since 1984 ®

EMISSION MONITORING SYSTEMS

VARIO*luxx* SYNGAS

USER MANUAL

9442EN

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Original user manual

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Note on electrochemical sensors
Electrochemical sensors are by their operating principle not only sensitive to the gas they are intended for, but for other gases as well.
This cross sensitivity is compensated by MRU for the typical application of flue gas analysis.
However, unusual high concentration levels of single gas components might lead to

- a reduced measurement accuracy of other gas components
- and to a temporary change of the sensitivity of sensors, which may require several hours recovery time.

Especially concentration levels as high as several % for single gas components may affect the measurement of other gas components at ppm level. Those applications need to be discussed with MRU in detail.

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1 Information for product and safety

1.1. Safety manual

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

1.2. Safety precautions

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

ATTENTION

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

NOTE

Identifies user tips and other especially important information.

The explanation of safety notices:

⚠ CAUTION

HOT – danger of burns and fire hazards from gas extraction probe.

Physical harm and property damage can be caused.

► Cool down the probe tube.

2 Introduction

- This manual enables you to understand and safely operate this Analyser.
  Please read this manual with great vigilant and get familiar with the product before using it.
- This analyser may only be operated by competent personnel and for its intended use.
- Please pay special attention to all safety directions and warnings to prevent personal injuries and damaging of the product.
- We can't be held responsible for any injuries and/or damages that occur by not following the instructions in this manual.
- Always keep the manual near you when working with the analyser, to be able to read instructions as needed. Please ensure to hand over all documents to when handing the analyser over to others.

2.1. Intended use

The analyser is intended as a portable syngas analyser for long-term measurements of special gases.
Applicable for example for:

- Steel industry: coke oven gas, blast furnace gas
- Biomass or coal catalytic oxidation (gasification)
- Waste gasification process, plasma gasification process
- Steam reforming of liquid hydrocarbons (refinery gas etc)
- Flare gases, research, etc.

The analyser is specifically not intended as a safety device or personal protective equipment.
The analyser should not be used as a warning device to warn people against the presence of harmful gases.
The analyser was manufactured according relevant standards and regulations.
The analyser must be used according to instructions for the intended use.

⚠ WARNING

Risk from manipulations to the measuring device

Operational safety hazard

► Modifications or changes to the measuring device are not allowed.

Syntax

Please note that this manual makes use of the scientific notation of gases (NO2), while the instrument itself and its screen shots display the gases in upper case letter only, i.e. (NO2).

2.2. About us

The analyser is produced by the MRU GmbH in Neckarsulm, Germany (Founded in 1984), a medium sized company that is specialised in developing, producing and marketing high quality emission monitoring analysers.

MRU GmbH produces a wide range of instruments, from standard analysers up to tailor made industrial analysers.

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3 Description

3.1. Task

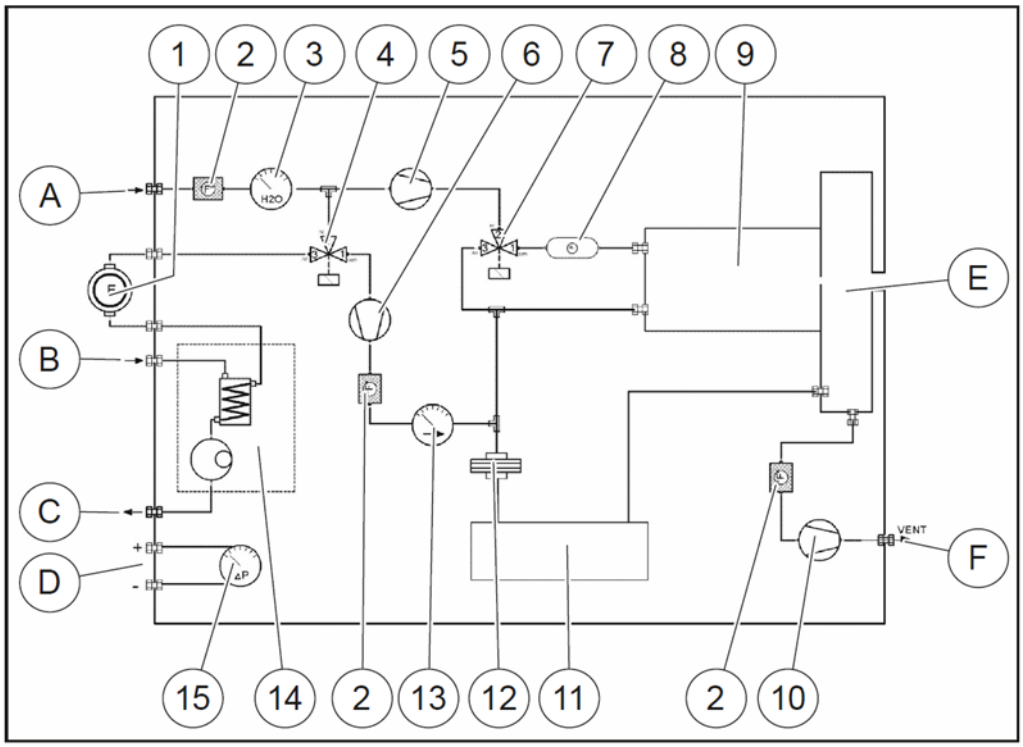
The main task of the analyser is to analyse flue gases, as they are emitting from incinerators or engines.

- The analyser is optimized for this purpose and includes all components from the gas sampling probe to data processing.
- The analyser also performs other measurement tasks such as pressure and temperature measurement or measurement of flow velocity.

For an overview on all available options please refer to the company's home page or sales representatives.

3.2. Gas flow diagram

In combination with the gas sampling probe, the analyser extracts a partial volume of the flue gas from the combustion channel and analyses it for its components by means of sensors (e.g., paramagnetic (oxygen) sensor, electrochemical (oxygen) sensor or NDIR sensors). Draft and temperature are measured at the tip of the sampling probe.

