

The menu has the following structure:

1. The first measuring phase...ends at: Set the time when the first measuring phase ends. The measuring phase is followed by a zero point calibration.
2. Interval for: Length of the further measuring phases. The measuring phase is followed by a zero point calibration.
3. Alternative end times: Display of the following measuring phase starts.
4. Time: Shows the current time.



In the pictured example, the measuring phase is always ended at noon, 2 pm, 4 pm, 6 pm, 8 pm, 10 pm, midnight, 2 am, 4 am, 6 am, 8 am or 10 am. This means that the zero point calibrations (except the first one after the power-on) are always started at these times.

NOTE

The interval should be selected so that the overall cycle duration is a multiple of this interval (in the example: 2h * 4 = 8h).

7.8.3 Setting the cycle timer (example)

A measuring system consists of 3 devices. The measuring cycle of the devices should be set so that the system is permanently monitored and the zero point calibrations do not overlap. The third device serves as failure protection.

This can, for example, be achieved with the following setting:

Device A:	1. measuring phase ends at 11:20	Interval = 2 hours
Device B:	1. measuring phase ends at 12:00	Interval = 2 hours
Device C:	1. measuring phase ends at 12:40	Interval = 2 hours

Without the cycle timer, all 3 devices would run synchronously in case of a power failure until the first zero point calibration is completed. Only then would the configured cycle start to run.

In case of a power failure at 1 pm this means that all 3 devices will carry out the self test simultaneously and that the zero point calibration and the first measuring phase run synchronously. The first measuring phase would be completed at 8:50 pm.

Activation of the cycle timer would make for the following offset:

A:	1. Measuring phase end: 9:20 pm	2. Start of zeroing: 9:20 pm
B	1. Measuring phase end: 8:00 PM	2. Start of zeroing: 8:00 PM
C:	1. Measuring phase end: 8:40 PM	2. Start of zeroing: 8:40 PM

8 Commissioning of the MRU measuring device

8.1 Carrying out auto calibration

With auto calibration, your device is able to automatically carry out a sensor calibration at defined time intervals.

To do so, a test gas cylinder is connected to the **Calibration gas inlet**.

☛ The manual sensor calibration can be found on page 114 - Manual adjustment of the sensors.

⚠ WARNING

High pressure

Gas cylinders are under high pressure. High pressure can lead to injuries.

➢ Only trained people must connect and operate gas cylinders.

STEPS:

▶ Connect the calibration cylinders to the **Calibration gas inlet 1**.

NOTE

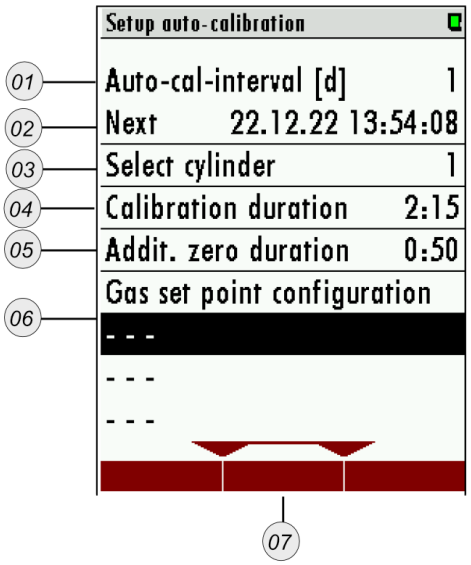
As an option, you can purchase several auto calibration points.

▶ Set the pressure of the calibration gas cylinder to maximum **500 hPa**.

NOTE

Should you require a pressure regulator for this, it can be purchased as an optional accessory to the device

▶ Open the menu: EXTRAS / CALIBRATION MENU / AUTO CALIBRATION.



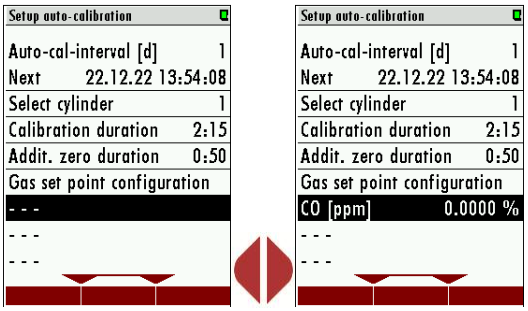
Config. auto calibration

#	Description
1	**Auto calibration interval [d]** Setting of the auto calibration interval from Off to 183 days **(left/right arrow key ◀▶)**
2	**Next** Setting the next auto calibration **(left/right arrow key ◀▶)**
3	**Selection of cylinder/port** Selection of port 1 to 5 (if additional auto calibration was ordered at purchase of device) **(left/right arrow key ◀▶)**
4	**Calibration duration** Duration of calibration 2 to 15 minutes **(left/right arrow key ◀▶)**
5	**Additional NP duration** Rinsing time 0 to 15 minutes **(left/right arrow key ◀▶)**
6	**Configuration of the gas setpoints** Setpoint of the calibration cylinder

▶ Set all values from **1 Auto calibration interval [d] to 5 Additional NP duration**.

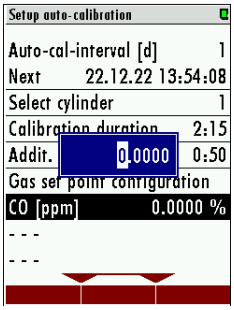
▶ Then select **Configuration of gas setpoints.**

▶ Using the **left/right arrow key (◀▶)** select the first gas component of your calibration cylinder.

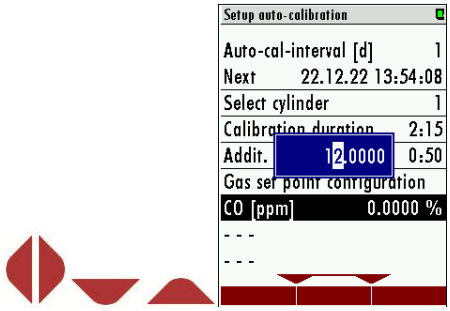


▶ Press the **OK key** to set the setpoint.

A blue input window appears.



▶ Using the **arrow keys (◀▶▲▼)**, set the setpoint of the gas component in the input window.



▶ Press the **OK** key to confirm the entry.

▶ Continue to execute the steps to enter all gas components in the calibration cylinder in the **Configuration of gas setpoints** list.

ⓘ If you wish to start the calibration as specified, quit the menu and confirm the settings. If you wish to start the automatic calibration immediately, press F2 **Start now**.

✔ You have configured the automatic calibration.

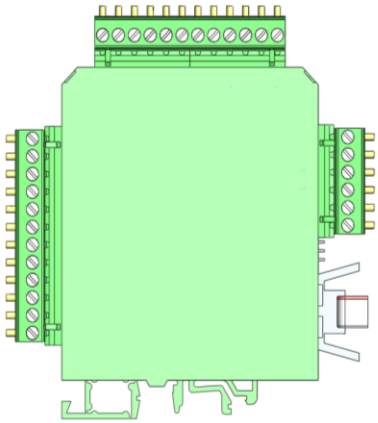
9 Options

9.1 Option: I/O module

I/O modules are interface modules. With **I/O modules** you can:

- Transfer the measuring signals through four separate 4-20 mA outputs,
- Two alarm outputs,
- One PT-2000 input,
- One thermocouple input (type: K),
- Four inputs for 4-20 mA standard measuring transducers (2-conductors, 3-conductors, 4-conductors) with an extra power supply.
- Two inputs for voltage transducers.
- Remote control function for the device.

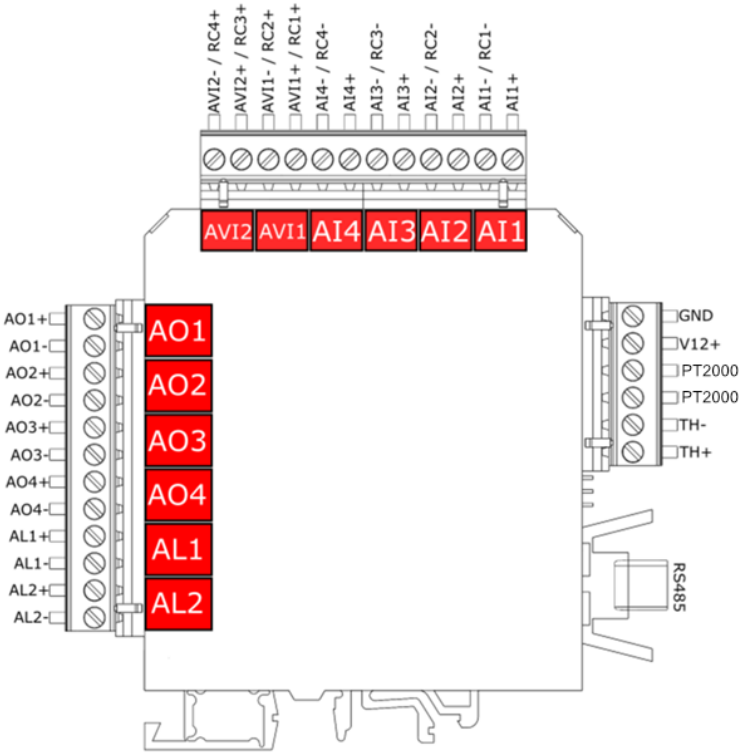
The I/O modules are on the top hat rail. The number of I/O modules can vary, depending on the individual configuration.



I/O module

9.1.1 Pin assignment

The following assignment plan shows where to locate the various pins with their respective functions and which pins have a double assignment.



Pin assignment I/O module

The table shows the allocation of the respective individual pins.

Description	Abbreviation	Pins	Max. external voltage	Apparent power	Measuring resistance	Double assignment
Analogue outputs 4-20 mA	AO1	AO1+ /AO1-	--	500R	--	No
	AO2	AO2+ / AO2-	--	500R	--	No
	AO3	AO3+ / AO3-	--	500R	--	No
	AO4	AO4+ / AO4-	--	500R	--	No
Alarm outputs	AL1	AL1+ / AL1-	24 VDC	500R	--	No
	AL2	AL2+ / AL2-	24 VDC	500R	--	No
Analogue inputs 4-20 mA	PWROUT	V12+ / GND	--	--	--	No
	AI1	AI1+ / AI1-	--	--	50R	AI1- = RC1-
	AI2	AI2+ / AI2-	--	--	50R	AI2- = RC2-
	AI3	AI3+ / AI3-	--	--	50R	AI3- = RC3-
	AI4	AI4+ / AI4-	--	--	50R	AI4- = RC4-
Remote control	RC1	RC1+ / RC1-	--	--	--	RC1- = AI1-
	RC2	RC2+ / RC2-	--	--	--	RC2- = AI2-
	RC3	RC3+ / RC3-	--	--	--	RC3- = AI3-
	RC4	RC4+ / RC4-	--	--	--	RC4- = AI4-
Analogue inputs 0-10 V	AVI1	AVI1+ / AVI1-	--	--	--	JMP1_out = AVI1+ JMP2_out = AVI1-
	AVI2	AVI2+ / AVI2-	--	--	--	JMP3_out = AVI2+ JMP4_out = AVI2-

9.1.2 Analogue outputs 4-20 mA (AO1-AO4)

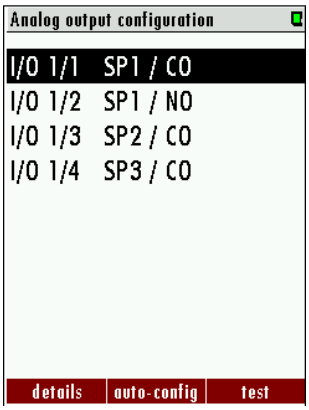
Up to 4 analogue outputs can be set per I/O module.

PREREQUISITE:

☑ The option I/O module is included in your configuration.

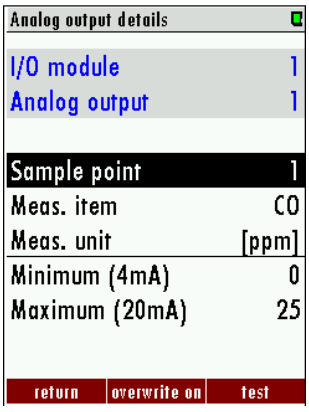
▶ Open the Configuration menu of the analogue outputs:

Path: EXTRAS / CONFIGURATION ANALOGUE OUTPUTS



Selection window: MS1 = measuring point 1, I/O 1/1 = first I/O module at the first 4-20 mA output.

▶ Select the desired I/O output and open the **Details** submenu.



Adjustment of measuring point, measurand and area for a 4-20 mA output.

▶ Select measuring point and measurand.

▶ Define the minimum (4 mA) and the maximum (20 mA) for the measurand.

ⓘ 2 mA is output for invalid measured values. Hardware errors or broken cables can thus be distinguished from this as the signal would then be 0 mA.

✔ The analogue output is configured.

The I/O module can output status values that can be read via outputs **AO1–AO4**; these status values are shown in the table below:

Output of the I/O-modules	Status number	Description
4.0 mA	0	Switch on and run the self-test
5.0 mA	1	Device extracts gas at measuring point SP1 (*1, *2)
6.0 mA	2	Device extracts gas at measuring point SP2 (*1, *2)
7.0 mA	3	Device extracts gas at measuring point SP3 (*1, *2)
8.0 mA	4	Device extracts gas at measuring point SP4 (*1, *2)
9.0 mA	5	Device extracts gas at measuring point SP5 (*1, *2)
10.0 mA	6	Device extracts gas at measuring point SP6 (*1, *2)
11.0 mA	7	Device extracts gas at measuring point SP7 (*1, *2)
12.0 mA	8	Device extracts gas at measuring point SP8 (*1, *2)
13.0 mA	9	Device extracts gas at measuring point SP9 (*1, *2)
14.0 mA	10	Device extracts gas at measuring point SP10 (*1, *2)
15.0 mA	11	Purge and zeroing
16.0 mA	12	Purging phase for H2S low Sensor**
17.0 mA	13	Auto-calibration
18.0 mA	14	Reset all system alarms
19.0 mA	15	
20.0 mA	16	Device is in “stand-by” (*3)

**only SWG100-BIOGAS.

The following meaning applies here: 0= open / 1= closed.

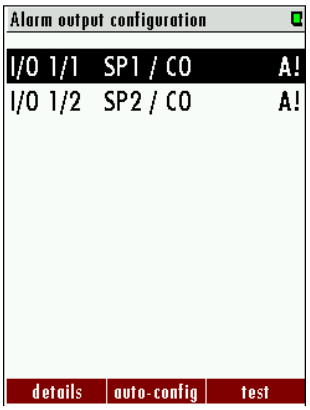
9.1.3 Alarm output setting (AL1-AL2)

Up to 2 alarm outputs can be set up per I/O module.

Prerequisite: The option I/O module is included in your configuration.

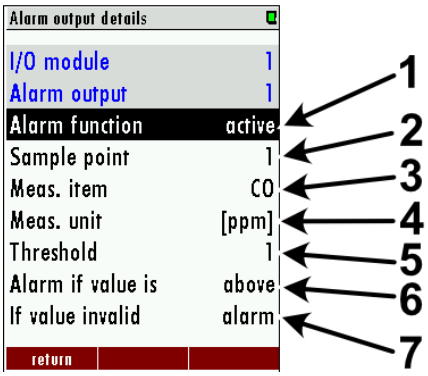
▶ Open the Configuration menu of the alarm outputs:

Path: EXTRAS / CONFIGURATION ALARM OUTPUTS



Selection window: MS1 = measuring point 1, I/O 1/1 = first I/O module at the first alarm output.

▶ Select the desired I/O output and open the **Details** submenu.



Setting the measuring point, the measurand, the threshold and the alarm page (overshoot or undershoot)

#	Description
1	**Example:** The threshold of an O2 sensor is 5%. An alarm is to be triggered if the threshold is above this value. A measurement of 6% O2 is captured by the sensor. **active** – an alarm signal is output, the alarm relay is e.g. open

	actively inverted - an alarm signal is output, the relay is closed as the system control requires a closed relay to trigger an alarm. **inactive** - no alarm signal is output, the relay is closed, e.g. because there is a known disruption of the process and the alarm is not to be triggered permanently until the disruption is eliminated. **inactively inverted** - no alarm signal is output, the relay is open as the system control requires a closed relay so that no alarm is triggered. ⓘ The inverted outputs are not “fail safe” as idle mode (no alarm) and signal interruption (broken cable, power failure) appear the same to the system control.
2	Here you can select the **measuring point**.
3	Here you can select the **measurand**.
4	The **measuring unit** is displayed.
5	Here you can select the **threshold**.
6	Here you can decide whether an alarm is to be output if the signal **overshoots** or **undershoots** the **threshold**.
7	Here you can decide whether an invalid value is to be **maintained** or an **alarm** is to be output.

9.1.4 AUX input for measuring transducers (AI1-AI4)

At the AUX inputs, the following 4-20 mA measuring transducers can be read in:

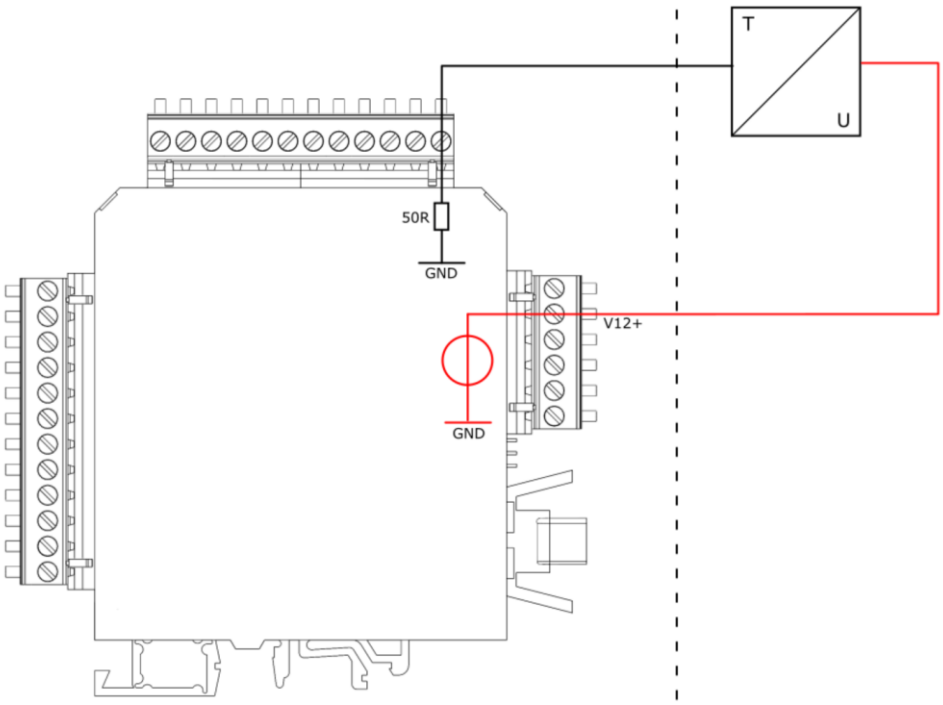
- 2-wire measuring transducer
- 4-wire measuring transducer

The I/O module is equipped with a separate 12V voltage source to supply the connected measuring transducer.