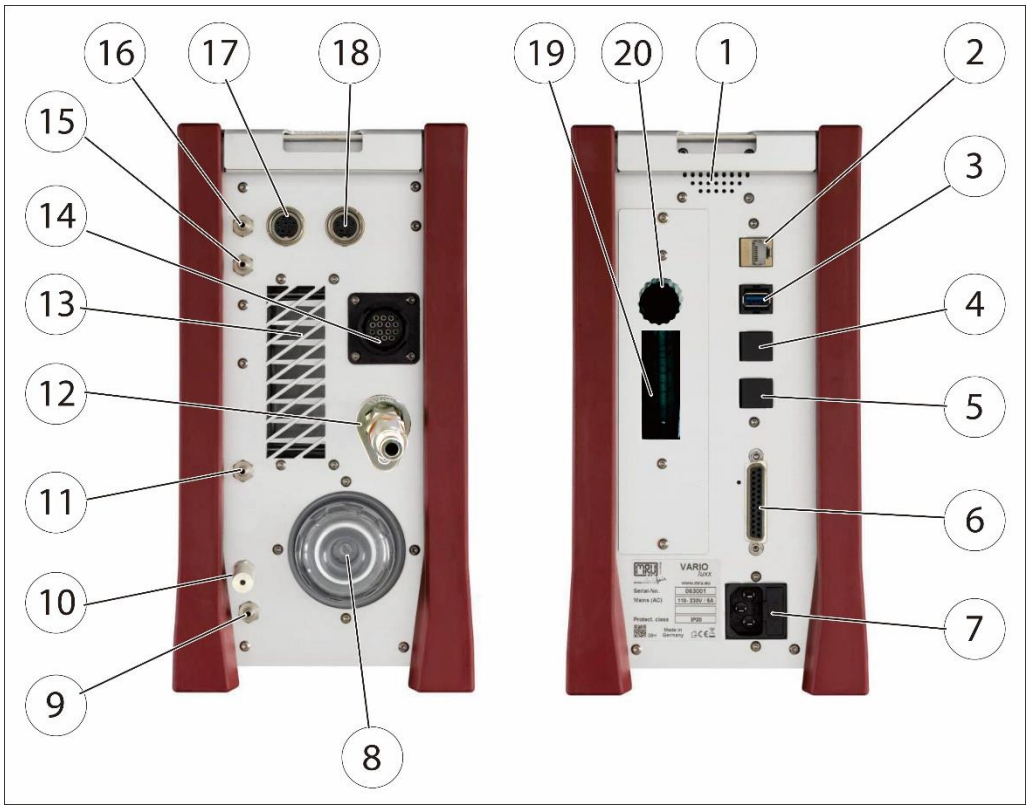


A	Fresh air inlet	B	Sample gas inlet
C	Condensate outlet	D	Diff. Pressure connector
E	Vent collection box	F	Vent outlet
1	Sample gas filter (PTFE)	2	Dust filter
3	Humidity sensor	4	Auto-zero solenoid valve
5	CO purging pump	6	Sample gas pump
7	CO purge solenoid valve	8	NOX protection filter
9	Box for electrochemical sensors	10	Vent pump
11	Infrared (NDIR) bank	12	Acrodisc PTFE filter
13	Sample flow sensor	14	Gas cooler
15	Diff. pressure sensor		

3.3. The Analyser

The analyser consists of a compact and robust metal housing with shock-absorbing rubber corners. All electrical and pneumatic connections are located on both front sides of the instrument. It is operated exclusively via the touch-sensitive touch screen.

3.4.Connectors



	Front side right		
1	Loudspeaker	2	Ethernet (LAN)
3	USB socket	4	Second USB socket (option)
5	RS485 (Option)	6	Analog outputs 4 ... 20 mA Analog-inputs 4 ... 20 mA
7	Mains power supply		

	Front side left		
8	Sample gas filter	9	Condensate outlet port Hose connection DN 4/6
10	Sample gas outlet port	11	Fresh air inlet port
12	Sample gas inlet port	13	Outlet fan of gas cooler
14	Probe connection, electrical	15	Pressure-/diff. pressure
16	Pressure-/diff. pressure (Absolute pressure)	17	Combustion air temperature
18	AUX socket		

3.5. Probes

In combination with the analyser, probes in different versions for high and less dust content are offered.

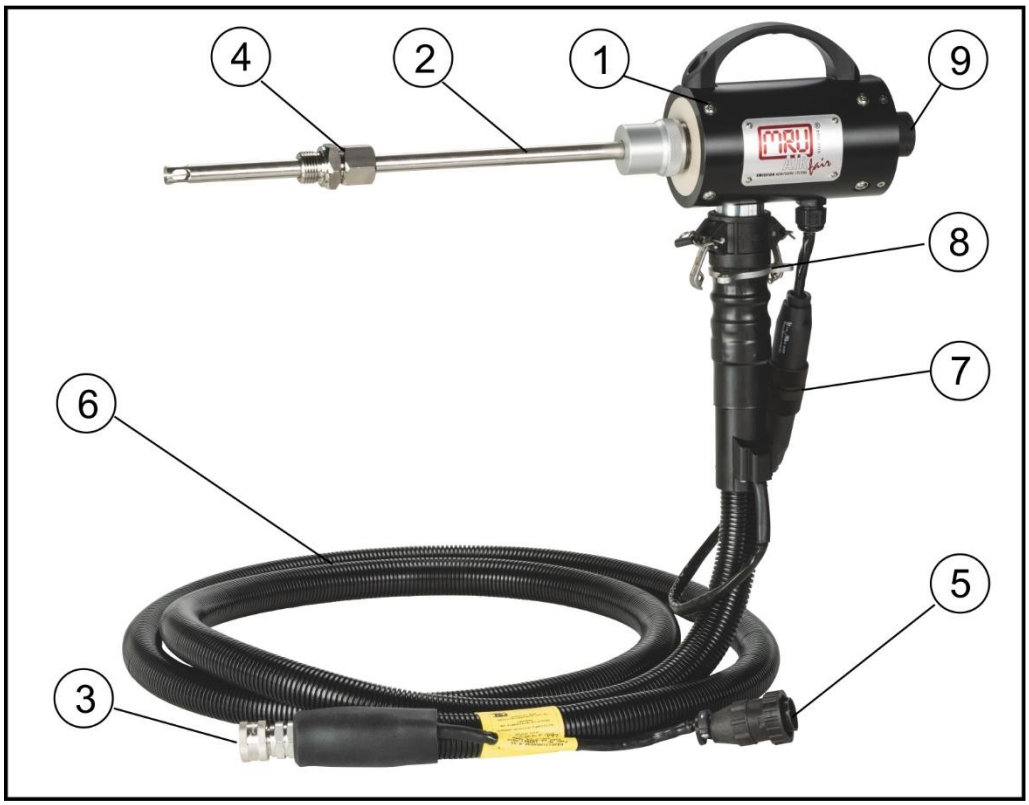
- for fuel temperatures up to 800 °C (Stainless-steel probe tube),
- for fuel temperatures up to 1.100 °C (Inconel steel probe tube),
- with and without heated pre-filter
- with and without heated gas sampling line
- probe tubes in different lengths

A complete list of available probes can be found in the current price list of this analyser.

- Probe adapter set HPI for existing probe tubes (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)
  for connecting ON-SITE existing 6- or 8-mm tubes to the probe handle
  INSTEAD of the enclosed MRU probe tube.
  But then no measurement of the flue gas temperature is possible with this probe tube

3.6. Heated Gas sampling probe

For interchangeable probe tube with flue gas temperature measurement using type K-thermoelement.



► Check the probe filter before and after every measurement.

1	Probe handle	2	Probe tube
3	Fast locking coupling	4	Probe cone
5	Cable plug (14-pin)	6	Heated hose line
7	Cable coupler (5-pin)	8	Fast locking coupling
9	Filter lock		

⚠ WARNING

Danger of burns and fire hazards from Heated hose line

Injuries and burns may result.

► Roll out the heated hose line completely for each measurement.

ATTENTION

When measuring with coiled heated hose line, the hose line is destroyed due to strong heat development.

► Roll out the heated hose line completely for each measurement.

NOTE

Please note that heating hoses with 110V and 230V are offered.

► Check the voltage supply of the heating hose before commissioning.

► You can operate a 230V heating hose with 110 volts, but with limited heat capacity.