AUX input: Technical data

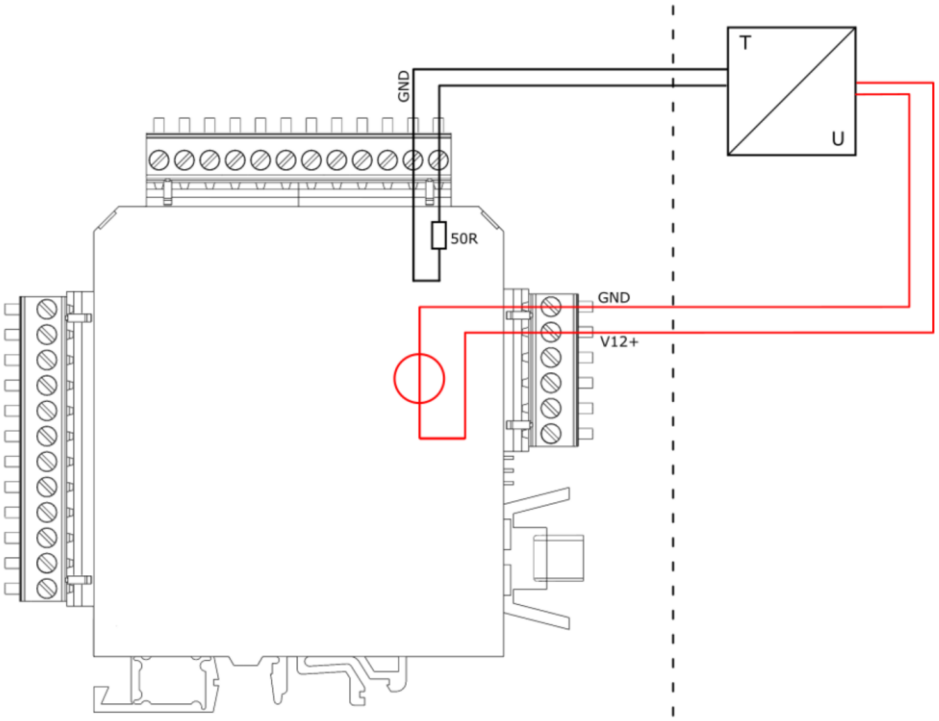
- Measuring resistance: 50 Ohm
- Voltage supply: 12 VDC / 200 mA

Connection: 2-wire measuring transducer



2-wire measuring transducer, connected to the 12 V DC supply of the I/O module

Connection: 4-wire measuring transducer



4-wire measuring transducer, connected to the 12 V DC supply of the I/O module

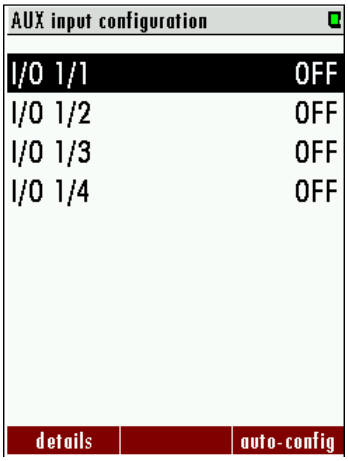
Setting up the AUX input

You can allocate 4 AUX inputs per I/O module.

Prerequisite: The option I/O module is included in your configuration.

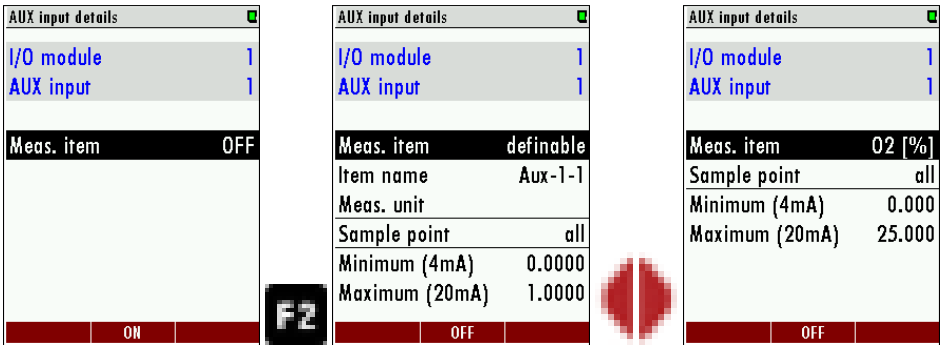
▶ Open the Configuration menu of the AUX inputs

Path EXTRAS / CONFIGURATION AUX INPUT CONFIGURATION



Selection window: AUX input 1 at the I/O module

▶ Select the desired AUX input and open the **Details** submenu.



Select measuring component

▶ In this window you can select the measurand.

▶ Define the minimum (4 mA) and the maximum (20 mA) for the measurand.

9.2 Configuration external control (option: I/O module)

Prerequisite: The option I/O module is included in your configuration.

This function makes it possible to remote-control the device. The following operations can be carried out by means of the external control:

- Sampling
- Triggering stand-by-mode
- Triggering auto calibration
- Reset all system alarms
- The commands are given by a 4-digit binary code which is transmitted by four external signals

There is a total of three transmission paths:

- By means of four potential-free relays
- By means of four 4...20 mA inputs
- By means of a 4...20 mA input
- By means of the RS 485 interface (Modbus RTU)

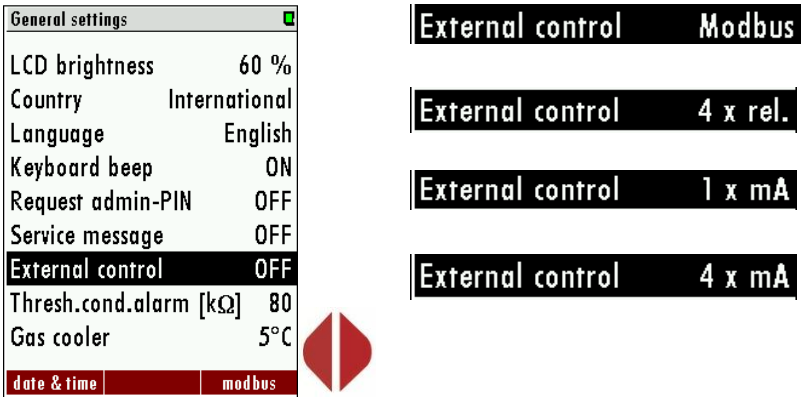
9.2.1 Setting up the external control

An external control can be set up via the top analogue outputs of an I/O module.

▶ Open the EXTRAS / GENERAL SETTINGS path.

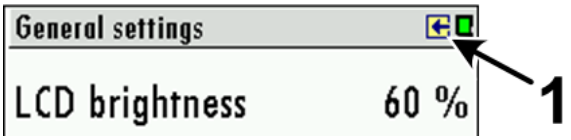
▶ Here, select EXTERNAL CONTROL.

▶ You can select the desired external control using the **left / right arrow key**.



Activating the external control with the respective 4 possible options

By activating the external control, a small arrow becomes visible in the top title bar.



Note arrow (1)

▶ In the GENERAL SETTINGS menu you can use **F2 (=ext. control)** to set the zeroing time, the aspiration/reaction time or the rinsing duration before standby.

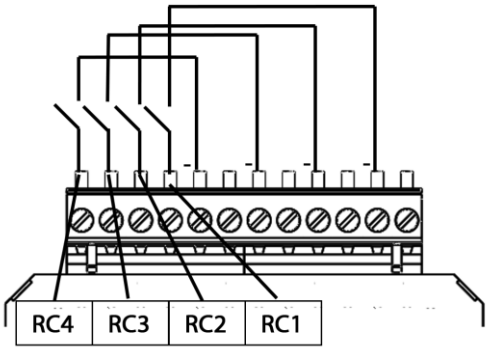
Once everything has been set, the external remote control must be wired.

9.2.2 Connecting the external control by means of 4 relays

This function can be used for external switchover between the extraction points. To do so, four external relays (e.g. of a PLC) are connected with the module inputs.

The four relays together form a binary 4-bit code: RC4-RC3-RC2-RC1.


General settings
LCD brightness 60 %
Country International
Language English
Keyboard beep ON
Request admin-PIN OFF
Service message OFF
External control 4 x rel.
Thresh.cond.alarm [kΩ] 80
Storage interval 1/m.phase
date & time
ext.ctrl.
modbus


RC4
RC3
RC2
RC1

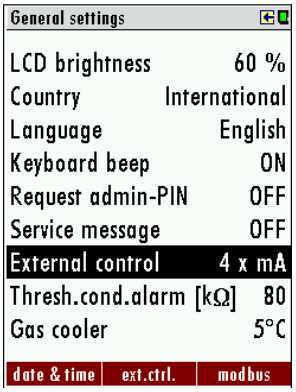
Status of the external signal source				Status number	Description
RC4	RC3	RC2	RC1		
0	0	0	0	0	Automatic measuring point switchover
0	0	0	1	1	Device extracts gas at measuring point SP1 (*1, *2)
0	0	1	0	2	Device extracts gas at measuring point SP2 (*1, *2)
0	0	1	1	3	Device extracts gas at measuring point SP3 (*1, *2)
0	1	0	0	4	Device extracts gas at measuring point SP4 (*1, *2)
0	1	0	1	5	Device extracts gas at measuring point SP5 (*1, *2)
0	1	1	0	6	Device extracts gas at measuring point SP6 (*1, *2)
0	1	1	1	7	Device extracts gas at measuring point SP7 (*1, *2)
1	0	0	0	8	Device extracts gas at measuring point SP8 (*1, *2)
1	0	0	1	9	Device extracts gas at measuring point SP9 (*1, *2)
1	0	1	0	10	Device extracts gas at measuring point SP10 (*1, *2)
1	0	1	1	11	Device is in “standby” mode (*3)
1	1	0	0	12	Rinsing phase for H2S low sensor**
1	1	0	1	13	Auto calibration
1	1	1	0	14	Resetting all system alarms
1	1	1	1	15	Device is in “standby” mode (*3)

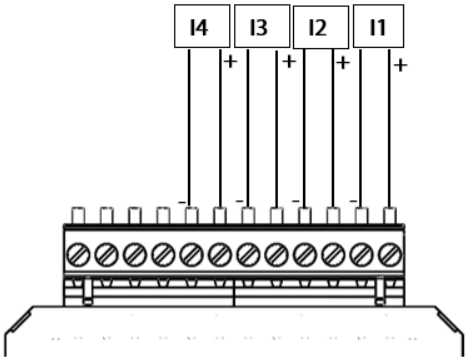
**only SWG100-BIOGAS.

The following meaning applies here: 0= open / 1= closed.

9.2.3 Connecting an external control by means of four 4-20 mA input signals

The 4-bit status number is formed by four 4...20 mA signals. The following meaning of I4-I3-I2-I1 applies here: 0-11 mA = 0 signal (low) / 11/12-20 mA =1 signal (high).

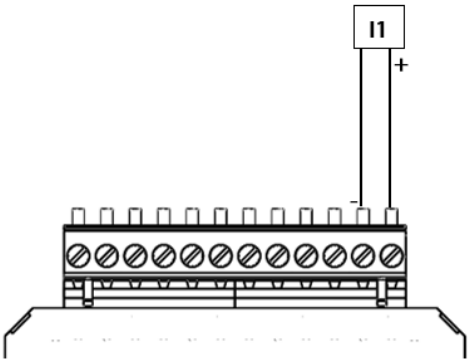




Status of the external signal source				Status number	Description
I4	I3	I2	I1		
0	0	0	0	0	Automatic measuring point switchover
0	0	0	1	1	Device extracts gas at measuring point SP1 (*1, *2)
0	0	1	0	2	Device extracts gas at measuring point SP2 (*1, *2)
0	0	1	1	3	Device extracts gas at measuring point SP3 (*1, *2)
0	1	0	0	4	Device extracts gas at measuring point SP4 (*1, *2)
0	1	0	1	5	Device extracts gas at measuring point SP5 (*1, *2)
0	1	1	0	6	Device extracts gas at measuring point SP6 (*1, *2)
0	1	1	1	7	Device extracts gas at measuring point SP7 (*1, *2)
1	0	0	0	8	Device extracts gas at measuring point SP8 (*1, *2)
1	0	0	1	9	Device extracts gas at measuring point SP9 (*1, *2)
1	0	1	0	10	Device extracts gas at measuring point SP10 (*1, *2)
1	0	1	1	11	Device is in “standby” mode (*3)
1	1	0	0	12	Rinsing phase for H2S low sensor**
1	1	0	1	13	Auto calibration
1	1	1	0	14	Resetting all system alarms
1	1	1	1	15	Device is in “standby” mode (*3)

9.2.4 Connecting an external control 4-20 mA input signal (via an input)

The user has the possibility of controlling the device externally by means of one input signal only (see drawing below). Different commands are given through the current level at measuring input I1. The zero signal corresponds to 4 mA. Each 1 mA level describes a state. Thus, the external control can assume up to 16 states. The first state corresponds to 5 mA (4 mA+1 mA), the second to 6 mA (4 mA+2mA) etc. until the signal has reached 20 mA.



Status of the external signal source	Status number	Description
4	0	Automatic measuring point switchover
5	1	Device extracts gas at measuring point SP1 (*1, *2)
6	2	Device extracts gas at measuring point SP2 (*1, *2)
7	3	Device extracts gas at measuring point SP3 (*1, *2)
8	4	Device extracts gas at measuring point SP4 (*1, *2)
9	5	Device extracts gas at measuring point SP5 (*1, *2)
10	6	Device extracts gas at measuring point SP6 (*1, *2)
11	7	Device extracts gas at measuring point SP7 (*1, *2)
12	8	Device extracts gas at measuring point SP8 (*1, *2)
13	9	Device extracts gas at measuring point SP9 (*1, *2)
14	10	Device extracts gas at measuring point SP10 (*1, *2)
15	11	Device is in “standby” mode (*3)
16	12	Rinsing phase for H2S low sensor**
17	13	Auto calibration
18	14	Resetting all system alarms
19	15	Device is in “standby” mode (*3)

9.2.5 General notes on the external control

Case 1: Standby

Standby mode is activated when the status number exceeds the number of installed measuring points (Example: 4 installed measuring points and active status number is 5). Standby mode follows the following course:

- Rinsing via zero gas port (depends on the configured time).
- Standby mode until a status number is entered that corresponds to an installed measuring point.

Case 2: Active external control for a measuring point

- Zero point: First of all, a zero point calibration is carried out. The run time of the zero point calibration can be set in the **Ext.ctrl** menu.
- Aspirating gas: During the gas aspiration phase, the entire system is rinsed with measuring gas to reach the T90 time of the device.
- Measurement: The measurement is started after the "gas aspiration" phase. The device remains in measurement mode until the signal of the external control is changed. The table below shows the possible status numbers the device can assume.

(*1): At each measuring point change, the device carries out a zero point calibration prior to the measurement at the next measuring point.

(*2): Not only 11 to 15, but all status numbers exceeding the number of installed measuring points will start the "standby" status

(Example: with 4 measuring points, the status numbers 5 to 15 are set to "standby").

(*3): If the status number changes to a "standby number", the sensors are rinsed, all solenoid valves are closed and the gas pump is switched off. If the status number changes to a smaller or equal number of installed measuring points, a zero point calibration will start. Then the measurement at the selected measuring point begins.

Note: The "standby" status can simply be used to only start a zero point calibration, without "standby" and without changing the measuring point.

Example:- Status number=1 (for each time period, recommended max. 1 hour)

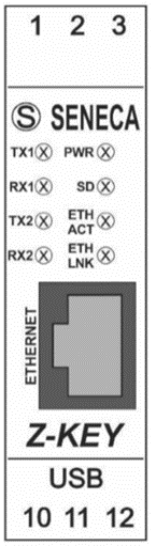
- Status number=15 (for a few seconds, recommended min. 10 seconds).

9.3 TCP to Modbus RTU converter

PREREQUISITE:

- ☑ Ethernet cable
- ☑ Seneca® Software Device Discovery or Software Easy-Setup (included on the SD card)
- ☑ MRU4Win or Software Modbus Poll (for test purposes only)

9.3.1 Different Ethernet states



LED	Status	Meaning
TX1	---	No connection
RX1	---	No connection
TX2 (red)	Blinking	Data reception at port # 2 RS485
RX2 (red)	Blinking	Data reception at port # 2 RS485
PWR (green)	On	Voltage is applied
SD (red)	Blinking	Access to micro SD card
ETH ACT (green)	Blinking	Transmission to Ethernet port
ETH ACT (green)	On	No activities at Ethernet port
ETH LNK (yellow)	On	Ethernet port connected
ETH LNK (yellow)	Off	No Ethernet connection

9.3.2 Setting up the Ethernet

The first step is to connect the TCP/RTU Modbus converter.

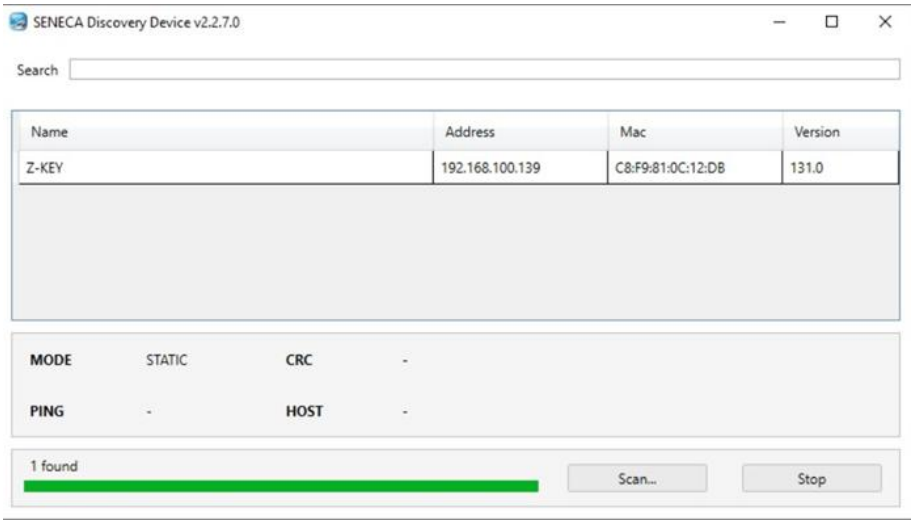
▶ Switch on the device.

▶ Connect the converter module to the network.

The power LED of the converter module lights up. During the next steps, you configure the module with the program "Seneca Discovery Device".

▶ Start the program "**Seneca Discovery Device**".