⚠ DANGER

Risk due to improper use

Risk of death due to electric shock

► Do not operate a 110V heating hose with 230V.

☞ See also chapter 15.6 General Instructions for the heated hose line, Page 123.

3.7.Unheated Gas sampling probe

1	Filter lock	2	Fast locking coupling
3	Cable coupler (5-pin)	4	Cable plug (14-pin)
5	Fast locking coupling	6	Unheated hose line
7	Probe cone	8	Probe tube
9	Probe handle		

► Check the probe filter before and after every measurement.

3.8. Gas conditioning

The sucked sample gas is dried and filtered before it is fed to the sensors.
A sample gas cooler with Peltier element is used for drying.
The condensate liquid appearing in the gas cooler is pumped to the condensate outlet by means of a peristaltic pump. The condensate forms drops at the outlet of the instrument.
Optionally, connect a hose to the condensate drain.
A hose can also be connected to the sample gas outlet for discharge.
For subsequent filtering, a round filter is used on the front of the analyser.

3.9. Gas supply

The analyser contains a gas feed pump (diaphragm pump).
The flow through the gas feed pump is measured and regulated to the nominal value by the analyser.
If the pump capacity is not sufficient to reach the flow of the nominal value, an alarm is issued.
If the flow does not reach the nominal value despite an increase of the pump capacity, the pump is switched off after a while to protect the analyser.

3.10. Gas sensors

The analyser can contain the following measuring modules:

1. The analyser works with electrochemical sensors for the Measurement of O_2 (oxygen)

2. The analyser works with a paramagnetic sensor for the Measurement of O_2 (oxygen).

3. The analyser works with a non-dispersive infrared absorption for the Measurement of CO, CO_2 and CH_4.

4. H_2 can be measured with a TCD/thermal conductivity detector.

5. Measuring module for the measurement of H_2S

4 Operation

4.1. Commissioning

The analyser leaves the factory assembled and ready for use.

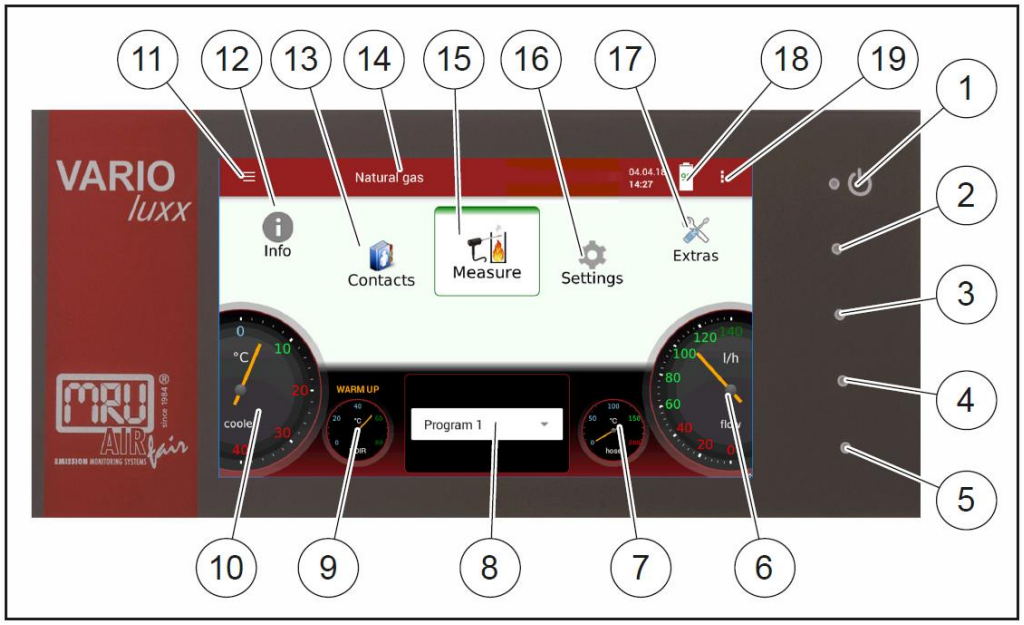
► Check the analyser regarding completeness and integrity.
► Connect the analyser to the mains.

⇨ The analyser switches on.
⇨ The operating system boots.
⇨ Blue LEDs for ON and power supply are switched on.
(In the event of an error, the Power LED lights red)
⇨ The device runs through a start routine of 30 minutes.
The start routine includes:

- self-test
- warm-up of the NDIR bench
- cool down of the stage gas cooler, indicated by the symbol
- Zeroing, indicated by symbol.

The remaining time until the end of zeroing is displayed.

4.2. Operating panel



All functions are controlled via the touch surface of the instrument. Different gestures are available in the individual menus and windows.

1	Power-on and reset
2	Reserve
3	Reserve
4	LED display mains operation/battery charging mode
5	Reserve
6	Current flow rate
7	Current temperatures heated hose
8	Selected measuring program, e.g., Test or measurement program
9	Current temperatures of NDIR bench
10	Current temperatures of gas cooler
11	Access to detailed information on the instrument components. Especially for service or inquiry
12	Menu info
13	Menu contacts
14	Status bar: display of zero point, alarms, executed measuring program, selected fuel, heat-up-, cool-down phase
15	Menu measure
16	Menu settings
17	Menu extras
18	Battery Charge indicator
19	Context menu with window-dependent additional functions

NOTE

For display reasons, the Service menu is missing from the description of the operating panel.

4.3. Charging the battery

The analyser has an integrated rechargeable battery.

► Connect the mains plug.

⇨ The battery will be charged as soon as it is connected to the mains.

⇨ The blue LED (4) lights up.

► Charge battery for more than 8h is recommended after first start to allow the battery to charge completely.

NOTE

Note that the analyser can only be used in battery operation to a limited extent.

► Do not carry out any measurements in battery mode.

► Carry out only data processing and setting work in battery operation.

4.4. Switching on the analyser

► Touch the ⏻ button (1) for 3 sec. minimum

⇨ LED lights blue

► Release the ⏻ button (1).

⇨ Analyser runs up.

4.5. Switching off the analyser

There are two possibilities to switch off the analyser.

► Touch the Context menu (19) on the display.

⇨ A selection list appears.

► Touch „Turn unit off“.

⇨ A message appears.

► Touch „YES“.

⇨ The analyser shuts down.

Alternatively, you can switch off the analyser as follows:

► Touch the ⏻ button (1).

⇨ A dialog window appears.

► Touch „YES“.

⇨ The analyser shuts down.

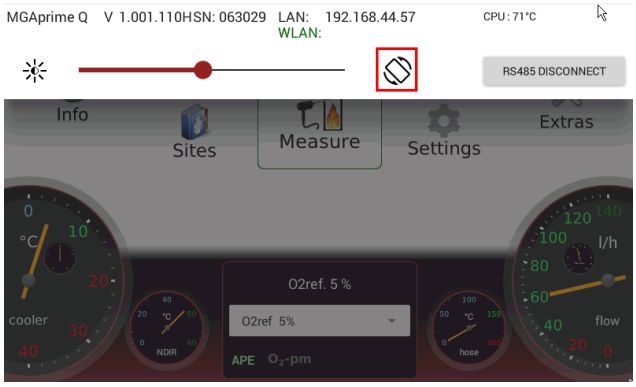
4.6.Turn Display

► Touch the Context menu (19) on the display.

⇨ A selection list appears.

► Touch Display settings.

⇨ A window appears.



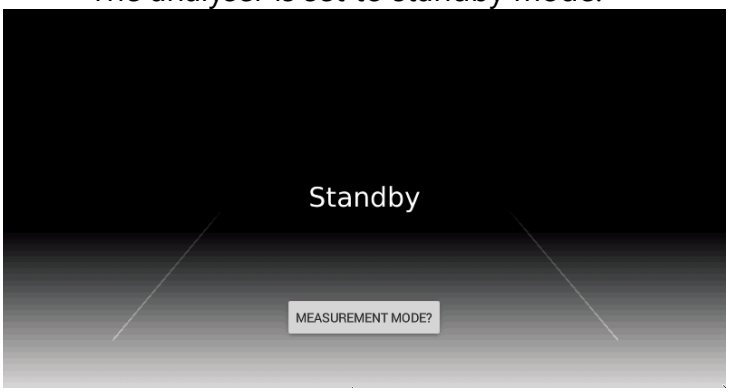
Touch

⇨ The display turns.

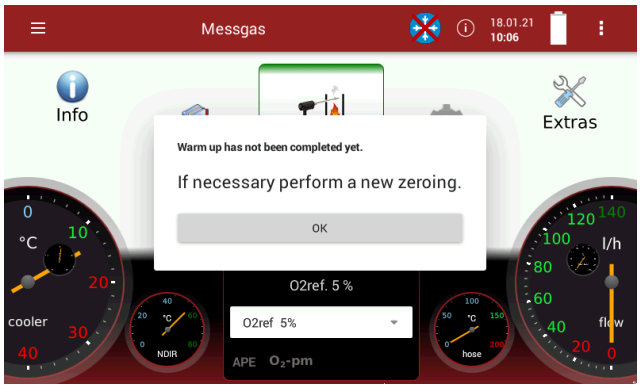
4.7.Set the analyser to standby mode

The analyser is protected in standby mode. You cannot take measurements in standby mode.
The actuators, for example pumps and gas coolers, are switched off as far as possible. Note that NDIR is not switched off. After you have left the standby mode, the analyser will start up again.
The analyser will display a message that a zeroing may be useful.

► Touch the Context menu (19) on the display.
  ⇨ A selection list appears.
► Touch Standby.
  ⇨ A message appears.
► Press Yes to activate standby mode.
  ⇨ The sensors are purged.
  ⇨ The analyser is set to standby mode.



► Press MEASUREMNT MODE? to restart the analyser.
  ⇨ A message appears.
► Press Yes to exit the standby mode.
  ⇨ A message appears.



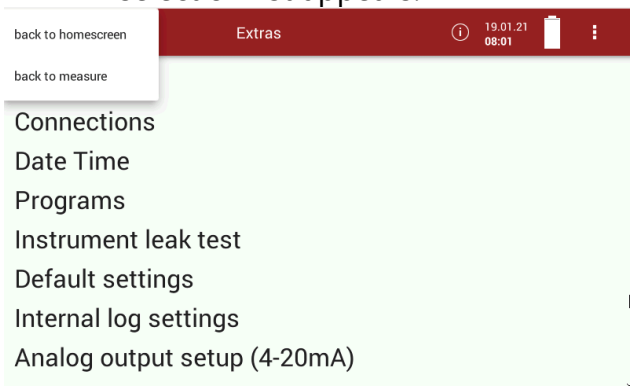
► Press OK.
  ⇨ The analyser is heated up.
► If necessary, perform a new zeroing.

4.8.Back to homescreen / Back to measure

As soon as the back button is displayed, you have the option to go back to the homescreen or go back to the measurement, from any window.

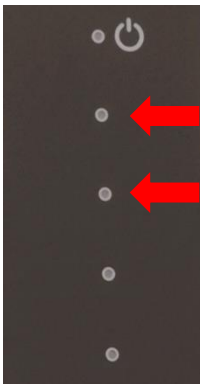
► Press for one second

⇨ A selection list appears.



► Select if you want to go back to the homescreen or to measure.

4.9.Create screenshots



You can create screenshots and save them on a USB-Stick.

► Insert a USB-Stick into the analyser.
► Touch the button 2 and button 3 simultaneously for 3 seconds.

☞ See also chapter 4.2 Operating panel, page 19.

⇨ A folder “Screenshots is created on the USB-Stick.
⇨ The screenshot is saved as PNG in the "Screenshots" folder.

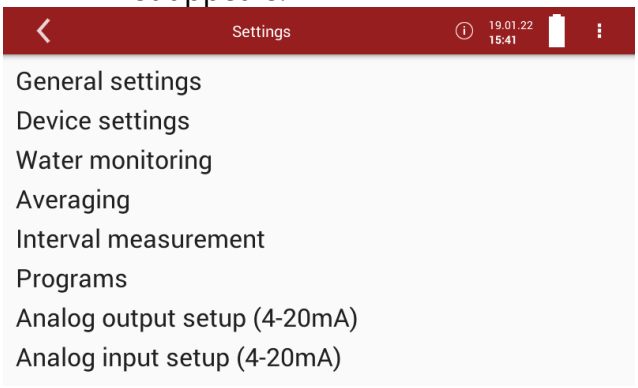
5 Settings

After the analyser has been inspected and is ready for start-up it can be switched on and personalized settings can be entered. These settings can be changed at any time.

5.1.Open menu Settings

► Press Settings

⇨ A list appears.



► Select the desired menu item.

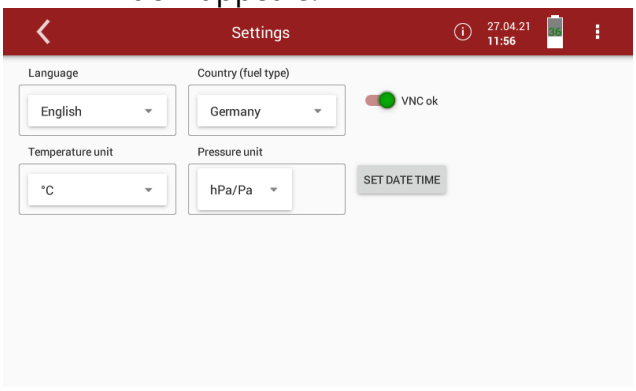
5.2.General settings

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press General settings.

⇨ A window appears.



In the menu General settings, you can make the following adjustments:

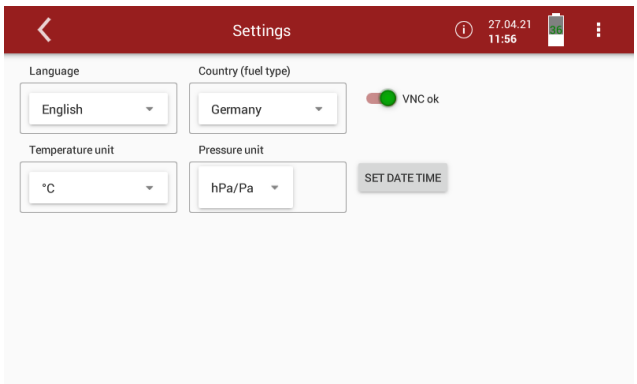
Setting	Range	Description
Language		Select analyser language
Country (fuel type)		By changing the country, the O_2 reference values settings are lost. The fuel list is reset. Similarly, country-specific defaults and methods of measurement are selected as a result. Ensure the correct setting of the country in which you are performing the measurement to ensure that all relevant ones are set up
Temperature unit	°C, °F	Change of unit
Pressure unit		Change of unit
VNC		VNC Viewer for remote control
Set Date Time		☞ 5.3 Setting Date and Time, Page 25.