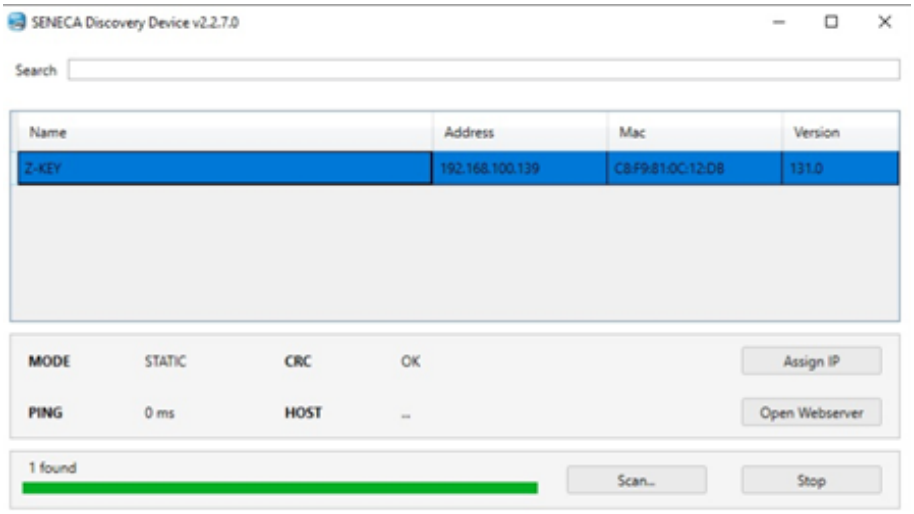
▶ Press the **Scan...** button.



The converter is searched for in the network and specified in the list.

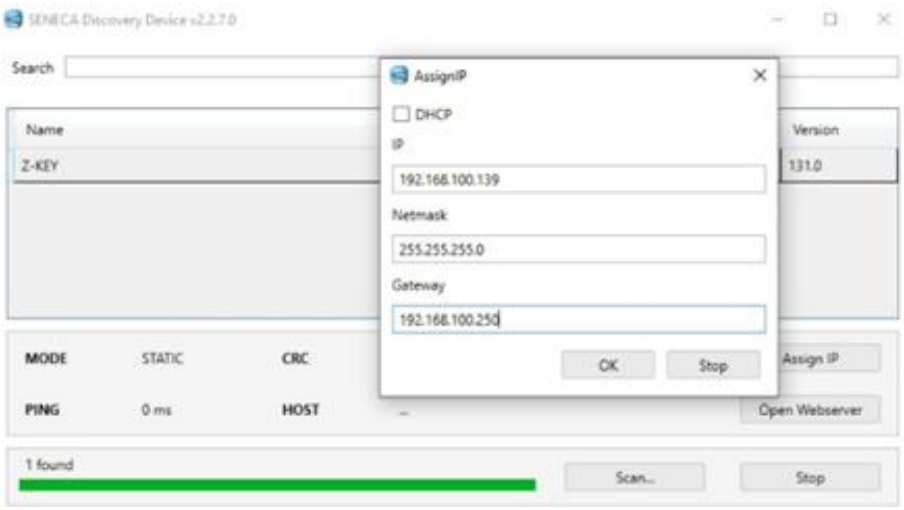
The **Assign IP** button appears after the scan.

▶ Press the **Assign IP** button



An input window appears.

▶ Enter the IP address, sub-mask and the gateway in the input window. Alternatively, you can activate DHCP.

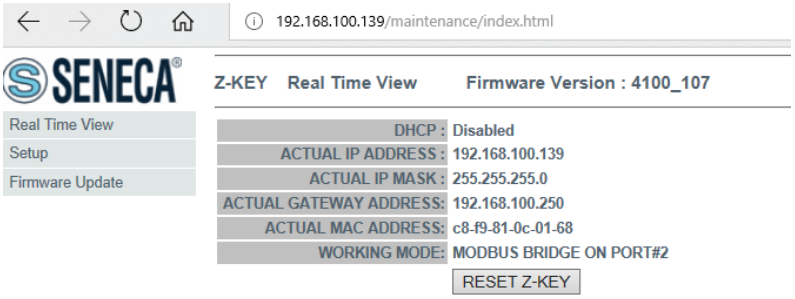


▶ Press the **Open web server** button.

The web server opens.

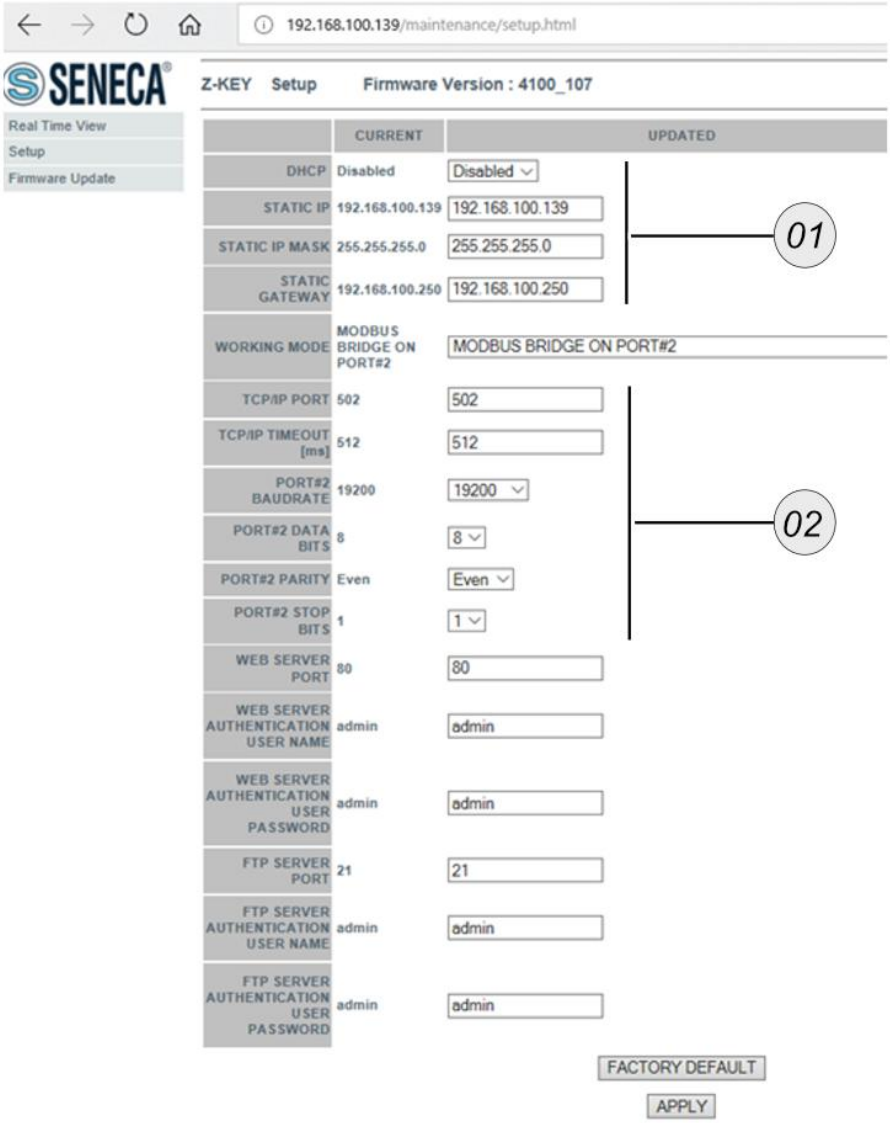
▶ Enter the **user name** “admin” and the **password** “admin”.

An input field appears where you can carry out the settings.



Web server interface in the Start menu

▶ Go to the **Setup** menu on the left hand side of the input mask. Enter both the TCP data but also the Modbus RTU data of your device in this settings field.

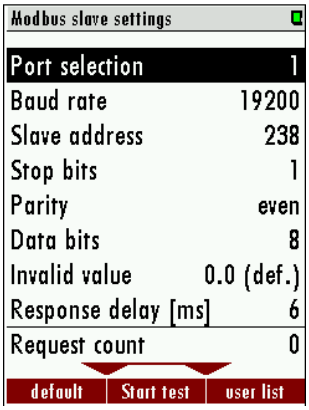


The Setup menu. 01 = Enter TCP data: IP address, sub-mask, gateway; 02 = enter RTU data of device: baud rate, stop bits, parity, data bits.

▶ Adjust the Modbus RTU settings on the device during the next step.

▶ Open the **Modbus slave settings** menu

Path: EXTRAS/GENERAL SETTINGS/MODBUS SLAVE SETTINGS



Modbus slave settings menu

NOTE

The settings of the Modbus slave settings menu must agree with those of the Seneca® software setup.

✔ The settings agree. The converter is set. The counter in the Modbus window counts up.

9.4 Option: Profibus converter

9.4.1 Connecting the device

PREREQUISITE

☑ 9-pin SUB connecting cable

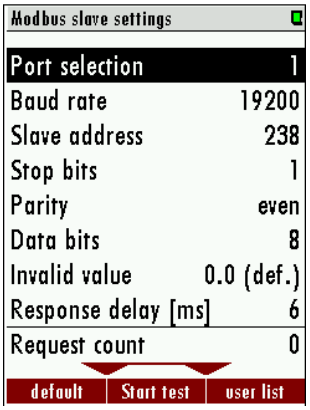
03 = connection A, 04 = 05 = GND (isolated ground), 06 = positive connection, 08 = connection B.

9.4.2 Device settings

The settings are as follows:

▶ Set the parameters under the EXTRAS/GENERAL SETTINGS/MODBUS menu.

ⓘ The query parameters increase in case of a correctly established connection.



Modbus slave settings menu

9.4.3 Special information on the Profibus slave function

- The Profibus slave function requires a configured Modbus Profibus transducer “Seneca HD67561” installed in the measuring device.
- MRU normally sets the Profibus ID to 84.

9.5 Option: Profinet converter

9.5.1 Connecting the device

Profinet converter

#	Description
1	Voltage supply
2	Connection web.config
3	Input signal
4	Connection Profinet

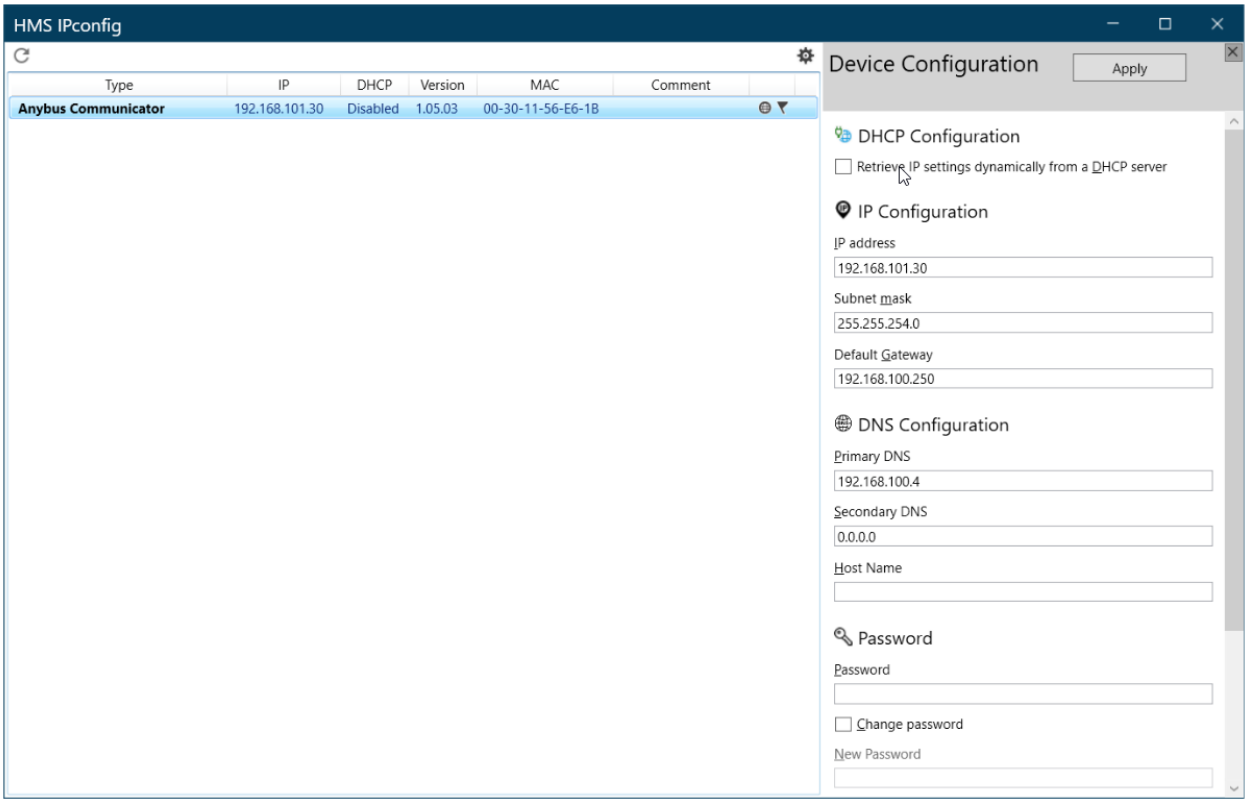
9.5.2 Device settings

PREREQUISITE:

- ☑ Program HMS IPconfig
- ☑ Profinet master simulator

STEPS:

- ▶ Connect the web.config (2) port of the Profinet adapter with your PC.
- ▶ Open the program HMS IP-Config



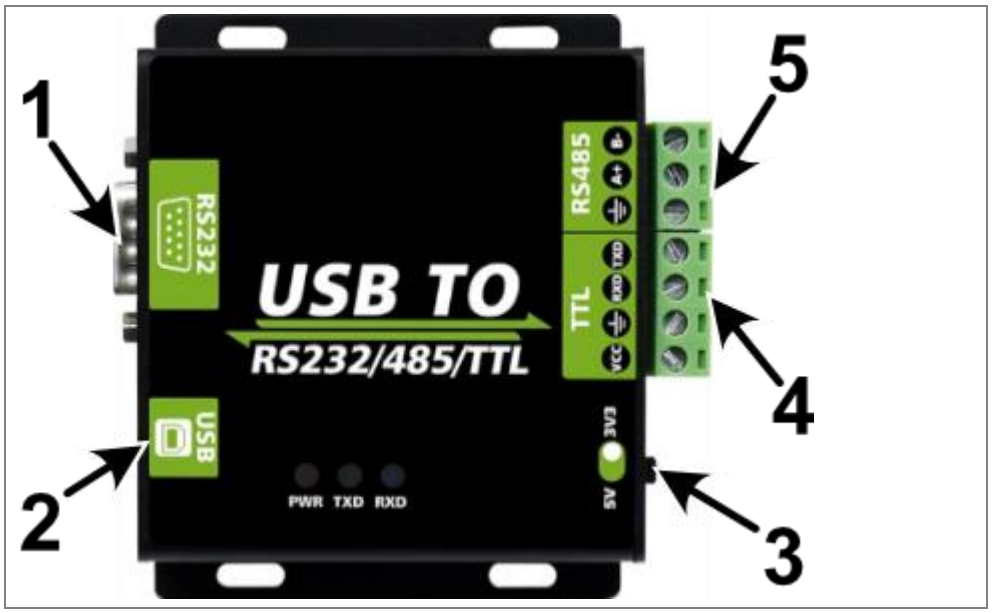
HMS IPconfig

- ▶ Select the **Communicator** as soon as it appears
- ▶ Enter the **DHCP configuration** shown above on the right hand side.
- ▶ To complete, click on **Apply** at the top right.
- ✔ The configuration is complete.

9.6 Option: RS-485 to USB converter

The RS485/USB converter facilitates the communication of the device via the Modbus point with an RS-485 compatible device. The receiver can, for example, be a normal PC.

9.6.1 Connecting and configuring the RS-485 converter



RS485/USB converter

#	Description
1	Connection RS232 (is not required for the device)
2	Connection USB cable
3	Selector switch voltage (is not required for the device) By default, the SWG devices always use a voltage of 3.3V. The switch should therefore always be set as shown in the picture.
4	TTL connection (is not required for the device)
5	RS485 connection

▶ Optional: Install USB drivers on the computer. The driver can be downloaded from the home page: https://www.waveshare.com/wiki/USB_TO_RS232/485/TTL#Resources.

Here you can also find the manufacturer's user manual.

▶ Connect the RS-485 converter to the PC with a USB cable.

The RS-485 converter is recognised by the PC. Connect the RS-485 converter with the device. The connection between the converter and the Modbus input of your device is established.

▶ Open the Extras menu in the device: EXTRAS/GENERAL SETTINGS

▶ Open the **Modbus** submenu (F3 key).

▶ Make the settings in the menu. This includes: Baud rate, parity, stop bits.

✔ The device is connected with the RS-485 converter. Data can be viewed and logged at the PC with a suitable software. If you do not own any software you can purchase the software **MRU4Win**.

9.7 Option: MRU4Win

MRU4Win is a log software. This software allows you to log and store the device data. The software can recognise devices with TCP protocol and RS-485 Modbus protocol (RTU).

9.7.1 Starting and adjusting MRU4Win

PREREQUISITE:

☑ The device must be connected with a suitable converter and able to communicate.

After the installation, the software is started and adjusted as follows.

▶ Open the software on your PC.

▶ Open “Create Modbus Device”.

An input window appears where you can select the respective protocol.

▶ For RS-485: Select Modbus RTU. Make the same settings here as in the device. Baud rate, parity, etc. must agree.

▶ For TCP: Select TCP. Make the same settings here as in the device. IP address, submask, etc. must agree.

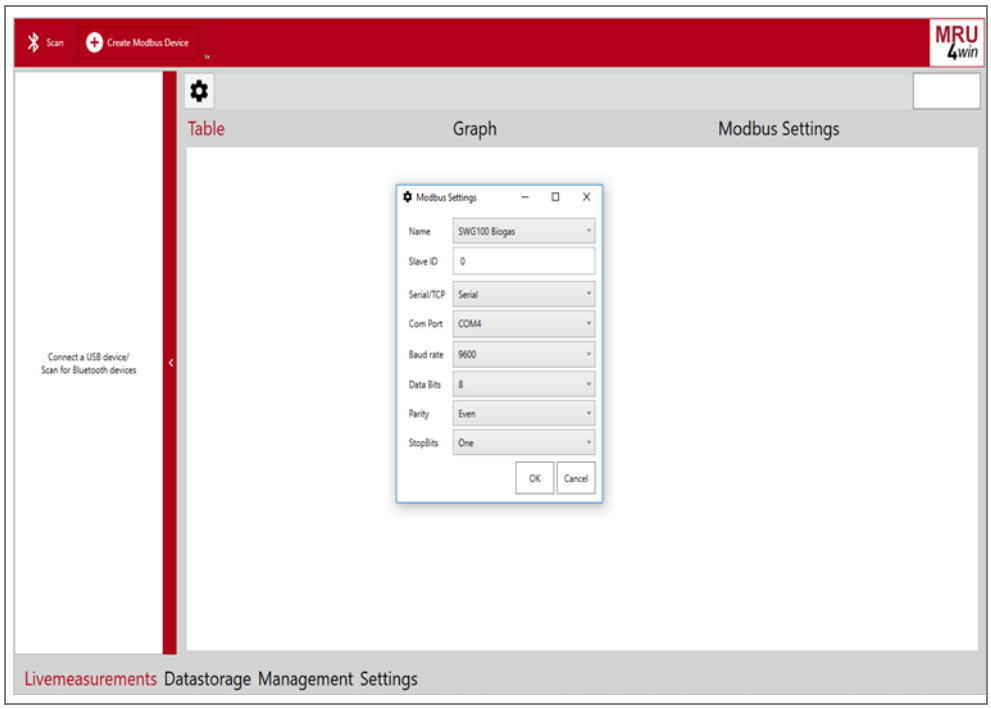


Fig. 2: MRU4Win interface.