► Select the desired setting.
► Change the desired setting
► Exit the menu General settings.
⇨ The change is automatically saved.

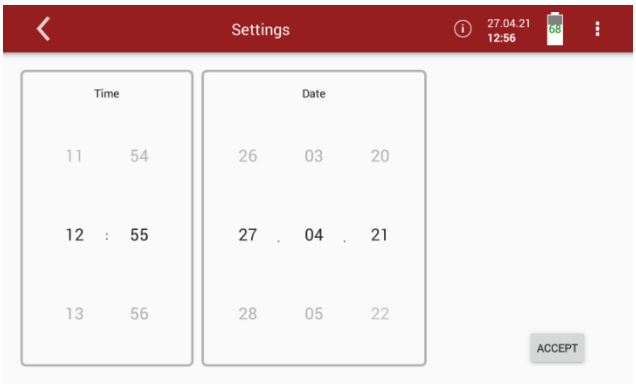
5.3.Setting Date and Time

► Open the menu Settings.
☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press General settings.
⇨ A window appears.



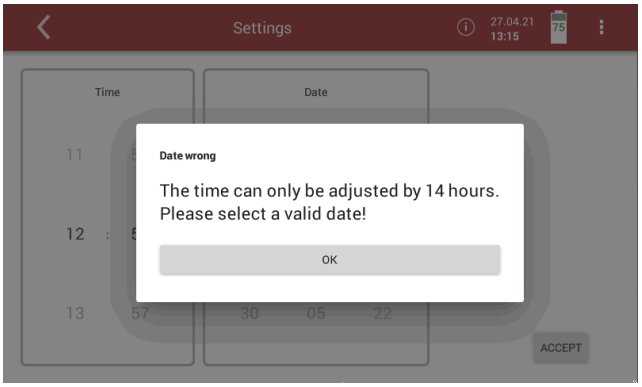
► Press SET DATE TIME
⇨ A window appears.



► Set the desired time and date.
► Press ACCEPT.
⇨ The set time and date are shown in the display.

NOTE

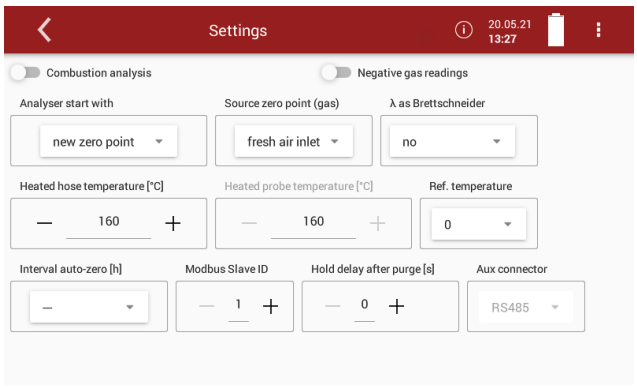
Note that the time setting is limited to +- 14 hours.
⇨ The analyser displays a corresponding message.
► Select a valid date.



5.4.Device settings

► Open the menu Settings.
☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Device settings.
☞ A window appears.



Setting	Range	Description
Combustion analysis	ON/OFF	Setting combustion analysis to ON allows for several calculation performed by the instrument, which are fuel type
Negative gas readings	ON/OFF	Negative gas readings caused by temperature drift of a sensor are suppressed (shown as zero) or displayed
Analyser start with		You can set whether the analyser starts with • a new zero point. • a stored zero point. ☞ See also chapter Use last valid zero point, Page 55.
Source zero point (gas)		Setting from which source zero-point gas is to be sucked in for zero-point measurement. ☞ See also chapter Select Source zero point (gas), Page 57. NOTE: After switching on, the first zeroing is always via the fresh air nozzle.
λ accor. Brettschneider		Calculation of the combustion air ratio (λ Lambda) according to “Brettschneider

Heated hose temperature	80 – 180°C 176 – 355°F	
Heated probe temperature	120 – 180°C 250 – 355°F	
Ref. temperature		Calculation of the values for a standard state at reference temperature
Interval auto-zero [h]		☞ See chapter Automatic zero point, Page 54.
Modus Slave ID		Modbus address of the instrument for the remote control via Modbus
Hold delay after purge		Time in which Analog outputs maintain their value after zero-point measurement
Aux connector		Analogue input for TC, 0-10 V, 4...20mA, RS485

5.5.Water monitoring

The analyser measures the water concentration of the sample gas in the infrared measuring cell. A measurement of different sample gas components is particularly accurate if the water concentration in the measuring cell is as constant as possible and does not change after the zero point has been taken. Reasons for a change can be a gradual drying out of the gas cooler or subsequent components. The analyser offers with this menu item the possibility to recommend or even start a new zeroing based on the water measurement.

HINWEIS

The accuracies achieved in the proficiency test are realised without this monitoring and derived zero point taking. This monitoring is only intended for higher accuracy requirements and is deactivated in the delivery state.

- You have the possibility to set a permitted deviation between the reference value and the current value.
- You have the possibility to set an allowed duration of the Deviation
- You have the possibility to set the time when the water monitoring should start after the zero point has been taken.

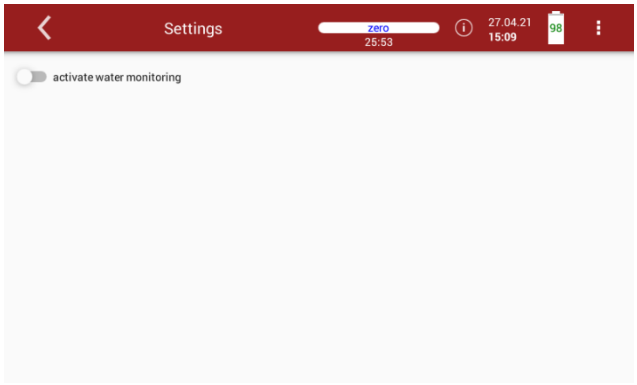
▶ Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

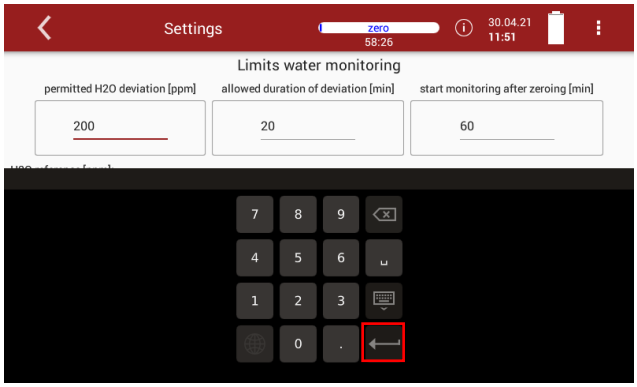
▶ Press Water monitoring.

⇨ A window appears.

▶ Activate water monitoring



⇨ A window appears.



▶ Set the permitted H20 deviation [ppm].

▶ Confirm the value with ↵.

▶ Set the allowed duration of deviation [min].

▶ Confirm the value with ↵.

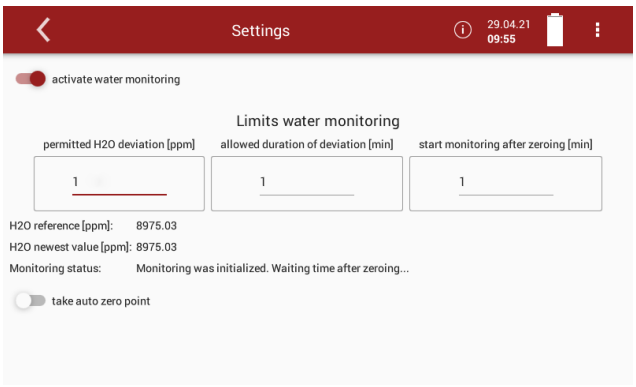
▶ Set the time after the zero point has been taken, when water monitoring is to be started.

▶ Confirm the value with ↵.

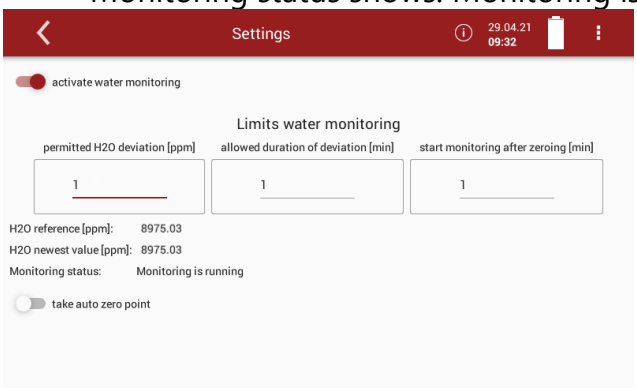
▶ Wait until zeroing is completed.

⇨ After zeroing, H_20 reference [ppm] value is displayed.

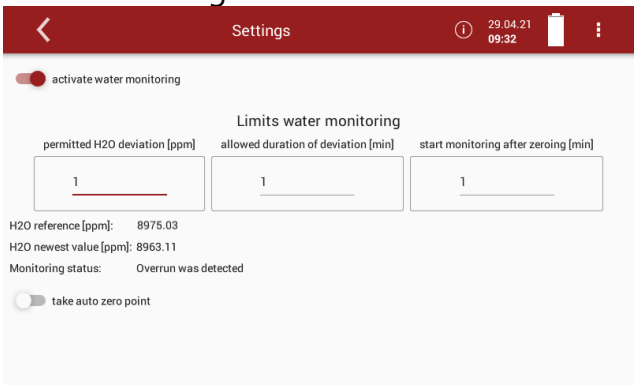
⇨ Monitoring status shows: Monitoring was initialized. Waiting time after zeroing.



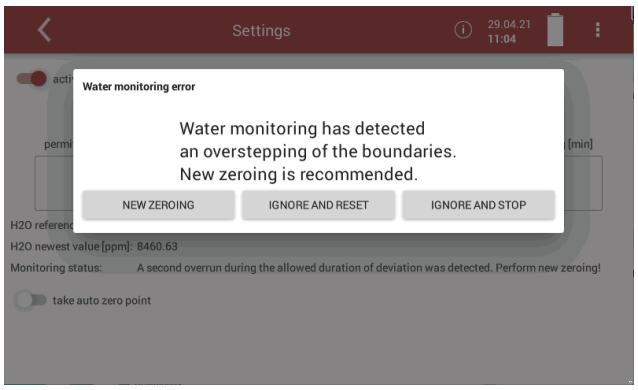
⇨ After the set time from start monitoring after zeroing has elapsed, monitoring starts.
Monitoring status shows: Monitoring is running



⇨ The analyser continuously displays the newest H_20 value [ppm].
⇨ As soon as the permitted H_20 deviation [ppm] is exceeded, the status changes to: Overrun was detected.



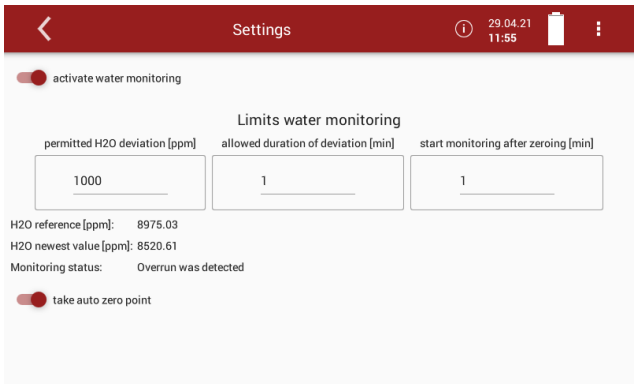
⇨ If the allowed duration of deviation [min] is exceeded, the status changes to: A second overrun during the allowed duration of deviation was detected. Perform new zeroing!
⇨ A message appears.



► You have the possibility to perform a new zeroing.
► You have the possibility to ignore the message and reset the water monitoring. The water monitoring starts again.
► You have the possibility to ignore the message and stop the water monitoring.

You can also set, that a zero point is taken automatically

► Activate take auto zero point.



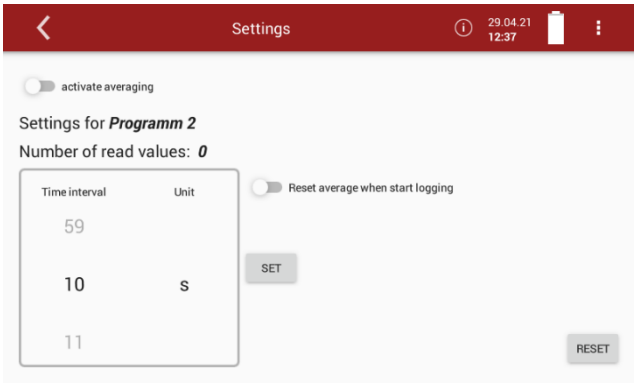
⇨ After a second overrun was detected, zeroing starts automatically.

5.6.Averaging

You can set that a permanent averaging is performed.

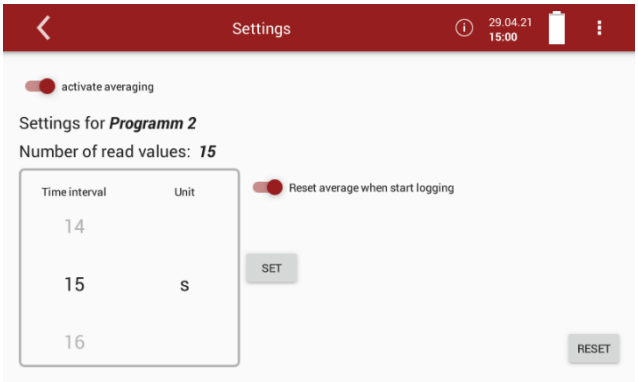
► Open the menu Settings.
☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Averaging.
⇨ A window appears.