ⓘ The connected device is depicted on the left hand side.

▶ Press the Connect symbol.

✔ The live values of the device become visible on the PC. The values can be displayed as curve or as number. It is possible to log and store these.

10 Maintenance of the MRU measuring device

10.1 General notes

The reliable function and the measuring quality of the device can only be guaranteed by means of regular inspection and maintenance.

Apart from the regular routine checks by the operating company, MRU recommends a six-monthly maintenance of the device by the **MRU Service** to maintain the reliable function and high measuring quality.

10.2 Preparation and notes on maintenance

For maintenance work, the main fuse in the device must be switched off. Even with switched off main fuse, dangerous electrical voltages are present at the primary fuse side.

If required, the device must be separated from the electrical supply and secured against being switched on again.

Dangerous gases can escape during maintenance work at the gas system. The gas supply to the device must be switched off.

All nationally applicable directives at the place of installation must be complied when performing electrical work and work on the gas system.

10.3 Regular maintenance work by the operating company

All inspection and maintenance work heavily depends on the individual conditions of use and operating conditions on site. The specified intervals should therefore be regarded as guide values.

Inspection	Recommended interval	Measure
Dirt or deposits in the device	Every six months	Remove dirt, prevent further dirt from penetrating.
Visually check gas lines for leak tightness and correct fit	Every six months	Replace gas lines if necessary
Inspect condition of gas filters and of critical parts	Every six months	Replace if necessary

10.4 Spare part kits

You can order the following spare part kits from your **MRU Service**:

- #15326 Maintenance kit SWG 19 – for devices with cuvettes for analysing CEM or synthetic gases
- #15327 Maintenance kit SWG 19 EC – exclusively for devices with EC sensors

10.5 Condensate monitoring

If your SWG 19 indicates a condensate alarm, you can empty the condensate monitoring reservoir to switch off the alarm.

The following chapter shows how you can

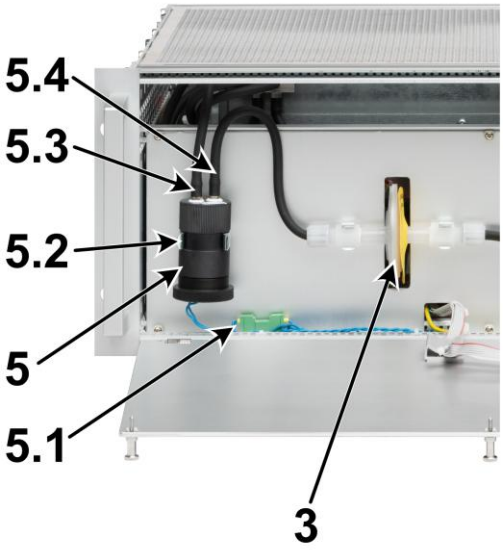
- dismantle
- empty
- or re-install the condensate monitoring.

CAUTION

Liquid in the device gas circuit

Damage to the measuring technology or falsified measuring results.

➢ Empty the condensate monitoring only after you have detected and remedied the cause.



Condensate monitoring in the device

#	Description
3	Water stop filter
5	Condensate monitoring (complete)
5.1	Electrical connection condensate monitoring
5.2	Clip condensate monitoring
5.3	Intake hose condensate monitoring
5.4	Drain hose condensate monitoring

10.5.1 Dismantling the condensate monitoring

STEPS:

▶ Disconnect the **electrical connection (5.1)** of the condensate monitoring.

▶ Remove the condensate monitoring from the **clip (5.2**).

▶ Disconnect the hoses of the **intake (5.3)** and **drain (5.4)** from the condensate monitoring.

✔ You have dismantled the condensate monitoring.

10.5.2 Emptying the condensate monitoring

STEPS:

Emptying the condensate monitoring

#	Description
5.6	Upper part of the condensate monitoring
5.7	Bottom part of the condensate monitoring

▶ Before dismantling it, hold the condensate monitoring above a suitable collecting vessel away from the device.

M009

⚠ CAUTION

Caustic condensate

Chemical burns to hands, damage to the measuring device

- ➢ Wear suitable safety gloves.
- ➢ Collect the condensate in a suitable vessel.
- ➢ Empty the condensate away from the device.

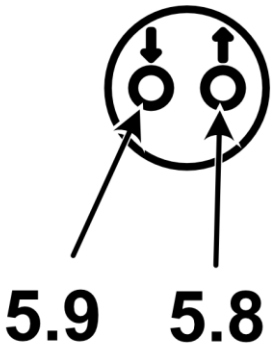
▶ Unscrew the **bottom part (5.6)** of the dismantled condensate monitoring from the **upper part (5.7)**.

▶ Empty the liquid and dry the interior

▶ Screw the **bottom part (5.6)** back into the **upper part (5.7)**.

✔ You have emptied the condensate monitoring.

10.5.3 Installing the condensate monitoring



Intake and drain of the condensate monitoring (top view)

#	Description
5.8	Drain condensate monitoring
5.9	Intake condensate monitoring

STEPS:

▶ Connect the **intake hose 5.3** to the **condensate monitoring intake 5.9**.

▶ Connect the **drain hose 5.4** (connection to the water stop filter (3)) to the **condensate monitoring drain 5.8**.

▶ Fasten the **condensate monitoring (5)** with the **clip (5.2)**.

▶ Re-establish the **electrical connection (5.1)** of the condensate monitoring.

✔ You have emptied and re-installed the condensate monitoring.

10.6 Device password

If necessary, all functions and menus that prevent a normal measuring function of the device when changed can be protected against unauthorised access by the administrator PIN code.

If unauthorised persons are able to access the device, we urgently recommend you activate the administrator PIN code.

ⓘ The PIN code is: **F1 - F1 - F3 - F2 – arrow up – arrow down**.

ⓘ It is possible to enable and disable the PIN code query in the EXTRAS – SETTINGS menu. Disabling requires a correct PIN code entry.

ⓘ If no keys are activated for 10 minutes, administrator mode is terminated.

10.7 Updating firmware / software

In this section you learn how to update the software of devices without operating system (firmware):

The following applies in general:

- You can update the firmware of the control panel.
- You can update the firmware of the individual modules.

ⓘ Updates have the program ending: "**.fwb"**.

10.7.1 Carrying out an update for the control panel of the main device

▶ Copy the **firmware** to the main directory (root directory) of an SD card.

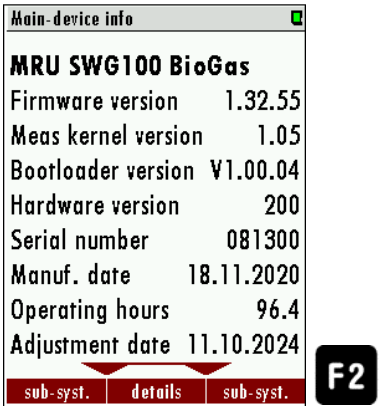
▶ Insert the **SD card** into the **SD card reader** at the rear of the device control panel.

The device emits an acoustic signal indicating that it has recognised the SD card.

▶ Open the EXTRAS / DEVICE INFORMATION menu.

The DEVICE INFORMATION window appears.

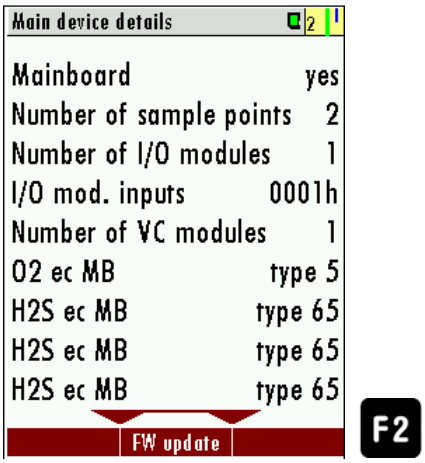
▶ Press **F2** = DETAILS.



Information main device menu

The DETAILS MAIN DEVICE menu appears.

▶ Press **F2** = UPDATE.



Details main device menu

The update starts.

▶ Wait until the device restarts.

✔ You have successfully carried out the update.

10.7.2 Carrying out an update for the different modules

ⓘ Following a firmware update of the control panel, the self-test may detect modules that are using an obsolete firmware and request you to update one or several modules.

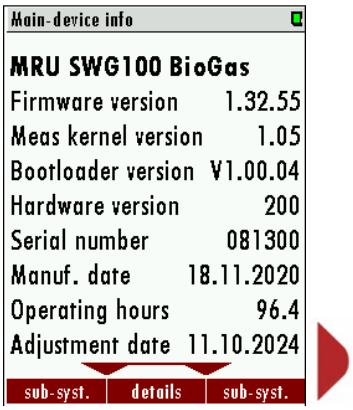
▶ Copy the **firmware** to the main directory (root directory) of an SD card.

▶ Insert the **SD card** into the **SD card reader** at the rear of the device control panel.

The device emits an acoustic signal indicating that it has recognised the SD card.

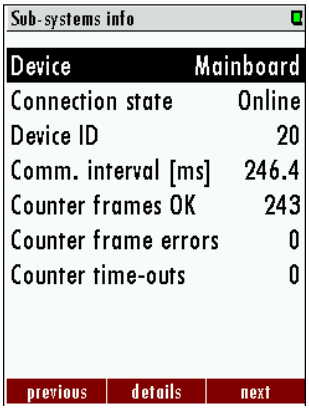
Open the EXTRAS / DEVICE INFORMATION menu.

▶ Press the **left / right arrow key**.



Information main device menu

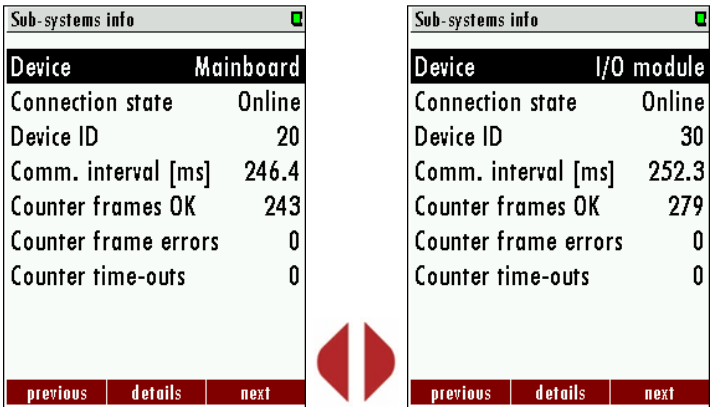
The INFORMATION SUB- SYSTEM menu appears.



Information sub-systems menu

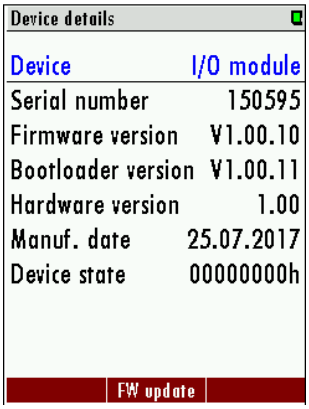
▶ Select the menu item DEVICE.

▶ Change to the respective menu with the **left / right arrow key**.



Changing between the modules

▶ Press **F2** F2 to change to **Details**.



Details on the device

▶ Press **F2** again F2.

The update starts.

▶ Wait until the device restarts.

✔ You have successfully carried out the update.

10.7.3 Manual adjustment of the sensors

In this chapter you learn how you can manually adjust the sensors of your device.

For this, a test gas cylinder is connected to the **calibration gas inlet**.

In contrast to the auto calibration, this procedure is used for adjustment during maintenance or to adjust the measuring cycle.

☛ The auto calibration can be found here: page 72 - Carrying out auto calibration.

⚠ WARNING

High pressure

The adjustment gas cylinder is under high pressure. Serious injuries can be the result if the pressure is discharged in an unregulated manner.

- ➢ Set the pressure regulator to a maximum of 500 hPa.
- ➢ Connect the adjustment cylinder to the device before you open the cylinder.
- ➢ The test gas cylinder must exclusively be connected via the **calibration gas inlet**

NOTE

The calibration gas inlet is equipped with an internally installed pressure regulator that protects the device against overpressure from the adjustment gas cylinder.

STEPS:

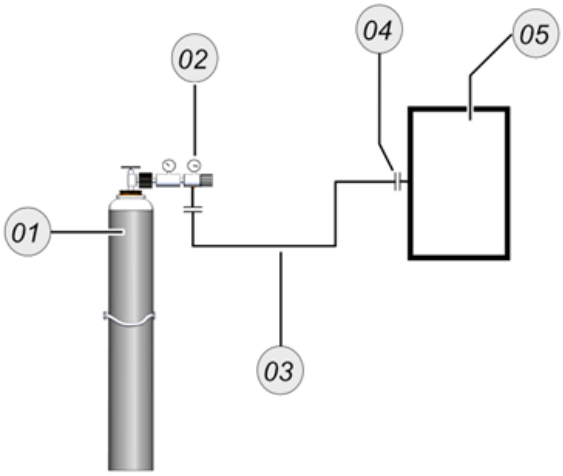
▶ Open the menu: EXTRAS / ADJUSTMENT MENU.

▶ Select the menu item GAS SELECTION.

Gas selection

▶ Use the **left / right arrow key** to set the ***gas selection*** to ***calibration gas.***

Connect the adjustment gas cylinder to the calibration gas inlet



Connection adjustment gas cylinder

#	Description
1	Adjustment gas cylinder
2	Pressure regulator (max. 500 hPa)
3	DN4/6 mm PTFE hose
4	Calibration gas inlet ⓘ The gas reducing unit must be fitted.  *Gas reducing unit*
5	Device

▶ Screw the **gas reducing unit** to the **calibration gas inlet** if this has not yet been done.

▶ Connect the calibration cylinder with a **PTFE DN4/6 mm hose** directly to the **gas reducing unit** that is mounted at the **calibration gas inlet**.

✔ The adjustment cylinder is connected. In adjustment mode, the device now draws the gas from the calibration gas inlet.

10.7.4 One-point adjustment of the electrochemical sensors

WARNING

Correctly connecting the adjustment cylinder

Adjustment cylinders are under high pressure and can contain poisonous gases. This can result in death.

➢ Only trained personnel must connect adjustment cylinders.

Here you will learn how to adjust an electrochemical sensor. There are two ways to adjust the sensor: by setpoint and by nominal factor. Both procedures are described below.

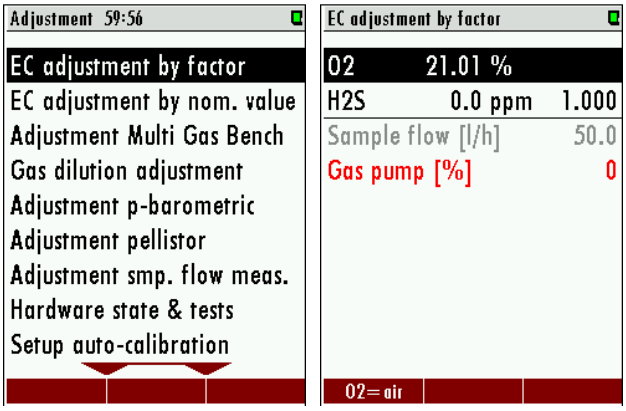
Adjustment by factor has the advantage of allowing for quick calibration without having to enter the setpoint for an adjustment gas cylinder, and is often used when the same gas cylinders are always used.

Adjustment using a setpoint has the advantage that the gas concentration is saved and is visible in the log data for the next service technician or for customer service.

PREREQUISITE:

- ☑ Adjustment cylinder with minimum 70 % of the upper measuring range
- ☑ Adjustment installation must be set up

STEPS: CALIBRATION BY FACTOR



▶ Open the adjustment menu: EXTRAS / ADJUSTMENT MENU.

▶ Open the menu item EC ADJUSTMENT BY FACTOR.

The menu appears.

▶ Connect the respective adjustment cylinder to the calibration installation.

▶ Open the adjustment cylinder.

The actual value changes in the adjustment window.

▶ Wait until the gas value no longer changes.

▶ Using the **left / right arrow key** ◀▶, change the factor until the setpoint of the gas cylinder is reached.

The sensor is adjusted to the setpoint.

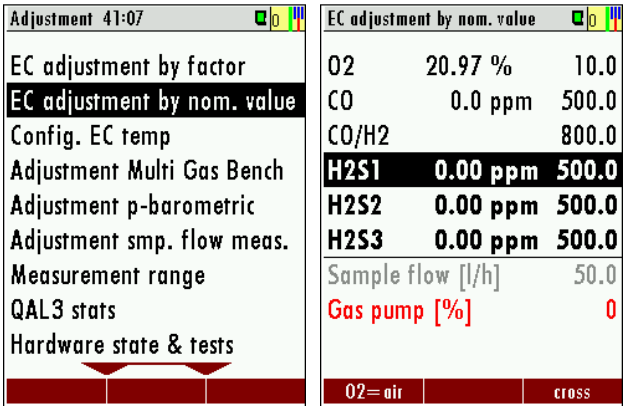
▶ Quit the menu.

▶ Confirm with **save**.

✔ The sensor is adjusted.

Alternatively, you can adjust using a nominal value:

STEPS: CALIBRATION BY NOM VALUE



▶ Open the adjustment menu: EXTRAS / ADJUSTMENT MENU.

▶ Open the menu item EC ADJUSTMENT BY NOM. VALUE.

The menu appears.

▶ Connect the respective adjustment cylinder to the calibration installation.

▶ Open the adjustment cylinder.

The actual value changes in the adjustment window.

▶ Wait until the gas value no longer changes.

▶ Using the **left / right arrow key** ◀▶, change the factor until the setpoint of the gas cylinder is reached.

The sensor is adjusted to the setpoint.

▶ Quit the menu.

▶ Confirm with **save**.

✔ The sensor is adjusted.