► Set the desired Time unit. You can choose between
► minutes and seconds.
► Set the desired Time interval
► Press SET

⇨ The averaging starts.
⇨ The number of read values is counted up according to the set time interval.
⇨ As soon as the set time interval is reached, the number of read values remains constant.



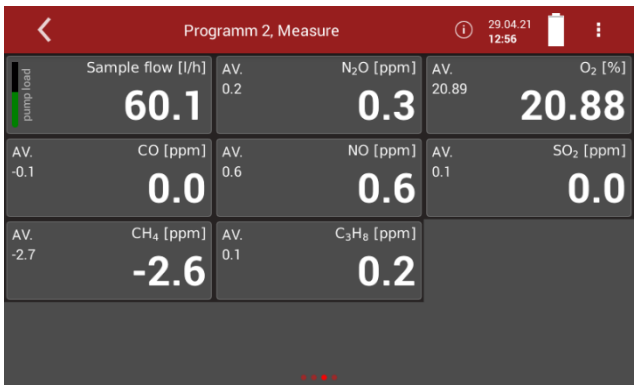
You can set that at the start of an Auto-measurement (logging) the average values are reset.

► Activate Reset average when start logging.

NOTE

Note that average values are only exported for single measurements (from a certain point in time) in a CSV export. Average values can be displayed in an Auto-measurement to check a measurement for plausibility.

If averaging is activated, the average values are displayed in the measurement window.



NOTE

Please note that average values are displayed immediately in the measurement window, even if the set time interval has not yet been reached. The average value is then calculated from the values read so far. As soon as the set time interval has been reached, the average value is constantly recalculated by replacing the last value read with the currently read value.

5.7.Interval measurement

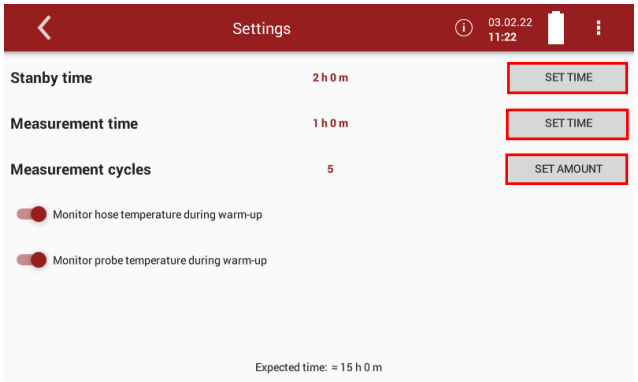
You have the possibility to perform an Interval measurement.
You can set the duration of the Measurement time, the duration of the Standby time and the amount of the Measurement cycles.
The analyser will go into standby mode between intervals.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

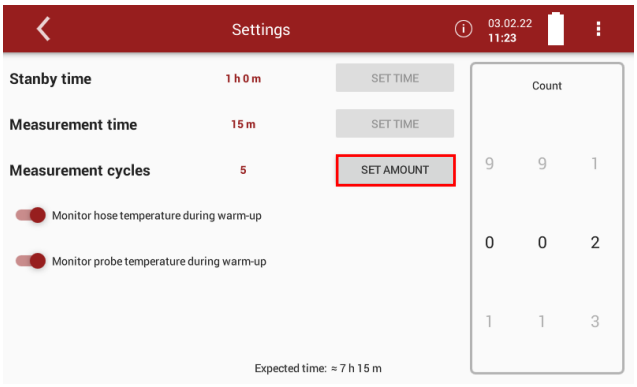
► Press Interval measurements

⇨ A window appears.

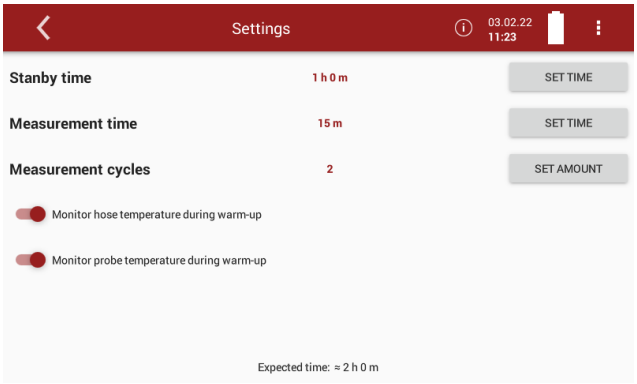


► Press SET TIME / SET AMOUNT to set the duration of the Standby time, the duration of the Measurement time and the amount of Measurement cycles.

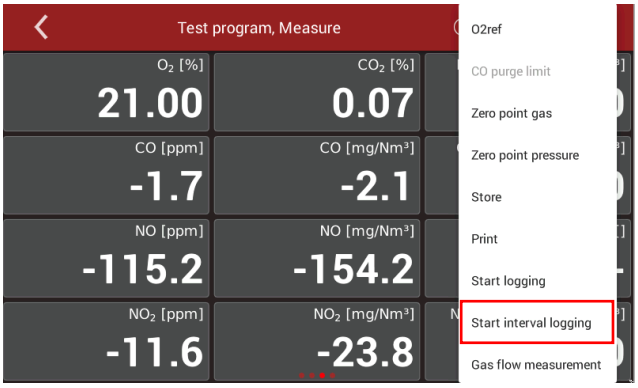
⇨ A separate input window appears for each setting.



▶ Set the duration of the Standby time, the duration of the Measurement time and the amount of Measurement cycles.
▶ Press TAKE TIME OVER / SET AMOUNT.
⇨ The set time/amount is taken over.
⇨ The expected time is adjusted.

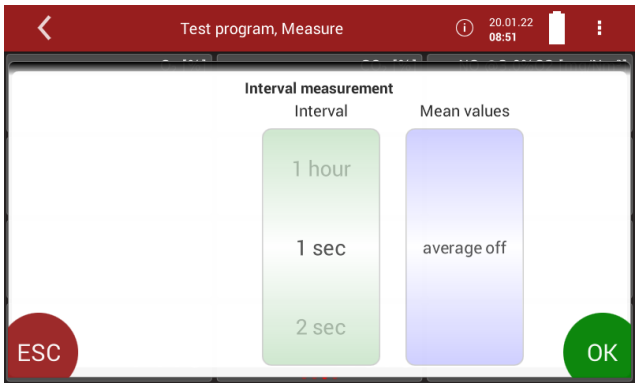


▶ Activate / deactivate whether the heated hose temperature should be monitored during heating.
▶ Activate / deactivate whether the probe temperature should be monitored during heating.
▶ Go to the menu Measure.
▶ Press the Context menu
⇨ A selection list appears.



► Press Start interval logging.

⇨ A window appears.