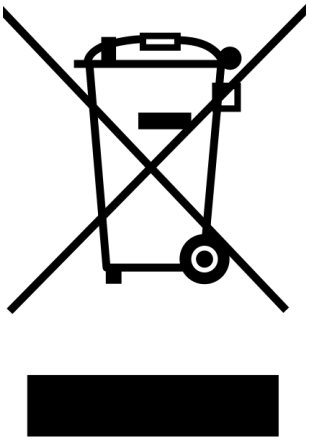
11 Decommissioning

Irrespective of the device version, the following steps must be taken before decommissioning:

- ▶ Evacuate all remaining analysis gases from the device.
- ▶ Rinse the device with nitrogen or ambient air.
- ▶ Dispose of the device in a professional manner. Observe the legal conditions at the place of disposal of your device.

  ⓘ Information on the disposal of your device can be obtained from your MRU Service Centre. Parts containing hazardous substances, such as electrochemical sensors, batteries or rechargeable batteries can be sent back to MRU. The return shipment must be free of charge for MRU.

The appliance must not be disposed of with household waste.



You can find the WEEE registration number in the imprint under www.mru.eu.

12 Technical data

12.1 General technical data

Specification	Value
Operating temperature (without antifreeze heating)	+5°C ... +45°C
Operating temperature (with optional antifreeze heating)	-10°C ... +45°C
Rel. atmospheric humidity during operation, non-condensing	<95%
Storage temperature	-20°C ... +50°C
Type of protection	IP20
Installation conditions	Mounting inside the analysis cabinet or under equivalent conditions
Internal rechargeable battery, buffer time for sensor bias	under 35°C 1 year
Power supply	100 - 240 V, 60 W
Weight, typically with sensors	10 kg
Dimensions without handles and connections	172 x 482 x 362 mm (HxWxD) / 6.77 x 18.98 x 14.25 in (HxWxD)
Dimensions with handles and connections	172 x 482 x 413 mm (HxWxD) / 6.77 x 18.98 x 16.26 in (HxWxD)
Housing material	Aluminium
System integration	Gas extraction in bypass operation compulsory The same pressure must prevail during zero point calibration and measurement to ensure constant humidity.
permissible inlet pressure at the gas inlet	

Negative pressure	0 hPa
Overpressure	30 hPa
Typical gas flow rate	50 l/h

12.2 Interfaces

Parameters	Specification
Display type	3.5*TFT*
Number of simultaneously displayed measured values	6
Keyboard with number of keys	12
Electrical inputs / outputs	
Serial interface	RS485
Protocol	Modbus RTU
Type of analogue output (optional)	4 ... 20 mA
Number of output channels per I/O module (optional)	4
Type of analogue input (optional)	4 ... 20 mA
Number of input channels per I/O module (optional)	4
Number of alarm outputs per I/O module (via relay)	2
maximum possible number of I/O modules	10

System alarm output	Relay contact

12.3 Gas inlets and outlets

Number of measuring points to be monitored in parallel	Implementing the adaptation by the end customer
Number of measuring gas inlets (serial switchover)	1
Housing screw connection measuring gas inlet	G1/8
Gas outlet	G1/8
Sensor rinsing EC sensors	via 2/3-way solenoid valve

12.4 Measuring technology

Parameters	**Specification**
Electrochemical sensor	**O2 Long Life**
Measuring range	0 ... 21%
Resolution	0.01%
Accuracy abs.	± 0.2 Vol.%
Response time T90	< 20 s
Years of expected lifespan exposed to air	2
Electrochemical sensor	**H2S very low** **H2 immune**
Nominal measuring range when using the dilution	0 - 50 ppm 0 - 2500 ppm
Overload range when using the dilution	250 ppm 12500 ppm
Resolution	1 ppm
Accuracy abs. /of measured value when using the dilution	± 2 ppm / 5% (0... 50 ppm) 10% (≥ 50 ppm) ± 5 ppm / 10%

Response time T90	40 s
Years of expected lifespan exposed to air	2
No cross sensitivity to	100%H2, 100% O2, 100% CO, 100% CO2, 100% N2O
Electrochemical sensor	**H2S** **H2 immune**
Nominal measuring range	0 - 1000 ppm
Overload range	2000 ppm
Resolution	1 ppm
Accuracy abs. /of measured value	± 5 ppm / 5% (0... 500 ppm) ± 15% (≥ 500 ppm)
Response time T90	< 40 s
Electrochemical sensor	**CO**
Nominal measuring range	0 - 4000 ppm
Overload range	< 10000 ppm
Resolution	1 ppm
Accuracy abs. /of measured value	± 10 ppm / 5%
Response time T90	< 30 s
Years of expected lifespan exposed to air	2
Electrochemical sensor	**H2**
Nominal measuring range	0 - 1000 ppm
Overload range	< 2000 ppm
Resolution	1 ppm
Accuracy abs. /of measured value	± 10 ppm / 5% (0... 1000 ppm) 10% (> 1000 ppm)
Response time T90	< 110 s

Years of expected lifespan exposed to air	2
Electrochemical sensor	**H2**
Nominal measuring range	0 - 1 Vol.%
Overload range	< 2 Vol.%
Resolution	0.01 Vol.%
Accuracy abs. /of measured value	0.02 Vol.% / 5%
Response time T90	< 90 s
Years of expected lifespan exposed to air	2
TCD Thermal conductivity detector	**H2**
Nominal measuring range	0 – 50 Vol.%
Resolution	0.01%
Accuracy abs. /of measured value Typically Customised	 ± 0.5 / 5% ± 0.2 / 2%
Response time T90	< 15 s

Gas	Nominal measuring range	Resolution	Accuracy	T90
CO CO2 SO2	1.000...100.000 ppm 50 Vol% 1.000...10.000 ppm	1 ppm 0.01 Vol% 1 ppm	±10 ppm / 3% ±0.1 Vol% / 3% ±10 ppm / 3%	40s
CO CO2 CH4	1.000...100.000 ppm 50 Vol% 1.000...40.000 ppm	1 ppm 0.01 Vol% 1 ppm	±10 ppm / 3% ±0.1 Vol% / 3% ±10 ppm / 3%	40s
CO CO2 C3H8	1.000...100.000 ppm 50 Vol% 1.000...20.000 ppm	1 ppm 0.01 Vol% 1 ppm	±10 ppm / 3% ±0.1 Vol% / 3% ±10 ppm / 3%	40s

NO NO2 SO2 CO CO2 CH4	200...4.000 ppm 150...1.000 ppm 150...4.000 ppm 175...10.000 ppm 0-50 Vol% 500 ... 10000 ppm	0,1 ppm 0,1 ppm 0,1 ppm 0,1 ppm 0.01 Vol% 0,1 ppm	±2 ppm / 3% ±2 ppm / 3% ±2 ppm / 3% ±2 ppm / 3% ±0.1 Vol% / 3% ±10 ppm / 3%	160s
NO NO2 SO2 CO CO2 C3H8	200...4.000 ppm 150...1.000 ppm 150...4.000 ppm 175...10.000 ppm 50 Vol% 200 ... 5,000 ppm	1 ppm 1 ppm 1 ppm 1 ppm 0.01 Vol% 1 ppm	±2 ppm / 3% ±2 ppm / 3% ±2 ppm / 3% ±2 ppm / 3% ±0.1 Vol% / 3% ±2 ppm / 3%	160s
CO CO2 CH4	100% 100% 100%	0.01% 0.01% 0.01%	±0.3 Vol% / 2% ±0.3 Vol% / 2% ±0.3 Vol% / 2%	40s

Parameters	**Specification**
T90 time	160s

Gas	**Nominal measuring range**	**Resolution**	**Repeatability**	**8h drift**
NO	0 - 200...4.000 ppm	0.1 ppm	2 ppm / 1% rdg.	2 ppm / 1% rdg.
NO2	0 - 150.... 500 ppm	0.1 ppm	1 ppm / 1% rdg.	1 ppm / 1% rdg.
SO2	0 - 150...4.000 ppm	0.1 ppm	2 ppm / 1% rdg.	2 ppm / 1% rdg.
CO2	0 - 50 Vol%	0.01 Vol%	0.2 Vol% / 1% rdg.	0.2 Vol% / 1% rdg.
CO	0 - 175...10.000 ppm	0.1 ppm	2 ppm / 1% rdg.	2 ppm/ 1% rdg.
N2O	0 - 100...500 ppm	0.1 ppm	2 ppm / 1% rdg.	2 ppm/ 1% rdg.
CH4	0 - 500...10.000 ppm	0.1 ppm	10 ppm/ 1% rdg	10 ppm/ 1% rdg.
C3H8	0 - 200...5.000 ppm	0.1 ppm	2 ppm / 1% rdg.	2 ppm/ 1% rdg.

Parameters	**Specification**
Linearity	1% measuring range
T90 time	160s

13 Declaration of Conformity

EU-Konformitätserklärung
Declaration of conformity

CE

MRU Messgeräte für Rauchgase und Umweltschutz GmbH

Fuchshalde 4 / 8 / 12
74172 Neckarsulm-Obereisesheim
Deutschland / *Germany*
Tel.: +49 (0) 7132 - 99 62 0
Fax: +49 (0) 7132 - 99 62 20
E-Mail / *mail:* info@mru.de
Internet / *site:* www.mru.eu

Bevollmächtigte Person, für die Zusammenstellung der technischen Unterlagen
Person authorized to compile the technical documents

Name / *name:*	Dr. Dietmar Doll
Funktion / *function:*	Geschäftsführer / *Managing Director*
Firmenname / *company:*	Messgeräte für Rauchgase und Umweltschutz GmbH
Straße /Ort // *street / city:*	Fuchshalde 4 / 8/ 12, 74172 Neckarsulm
Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung /*designation:*	Gasanalysator / *Gas analyser*
Produktname / *name:*	SWG 19
Funktion / *function:*	Gasanalyse / *Gasanalysis*

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)
- DIN EN 60204-1
- DIN EN 61010-1

Neckarsulm, 09.09.2025

D. Doll

Dr. Dietmar Doll (Geschäftsführer / *Managing Director)*

14 Photo credits

- M002: Von ISO - ISO 7010 - M002Eigenes Werk, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=27519901
- M004: Von ISO - ISO 7010 M004Eigenes Werk, Gemeinfrei, https://commons.wikimedia.org/w/index.php?curid=26466677
- M008: Von ISO - ISO 7010 M008Eigenes Werk, Gemeinfrei, https://commons.wikimedia.org/w/index.php?curid=26466756
- By ISO - ISO 7010 - M009Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=26466778
- W028: Von MaxxL - Eigenes Werk Technische Regeln für Arbeitsstätten - Sicherheits- und Gesundheits-schutzkennzeichnung - Quelle : ASR-A1-3.pdf; Gemeinfrei; https://upload.wikimedia.org/wikipedia/commons/3/39/ISO_7010_W028.svg
- W071: Von Clemenspool – W071 - Eigenes Werk, CC0, https://commons.wikimedia.org/w/index.php?curid=122497941
- W072: Von Clemenspool – W072Eigenes Werk, CC0, https://commons.wikimedia.org/w/index.php?curid=122678825
- W001: Von Maxxl2 - Eigenes Werk Technische Regeln für Arbeitsstätten - Sicherheits- und Gesundheits-schutzkennzeichnung - Quelle : ASR-A1-3.pdf, Gemeinfrei, https://commons.wikimedia.org/w/index.php?curid=26501331
- W012: Von MaxxL, Public domain, via Wikimedia Commons
- Quelle: ASR-A1-3.pdf https://commons.wikimedia.org/wiki/File:ISO_7010_W012.svg#/media/File:ISO_7010_W012.svg
- W023: Von MaxxL Eigenes Werk Technische Regeln für Arbeits-stätten - Sicherheits- und Gesundheitsschutzkennzeichnung
- Quelle: ASR-A1-3.pdf, Gemeinfrei; https://commons.wikimedia.org/wiki/File:ISO_7010_W023.svg#/media/File:ISO_7010_W023.svg
- WEEE: Quelle: WEEE.svg, Gemeinfrei; https://de.m.wikipedia.org/wiki/Datei:WEEE_2.svg

15 Customer service, service centres

MRU customer service can be contacted by telephone, fax and email:

Tel.: +49 (0) 7132 - 99 62 61
Fax: +49 (0) 7132 - 99 62 60
service@mru.de

To find your nearest **MRU service centre** for your **MRU products**, please visit our website:

https://www.mru.eu/service/regionale-servicestellen/

16 Appendix

wiring diagram SWG 19

the wiring diagram is for all versions

table of content	
page	description
1	overview
2	main PCB
3	RS485 bus
4	external connections X0 - X1 - X2
5	external connections internal I / O module X3 - X4
6	external connections external I / O - module
7	external connections converter modules

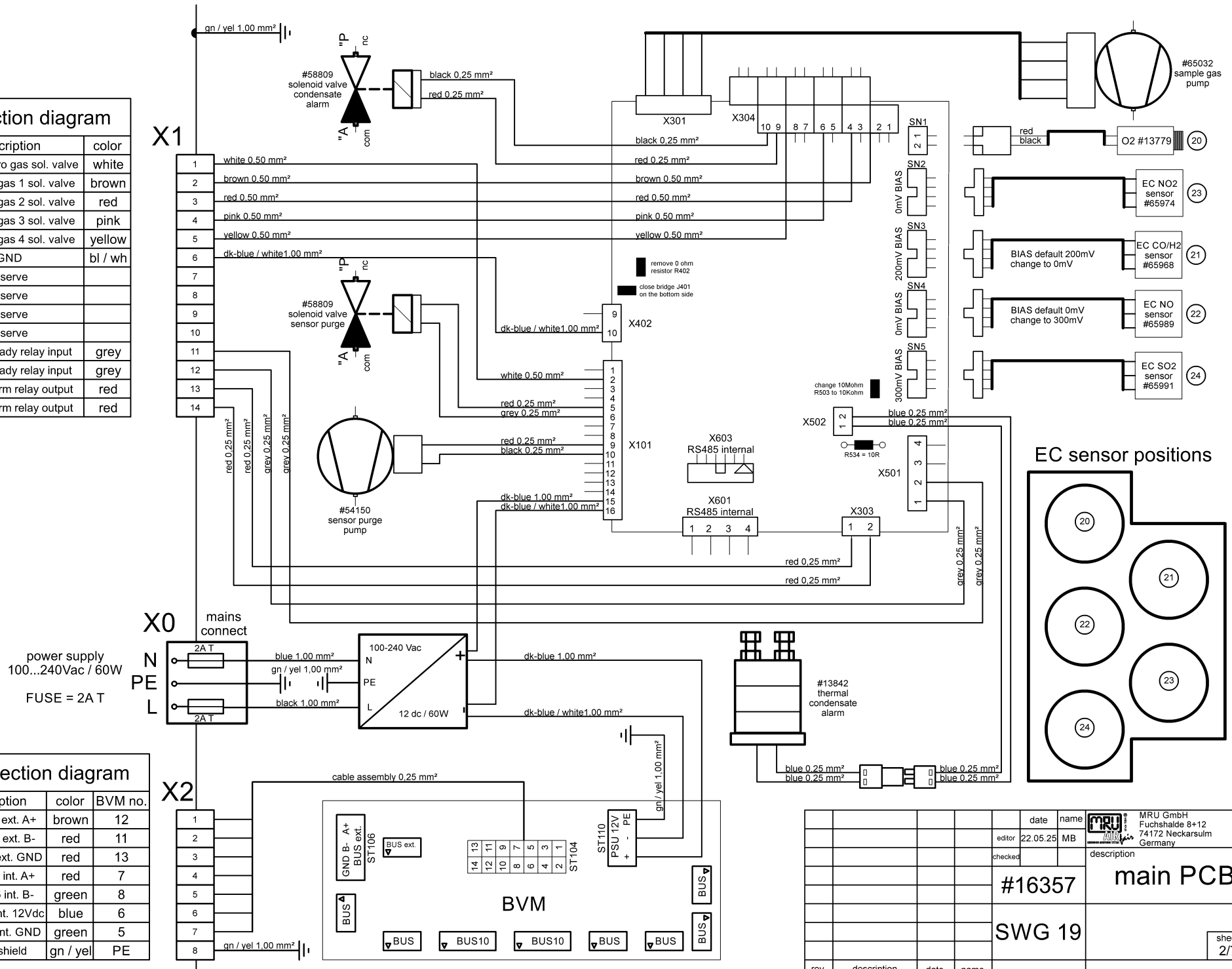
date	name	revision		MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	overview	#16357 SWG 19		date	name
							editor	22.05.2025	M. Brandt
			file name: VPL_wiring SWG 19				checked		

X1 connection diagram

X1 no.	description	color
1	sample / zero gas sol. valve	white
2	calibration gas 1 sol. valve	brown
3	calibration gas 2 sol. valve	red
4	calibration gas 3 sol. valve	pink
5	calibration gas 4 sol. valve	yellow
6	GND	bl / wh
7	reserve	
8	reserve	
9	reserve	
10	reserve	
11	external ready relay input	grey
12	external ready relay input	grey
13	system alarm relay output	red
14	system alarm relay output	red

X2 connection diagram

X2 no.	description	color	BVM no.
1	RS485 ext. A+	brown	12
2	RS485 ext. B-	red	11
3	RS485 ext. GND	red	13
4	RS485 int. A+	red	7
5	RS485 int. B-	green	8
6	RS485 int. 12Vdc	blue	6
7	RS485 int. GND	green	5
8	PE / shield	gn / yel	PE



rev.	description	date	name
		editor 22.05.25	MB
		checked	

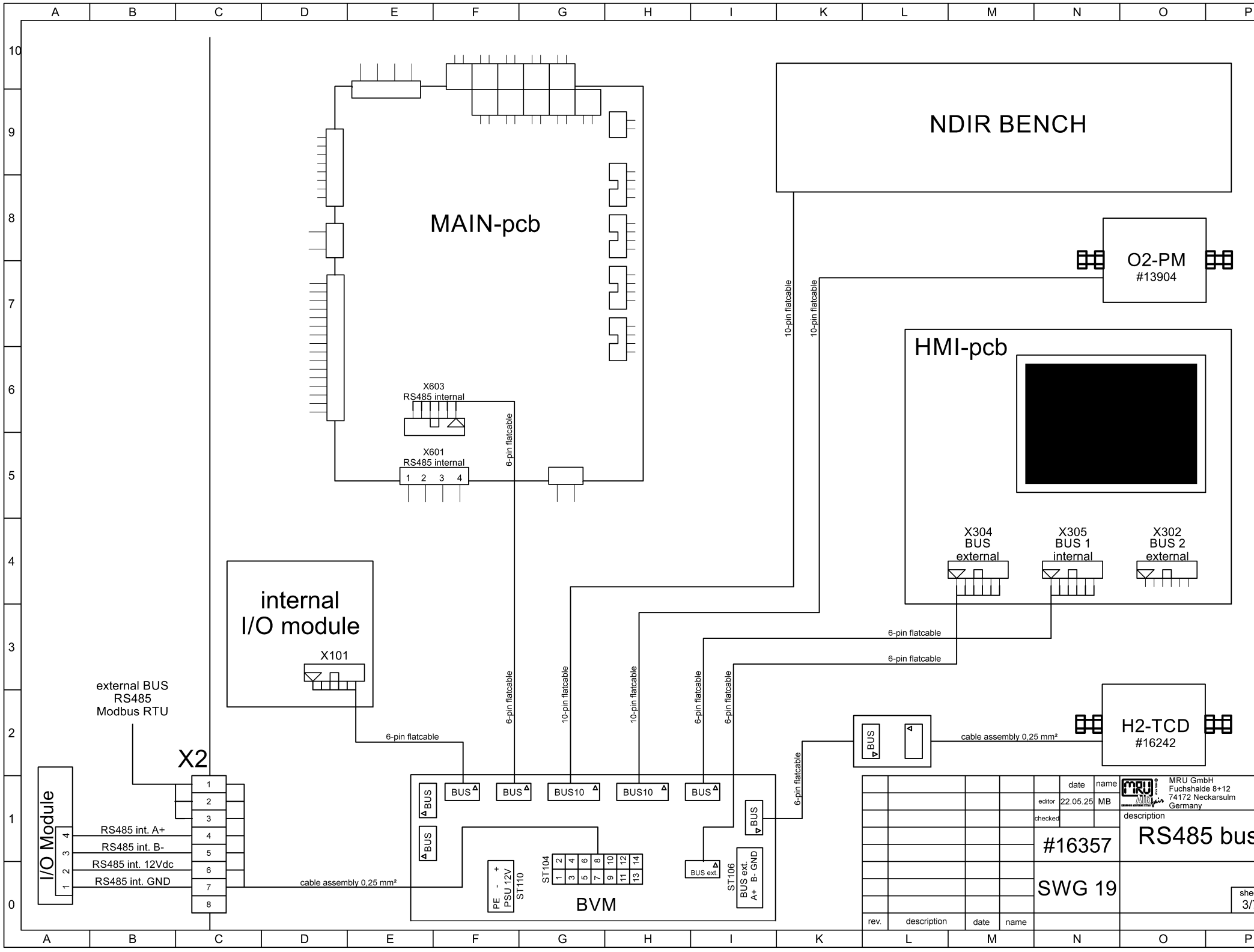
MRU GmbH
Fuchshalde 8+12
74172 Neckarsulm
Germany

description: main PCB

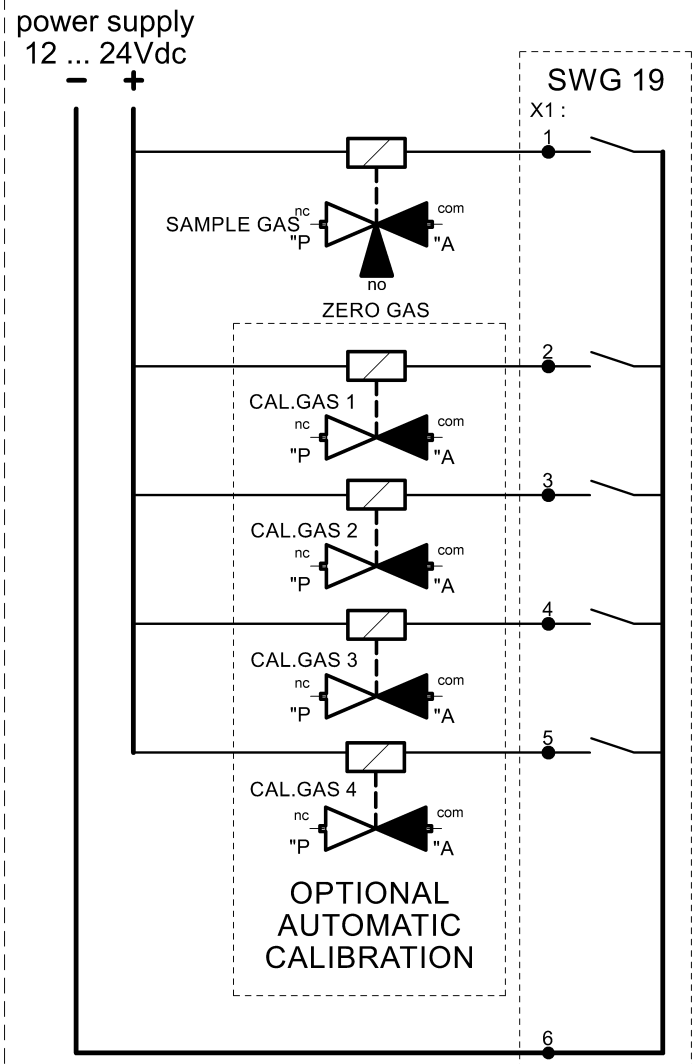
#16357

SWG 19

sheet 2/


NDIR BENCH
MAIN-pcb
X603
RS485 internal
X601
RS485 internal
1 2 3 4
6-pin flatcable
O2-PM
#13904
10-pin flatcable
10-pin flatcable
HMI-pcb
X304
BUS
external
X305
BUS 1
internal
X302
BUS 2
external
6-pin flatcable
6-pin flatcable
internal
I/O module
X101
6-pin flatcable
6-pin flatcable
10-pin flatcable
10-pin flatcable
6-pin flatcable
6-pin flatcable
external BUS
RS485
Modbus RTU
X2
BUS
BUS
BUS10
BUS10
BUS
BUS
BUS
6-pin flatcable
BUS
cable assembly 0,25 mm²
H2-TCD
#16242
I/O Module
1 2 3 4
RS485 int. A+
RS485 int. B-
RS485 int. 12Vdc
RS485 int. GND
1
2
3
4
5
6
7
8
cable assembly 0,25 mm²
PE - +
PSU 12V
ST110
ST104
1 2 4 6 8 10 12 14
3 5 7 9 11 13
BVM
BUS ext.
ST106
BUS ext.
A+ B- GND
date
name
editor
22.05.25
MB
checked
MRU GmbH
Fuchshalde 8+12
74172 Neckarsulm
Germany
description
RS485 bus
#16357
SWG 19
rev.
description
date
name

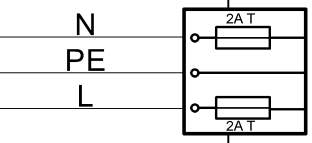
example diagram of solenoid valve wiring



power requirements

- power supply 100...240Vac / 150W
- fuse = 2A T
- single phase power supply
- min. wire diameter 1,00 mm² (AWG 17)

X0



X1

external solenoid valve control

- external power supply 12Vdc ... 24Vdc needed
- SWG 19 switches GND of external power supply (see diagram to the left)
- max. power consumption for each sol. valve: 8W

external ready signal input

- potential free relais contact
- meant to signal gas conditioning being ready

system alarm output

- potential free relais contact
- max. 24Vdc / 1A

X1 connection diagram

X1 no.	description
1	sample / zero gas sol. valve
2	calibration gas 1 sol. valve
3	calibration gas 2 sol. valve
4	calibration gas 3 sol. valve
5	calibration gas 4 sol. valve
6	GND
7	reserve
8	reserve
9	reserve
10	reserve
11	external ready relay input
12	external ready relay input
13	system alarm relay output
14	system alarm relay output

RS485 interface

to external modules

- Modbus RTU protocol
- works as modbus slave
- RS485 2-wire interface
- slave address: 1 ... 238 (default 238)
- user definable comm. parameter (default 19200 bd / parity even / stop bits 1 / data bits 8)

external bus

RS 485 interface to external modules
- I/O modules
- Profibus converter
- ProfiNet converter
- Ethernet converter

internal bus

shield connector for bus cable

X2

X2 connection diagram

X2 no.	description
1	RS485 ext. A+
2	RS485 ext. B-
3	RS485 ext. GND
4	RS485 int. A+
5	RS485 int. B-
6	RS485 int. 12Vdc
7	RS485 int. GND
8	PE / shield

date	name	revision		wiring diagram SWG 19 external connections X0 - X1 - X2	#16357 SWG 19		date	name
						editor	22.05.2025	M. Brandt
			file name:	VPL_wiring SWG 19		checked		

configurable analog in

- signal 0 - 20 mA / 4 - 20 mA
- suitable for 2-wire meas. transducer
- suitable for 4-wire meas. transducer
- burden 50 ohms

configurable 0-30Vdc in

- input for 0-30Vdc transducer
- used for external control via relais (RCx)

configurable analog out

- signal 0 - 20 mA / 4 - 20 mA
- active output
- burden 500 ohms

configurable alarm out

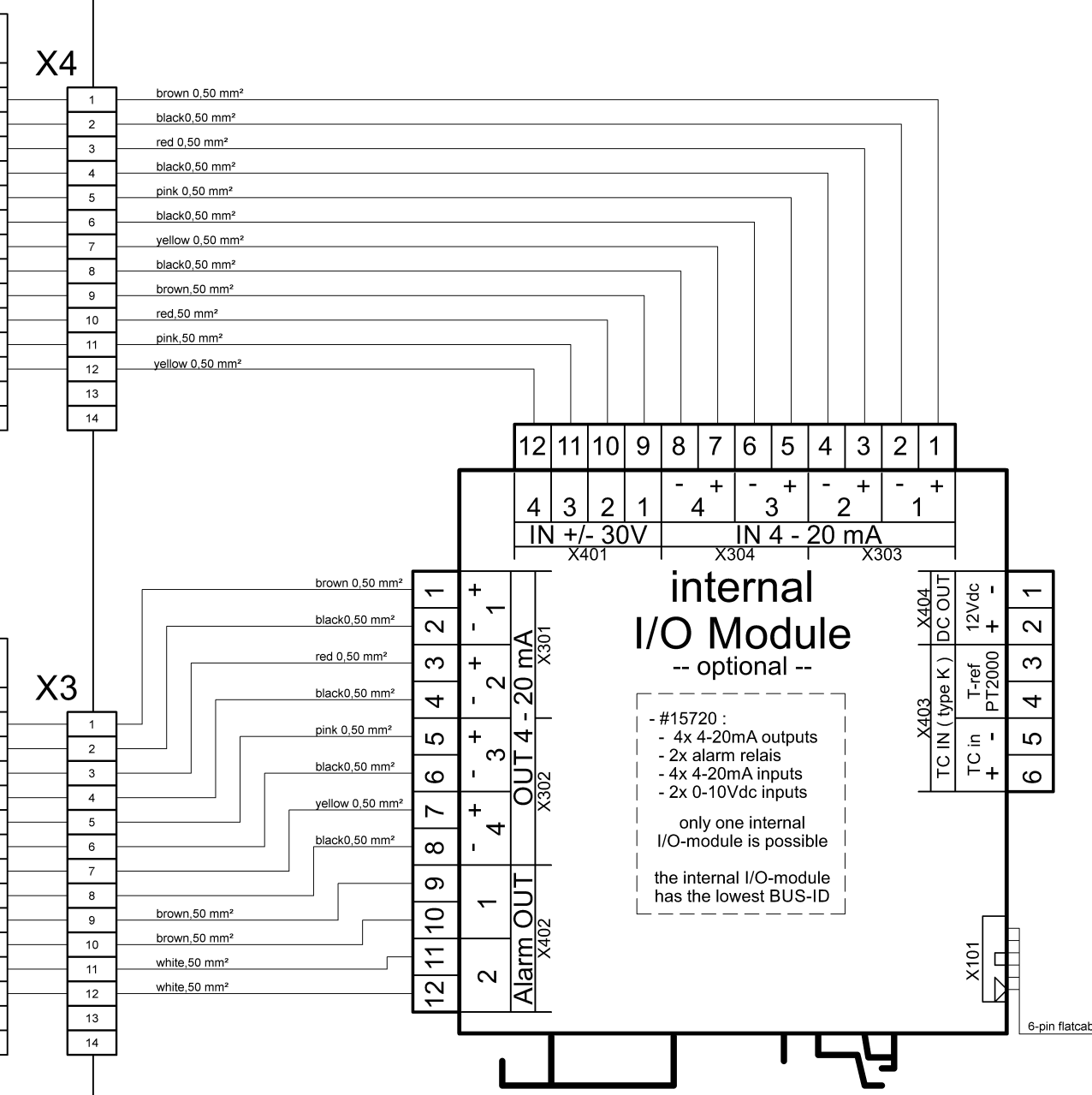
- potential free relais contact
- max. 24Vdc / 2A
- no inductive loads allowed

X4 connection diagram

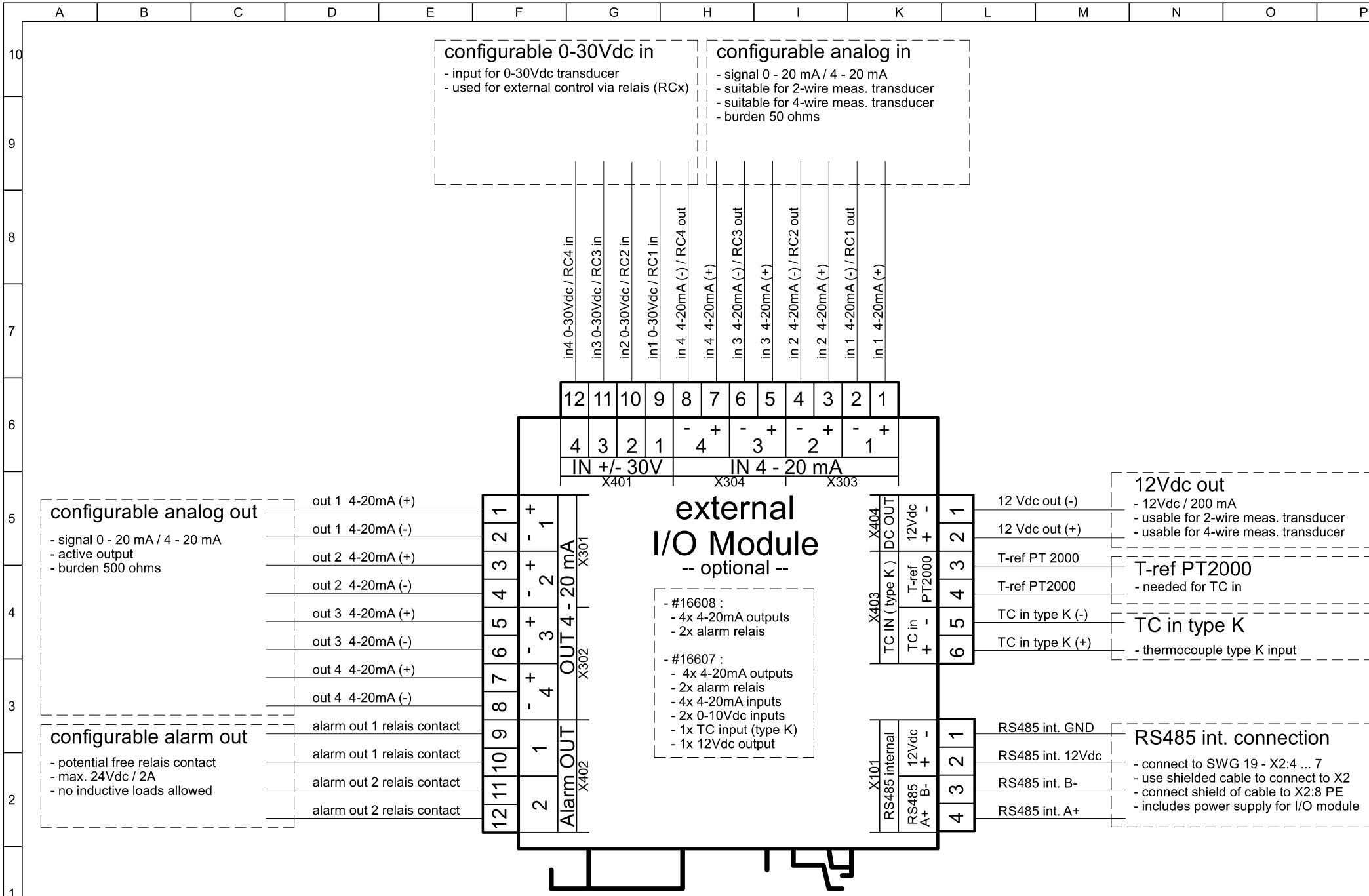
X4 no.	description
1	in 1 4-20mA (+)
2	in 1 4-20mA (-) / RC1 out
3	in 2 4-20mA (+)
4	in 2 4-20mA (-) / RC2 out
5	in 3 4-20mA (+)
6	in 3 4-20mA (-) / RC3 out
7	in 4 4-20mA (+)
8	in 4 4-20mA (-) / RC4 out
9	in1 0-30Vdc / RC1 in
10	in2 0-30Vdc / RC2 in
11	in3 0-30Vdc / RC3 in
12	in4 0-30Vdc / RC4 in
13	not used
14	not used

X3 connection diagram

X3 no.	description
1	out 1 4-20mA (+)
2	out 1 4-20mA (-)
3	out 2 4-20mA (+)
4	out 2 4-20mA (-)
5	out 3 4-20mA (+)
6	out 3 4-20mA (-)
7	out 4 4-20mA (+)
8	out 4 4-20mA (-)
9	alarm out 1 relais contact
10	alarm out 1 relais contact
11	alarm out 2 relais contact
12	alarm out 2 relais contact
13	not used
14	not used



date	name	revision		wiring diagram SWG 19 external connections internal I / O module X3 - X4	#16357 SWG 19		date	name
						editor	22.05.2025	M. Brandt
			file name:	VPL_wiring SWG 19		checked		



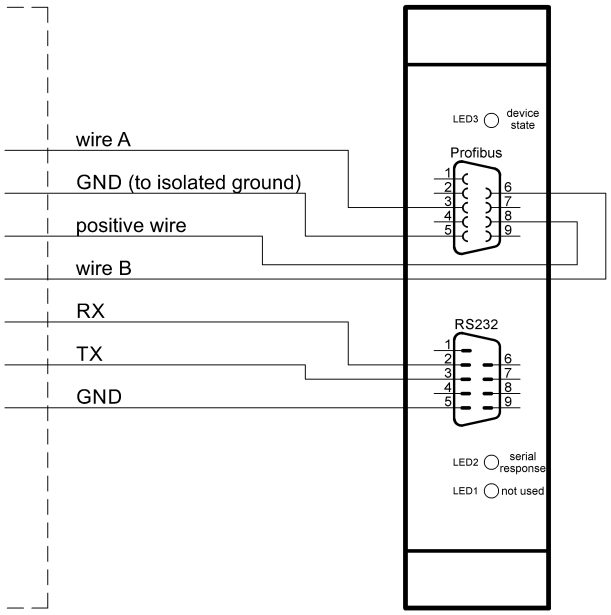
date	name	revision		wiring diagram SWG 19 external connections external I / O - module	#16357 SWG 19		date	name
						editor	22.05.2025	M. Brandt
			file name: VPL_wiring SWG 19			checked		

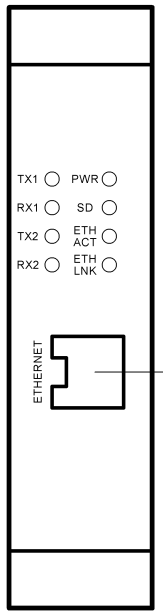
Profibus converter

- baud rate and party changeable with software "compositor SW67561"
- isolated Profibus port
- Profibus slave
- Modbus master

- signals via LED on front panel

LED	STATUS	LED meaning
device state	flashing (~1Hz)	normal mode
serial response	flashing	Profibus communicaton





min. Cat 5e cable

Ethernet converter

- 1x Ethernet 10-100 Mbits/s port
- configuration via Web-server.
- 1500 Vac power insulation

- signals via LED on front panel

LED	STATUS	LED meaning
TX1 (Rd)	flashing	data transmission on port #1 RS485
RX1 (Rd)	flashing	data receipt on port #1 RS485
TX2 (Rd)	flashing	data transmission on port #2 RS485
RX2 (Rd)	flashing	data receipt on port #2 RS485
PWR (Gn)	on	device powered
SD (Rd)	flashing	access to micro SD card.
ETH ACT (Gn)	flashing	packet transm. on Ethernet port
ETH ACT (Gn)	on	no activity on Ethernet port
ETH LNK (Ye)	on	Ethernet port connected
ETH LNK (Ye)	off	no Ethernet connection

- When connecting the Ethernet converter to the SWG 19, only connect A(+) and B(-). GND is not used.

Profinet converter

- configurable with "Setup HMS IPconfig" software
- default IP settings for configuration:

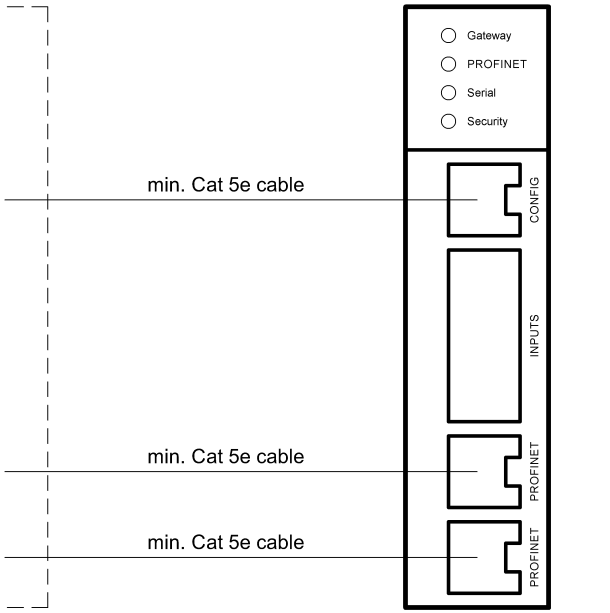
IP address:	192.168.101.30
subnet mask:	255.255.254.0
default gateway:	192.168.100.250
primary DNS:	192.198.100.4

- signals via LED on front panel

LED	STATUS	LED meaning
Gateway	on	gateway operational
PROFINET	on	Profinet connected
Serial	on	subnet running
Security	on	web interface locked

- connection diagram Profinet ports

pin 1 - TD+	pin 2 - TD-
pin 3 - RD+	pin 4 - na
pin 5 - na	pin 6 - RD-
pin 7 - na	pin 8 - na



For connecting the different converters see user manual of each converter in the user manual of the SWG 19.

date	name	revision		wiring diagram SWG 19 external connections converter modules	#16357 SWG 19		date	name
						editor	22.05.2025	M. Brandt
			file name: VPL_wiring SWG 19			checked		

suggestion of gas conditioning for SWG 19

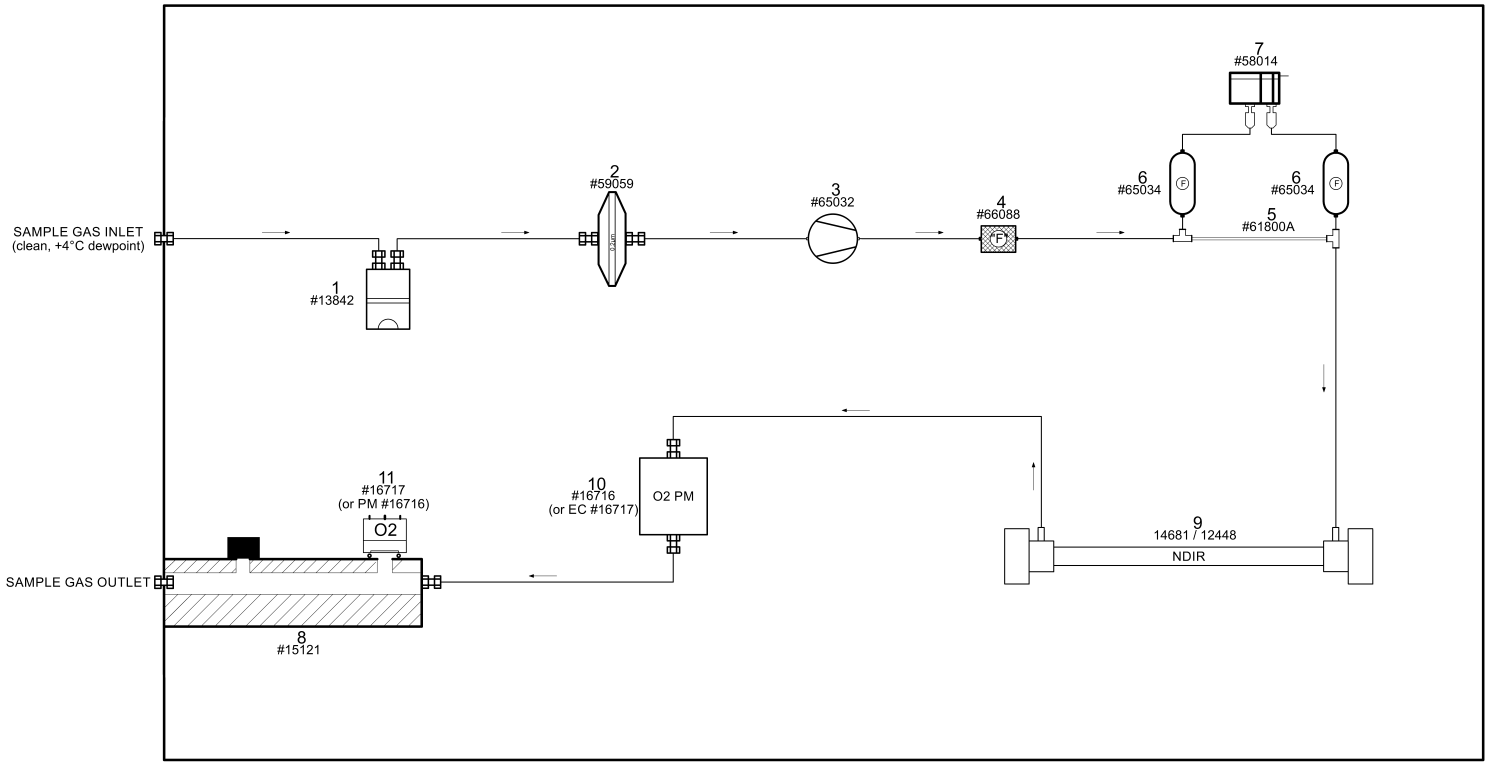
table of content

date	name	revision		MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	overview	#16357 SWG 19		date	name
							editor	14.11.2025	M. Brandt
			file name: GLP_CEMS-suggestion				checked		

gas flow diagram SWG 19

table of content	
page	description
1	overview
2	gas flow diagram SWG 19 COA #300500
3	gas flow diagram SWG 19 CEM NDIR #300502
4	gas flow diagram SWG 19 CEM EC #300502
5	gas flow diagram SWG 19 SYNGAS #300504

date	name	revision	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	overview	#16357 SWG 19		date	name
						editor	22.05.2025	M. Brandt
			file name: GLP_SWG19			checked		



NO	DESCRIPTION	MRU ART.NO.	NO	DESCRIPTION
1	condensate monitoring	13842	7	pressure sensor 100 mbar
2	single-use filter 0,2µm PTFE	59059	8	sensor mounting plate 2x
3	gas pump 12Vdc	65032	9	NDIR bench 3-gas CO/CO2/(CH4)(C3H8)
4	filter-inline - 0,3µm	66088	10	O2 - measurement 0 ... 25,00 % paramagnetic
5	stainless steel capillary	61800A	11	O2 Measurement longlife 0 ... 25,00 % EC
6	activated carbon inline filter	65034		

sample gas inlet requirements :

- max. pressure: 0 ... 30 mbar (0 ... 0,45 PSI)
- dewpoint: 4°C (39°F) noncondensing
- clean (no dust / no soot / no tar/ no other particulate matter)
- gas consumption 50 l/h (1.8 cfh)
- Screw joint G1/8 ID
- sample gas should be applied via bypass
- pressure in gascooler must be constant during zero-point calibration and measurement to ensure constant humidity

calibration gas inlet requirements :

- gas consumption 50 l/h (1.8 cfh)
- gas concentrations should be near the expected measuring values to achieve the best accuracy

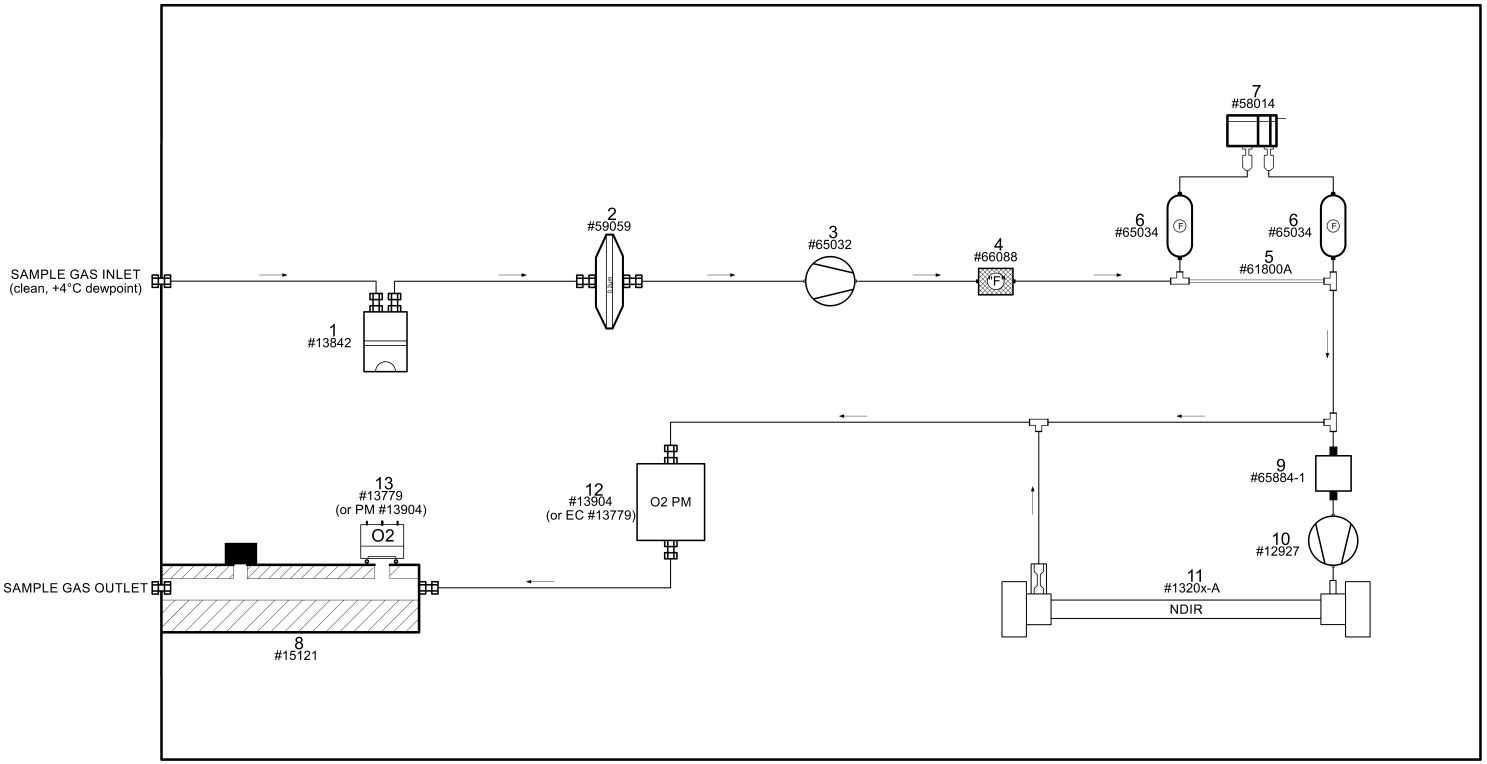
zero gas inlet requirements :

- source of air must be free of sample gas

vent requirements :

- vent sample flow 50 l/h (1,8 cfh)
- Screw joint G1/8 ID
- keep vent as short as possible because of measure
  1% of meassuring value per 10 Pa pressure drag
- possibly flamable / toxic gas

1	initial release	M. Brandt	01.08.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	gas flow diagram	SWG 19 C
					art. no. #300500	



NO	DESCRIPTION	MRU ART.NO.	NO	DESCRIPTION
1	condensate monitoring	13842	8	sensor mounting plate 2x
2	single-use filter 0,2µm PTFE	59059	9	fine filter assembly
3	gas pump 12Vdc	65032	10	DPT gas pump 12Vdc
4	filter-inline - 0,3µm	66088	11	NDIR bench 6- / 8-gas CO/CO2/CH4/NO/NO2/SO2/(N2O/C3H8)
5	stainless steel capillary	61800A	12	O2 - measurement 0 ... 25,00 % paramagnetic
6	activated carbon inline filter	65034	13	O2 Measurement longlife 0 ... 25,00 % EC
7	pressure sensor 100 mbar	58014		

sample gas inlet requirements :

- max. pressure: 0 ... 30 mbar (0 ... 0,45 PSI)
- dewpoint: 4°C (39°F) noncondensing
- clean (no dust / no soot / no tar/ no other particulate matter)
- gas consumption 50 l/h (1.8 cfh)
- Screw joint G1/8 ID
- sample gas should be applied via bypass
- pressure in gascooler must be constant during zero-point calibration and measurement to ensure constant humidity

calibration gas inlet requirements :

- gas consumption 50 l/h (1.8 cfh)
- gas concentrations should be near the expected measuring values to achieve the best accuracy

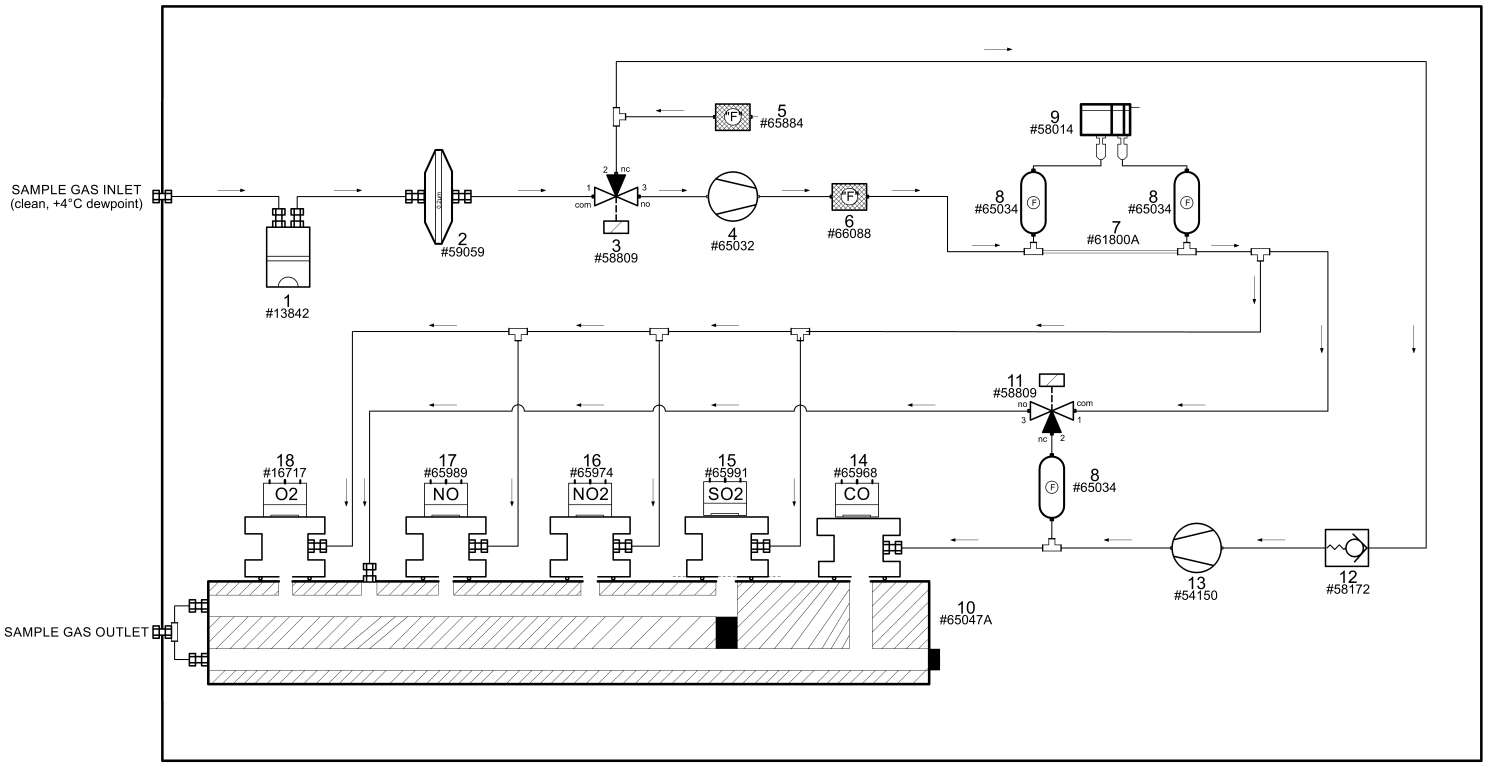
zero gas inlet requirements :

- source of air must be free of sample gas

vent requirements :

- vent sample flow 50 l/h (1,8 cfh)
- Screw joint G1/8 ID
- keep vent as short as possible because of measure 1% of meassuring value per 10 Pa pressure drag
- possibly flamable / toxic gas

1	initial release	M. Brandt	01.08.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	gas flow diagram art. no. #300502	SWG 19 CEM



NO	DESCRIPTION	MRU ART.NO.	NO	DESCRIPTION
1	condensate monitoring	13842	10	sensor mounting plate 4+1
2	single-use filter 0,2µm PTFE	59059	11	sensor purge solenoid valve 2/3 way
3	condensate alarm solenoid valve 2/3 way	58809	12	non-return valve
4	gas pump 12Vdc	65032	13	diaphragm pump for sensor purge
5	universal fine filter	65884	14	CO/H2+ H2-comp. - sensor 0 ... 10.000 ppm EC
6	filter-inline - 0,3µm	66088	15	SO2 - measurement 0 ... 1.000 ppm EC
7	stainless steel capillary	61800A	16	NO2 - measurement 0 ... 200 ppm EC
8	activated carbon inline filter	65034	17	NO - measurement 0 ... 1.000 ppm EC
9	pressure sensor 100 mbar	58014	18	O2 Measurement longlife 0 ... 25,00 % EC

sample gas inlet requirements :

- max. pressure: 0 ... 30 mbar (0 ... 0,45 PSI)
- dewpoint: 4°C (39°F) noncondensing
- clean (no dust / no soot / no tar/ no other particulate matter)
- gas consumption 50 l/h (1.8 cfh)
- Screw joint G1/8 ID
- sample gas should be applied via bypass
- pressure in gascooler must be constant during zero-point calibration and measurement to ensure constant humidity

calibration gas inlet requirements :

- gas consumption 50 l/h (1.8 cfh)
- gas concentrations should be near the expected measuring values to achieve the best accuracy

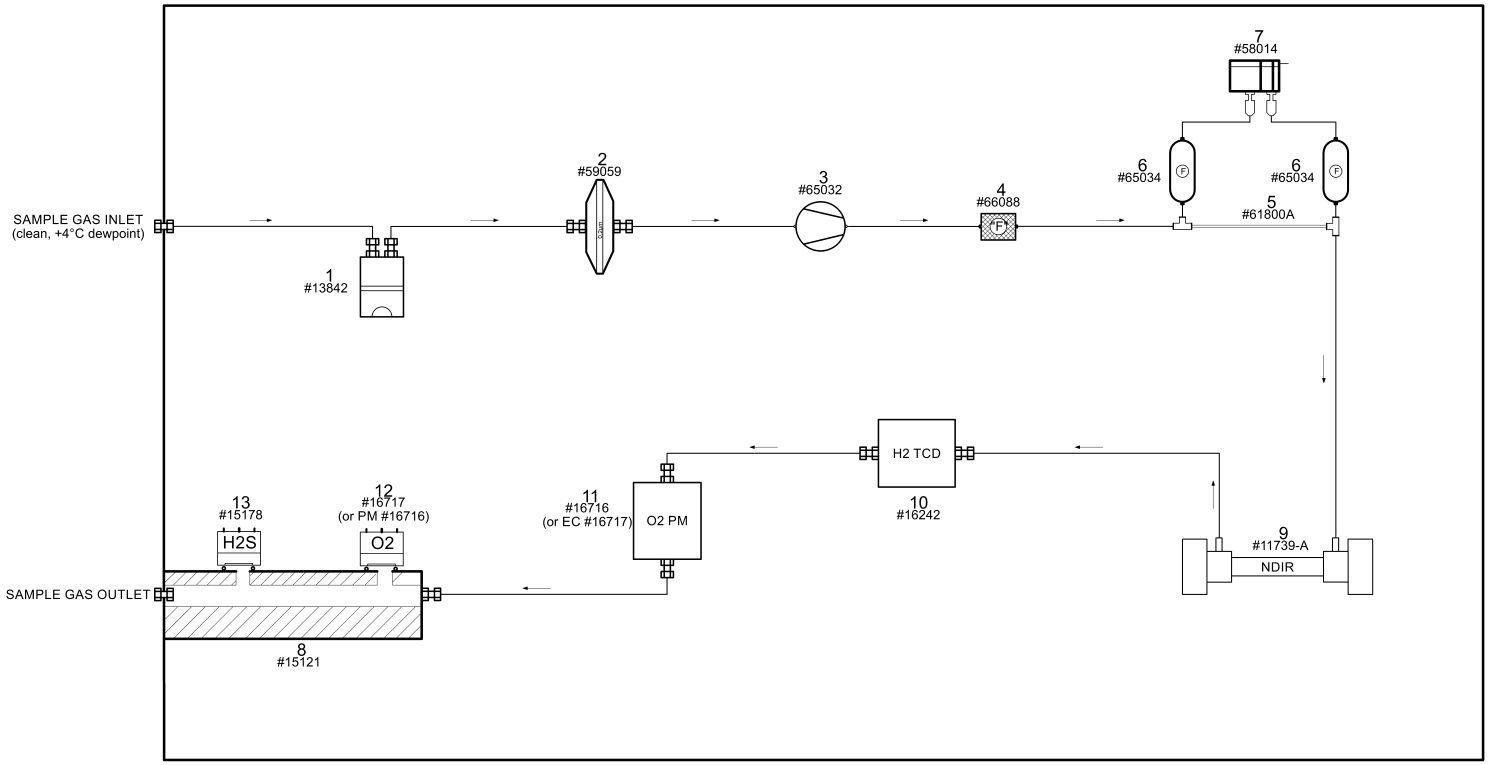
zero gas inlet requirements :

- source of air must be free of sample gas

vent requirements :

- vent sample flow 50 l/h (1,8 cfh)
- Screw joint G1/8 ID
- keep vent as short as possible because of measure 1% of meassuring value per 10 Pa pressure drag
- possibly flamable / toxic gas

1	initial release	M. Brandt	01.08.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	gas flow diagram	SWG 19 CEM
					art. no. #300502	



NO	DESCRIPTION	MRU ART.NO.	NO	DESCRIPTION
1	condensate monitoring	13842	8	sensor mounting plate 2x
2	single-use filter 0,2µm PTFE	59059	9	NDIR bench syngas CO/CO2/CH4(sel)
3	gas pump 12Vdc	65032	10	H2 - measurement 0 ... 10% up to 100% TCD
4	filter-inline - 0,3µm	66088	11	O2 - measurement 0 ... 25,00 % paramagnetic
5	stainless steel capillary	61800A	12	O2 Measurement longlife 0 ... 25,00 % EC
6	activated carbon inline filter	65034	13	H2S - measurement 0 ... 1.000 ppm EC
7	pressure sensor 100 mbar	58014		

sample gas inlet requirements :

- max. pressure: 0 ... 30 mbar (0 ... 0,45 PSI)
- dewpoint: 4°C (39°F) noncondensing
- clean (no dust / no soot / no tar/ no other particulate matter)
- gas consumption 50 l/h (1.8 cfh)
- Screw joint G1/8 ID
- sample gas should be applied via bypass
- pressure in gascooler must be constant during zero-point calibration and measurement to ensure constant humidity

calibration gas inlet requirements :

- gas consumption 50 l/h (1.8 cfh)
- gas concentrations should be near the expected measuring values to achieve the best accuracy

zero gas inlet requirements :

- source of air must be free of sample gas

vent requirements :

- vent sample flow 50 l/h (1,8 cfh)
- Screw joint G1/8 ID
- keep vent as short as possible because of measure 1% of meassuring value per 10 Pa pressure drag
- possibly flamable / toxic gas

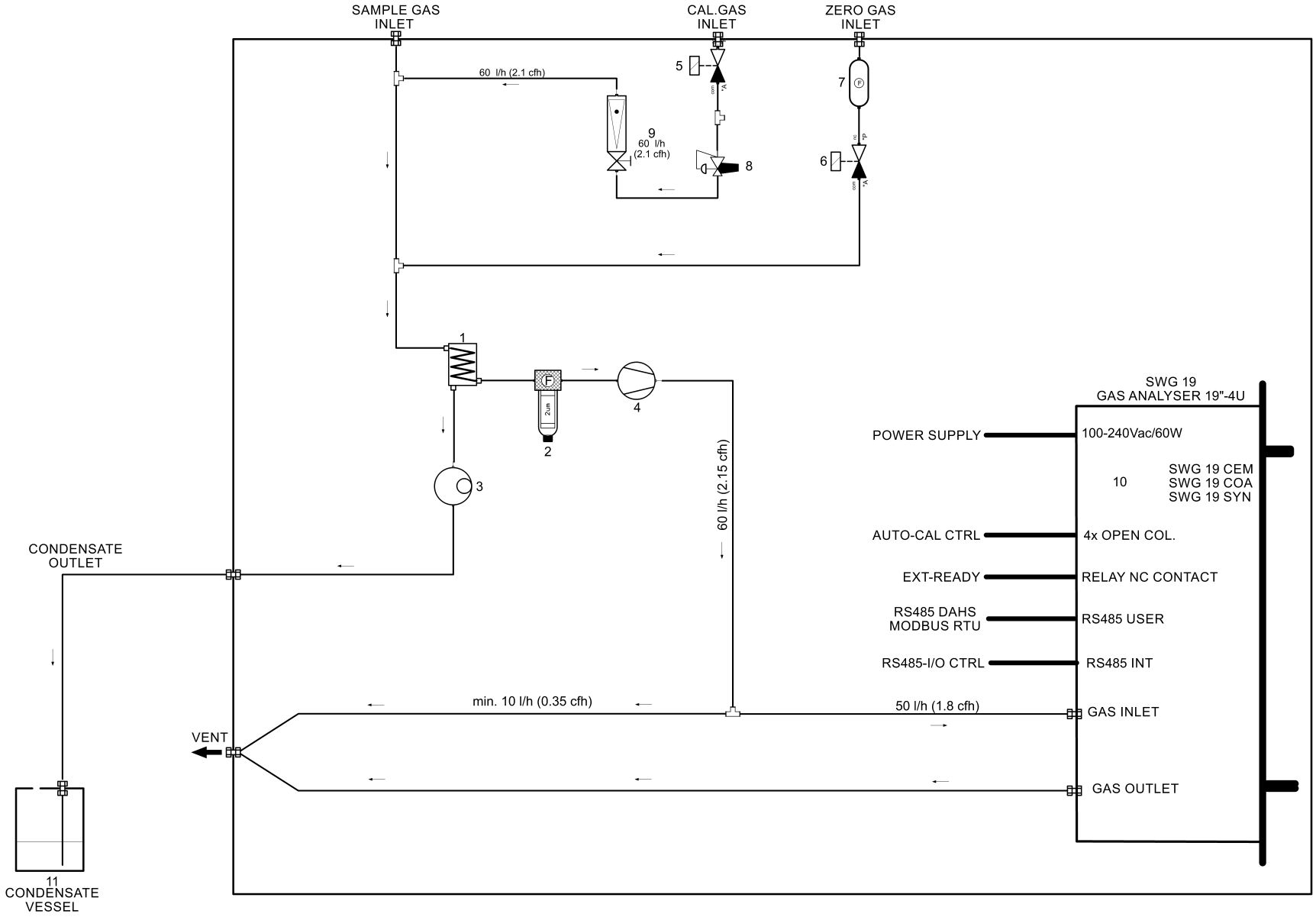
1	initial release	M. Brandt	01.08.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	gas flow diagram	SWG 19 SYN
					art. no. #300504	

suggestion of gas conditioning for SWG 19

table of content

date	name	revision		MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	overview	#16357 SWG 19		date	name
							editor	14.11.2025	M. Brandt
			file name: GLP_CEMS-suggestion				checked		

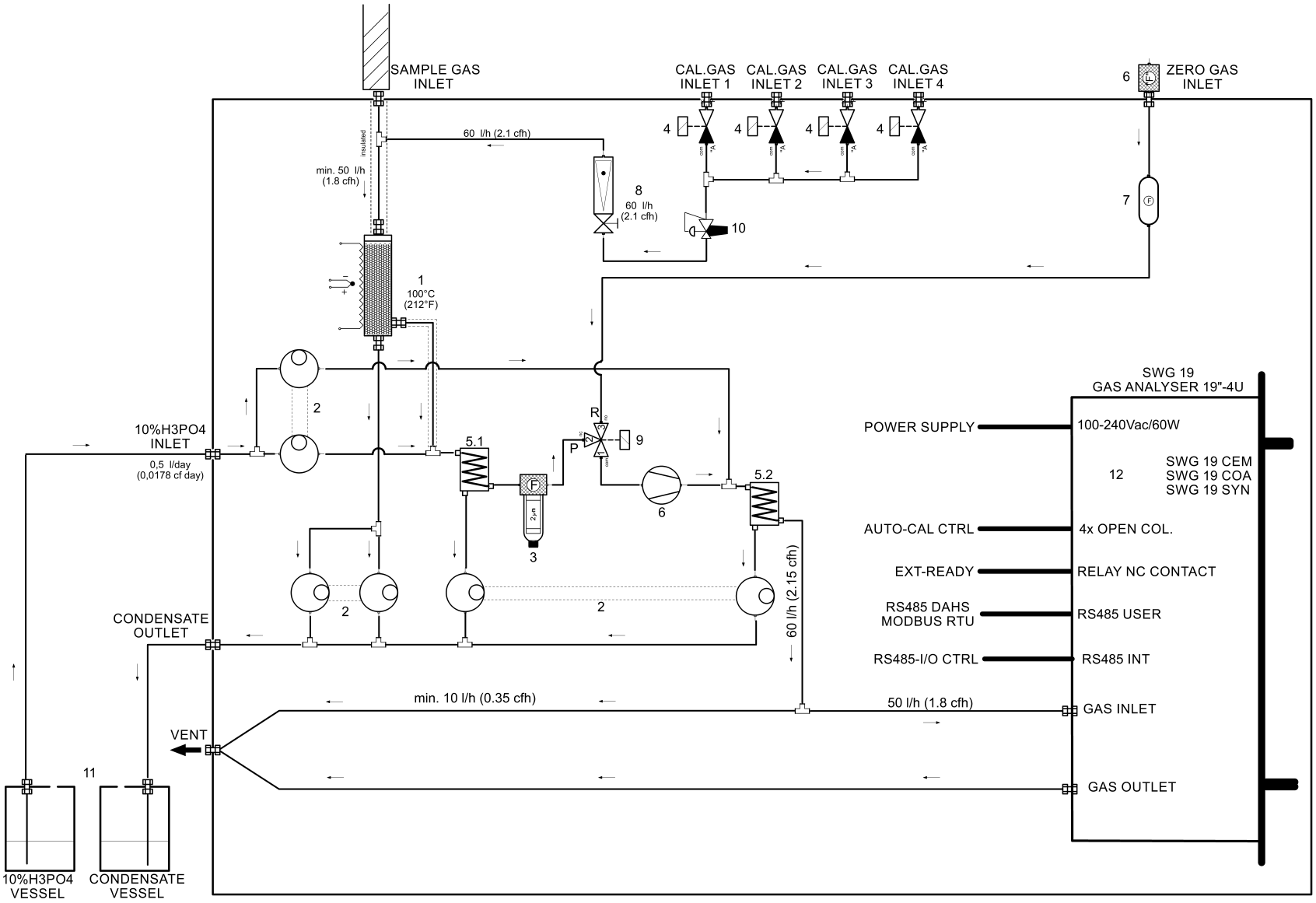
NO	DESCRIPTION	MRU Art.No.	SUGESTED PARTS		NO	DESCRIPTION	MRU Art.No.	SUGESTED PARTS	
			MANUFACTURER	TYPE				MANUFACTURER	TYPE
1.	SAMPLE GAS COOLER	56628	M&C	ECP 1000C	7.	ACTIVATED CARBON FILTER	65034	VARIOUS	ACTIVATED CARBON
2.	SINTERED PTFE FILTER 2µm	12553	SUN-CONTROL	PF 2017-2	8.	PRESSURE REDUCER 100mbar (1.5 PSI)	10245	FLUID CONCEPT	DRW 142
3.	CONDENSATE DRAINING PUMP/	11230	THOMAS	SR25 SERIES PERESTALTIC PUMP (e.g.: SR25/10)	9.	FLOWMETER w. NEEDLE VALVE	62722	M&C	FM40
4.	SAMPLE GAS PUMP 12Vdc	65032	THOMAS	TYPE 1410VD	10.	GAS ANALYSER SWG 19 xxx	16357	MRU	SWG 19
5.	CAL. GAS SOLENOID VALVE 2/2-WAY	65466	ASCO / SIRAI	D103V06	11.	CANISTER CONDENSATE	13520	VARIOUS	10L (340 fl oz) / MATERIAL PE-HD
6.	ZERO GAS SOLENOID VALVE 2/2-WAY	65466	ASCO / SIRAI	D103V06					



1	initial release	M. Brandt	14.11.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	SWG 19 art. no. #16357
2	added suggested parts	M. Brandt	10.06.26		gas flow diagram CEMS minimum model

NO	DESCRIPTION	MRU Art.No.	SUGESTED PARTS	
			MANUFACTURER	TYPE
1.	HEATED ACID MIST CATCH & DRAIN	13186	MRU	HEATED ACID MIST CATCH & DRAIN DEVICE
2.	CONDENSATE DRAINING PUMP/ 10% H3PO4 DOSAGE PUMP	13095	THOMAS	SR25 SERIES PERESTALTIC PUMP (e.g.: SR25/10)
3.	SINTERED PTFE FILTER 2µm	12553	SUN-CONTROL	PF 2017-2
4.	SOLENOID VALVE 2/2-WAY	65466	ASCO / SIRAI	D103V06
5.	ECP2000 SAMPLE GAS COOLER	13339	M&C	ECP 2000C
6.	AIR FILTER w. 1/8"F	65978	VARIOUS	SINTERED PE-FILTER ~ 100µm
7.	SAMPLE GAS PUMP 12Vdc	65032	KNF	TYPE N86

NO	DESCRIPTION	MRU Art.No.	SUGESTED PARTS	
			MANUFACTURER	TYPE
7.	ACTIVATED CARBON FILTER	65034	VARIOUS	ACTIVATED CARBON
8.	FLOWMETER w. NEEDLE VALVE	62722	M&C	FM40
9.	SOLENOID VALVE 3/2-WAY	12995	BUERKERT	TYPE 7012
10.	PRESSURE REDUCER 100mbar (1.5 PSI)	10245	FLUID CONCEPT	DRW 142
11.	CANISTER CONDENSATE / H3PO4	13520	VARIOUS	10L (340 fl oz) / MATERIAL PE-HD
12.	GAS ANALYSER SWG 19 xxx	16357	MRU	SWG 19



1	initial release	M. Brandt	14.11.25	MRU GmbH Fuchshalde 8+12 74172 Neckarsulm Germany	SWG 19 art. no. #16357
2	added suggested parts	M. Brandt	10.06.26		gas flow diagram CEMS maximum model