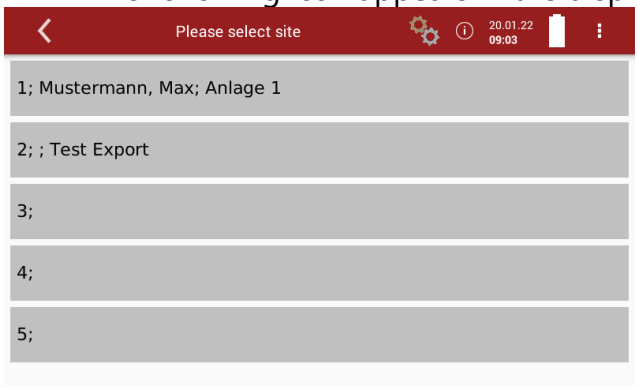
► Set the desired interval.

► Set whether Mean values should be calculated.

► Press OK.

⇨ The menu Please select site appears.

⇨ The following icon appears in the display



► Select the desired site.

⇨ The measuring window appears.

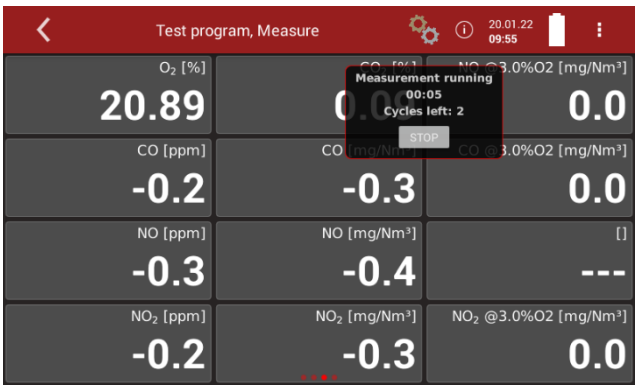
► Press

⇨ A window appears.

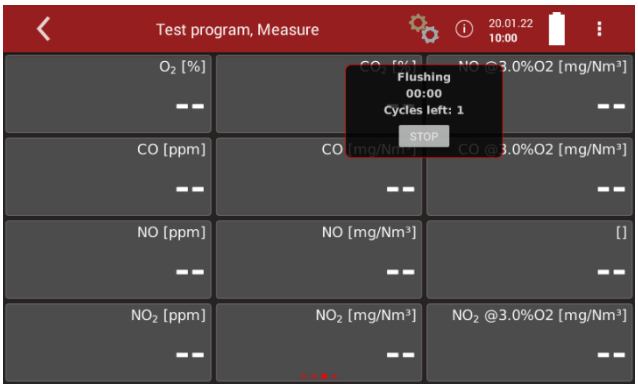
NOTE

To stop displaying the window, press the button again.

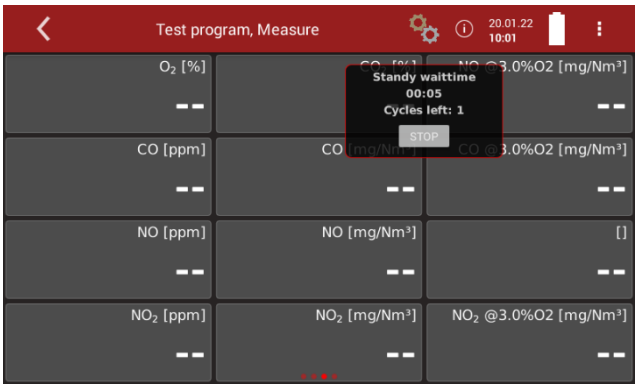
⇨ Information on the remaining time of the measurement and the remaining measurement cycles is displayed.



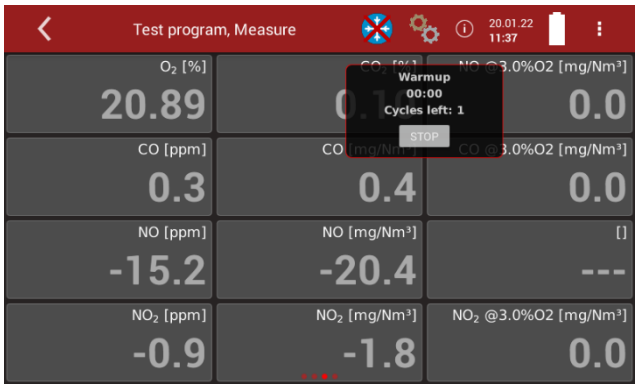
⇨ After the set measurement time has been completed, a flushing process is initiated.



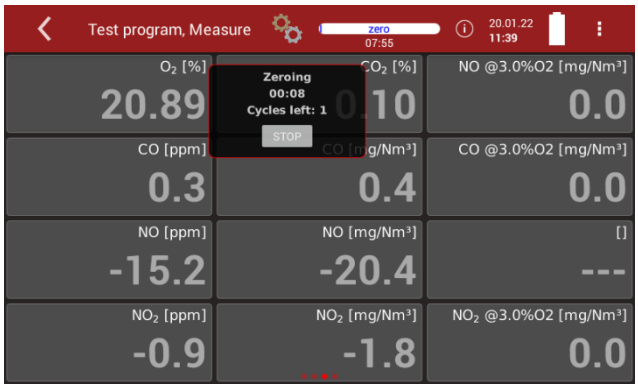
⇨ After the flushing process, the analyser is put into standby mode.
⇨ The remaining standby/wait time is displayed.



⇨ After the set standby time has elapsed, a warm-up phase is initiated.



⇨ After the warm-up phase has elapsed, a zeroing is initiated.



⇨ After taking the zero point, another measurement is started
⇨ The process repeats itself according to the set amount of measurement cycles.

5.8.Programs

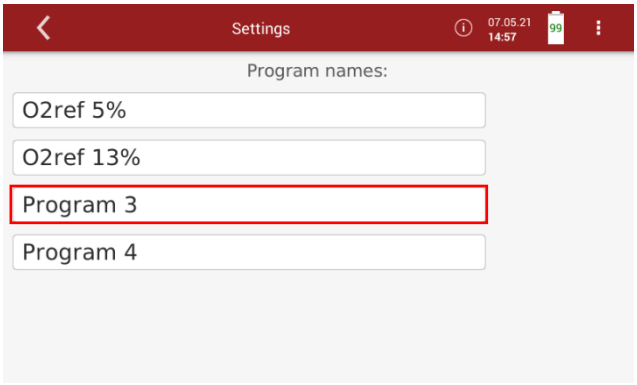
You can change the Program names.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Programs.

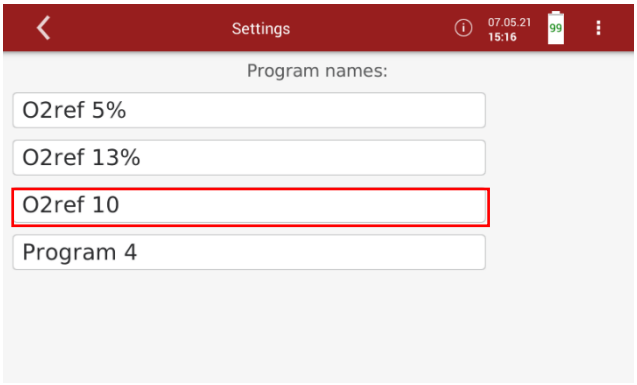
⇨ A window appears.



► Select the program you want to change the name for.

⇨ A keybar appears.

► Enter the desired Program name.

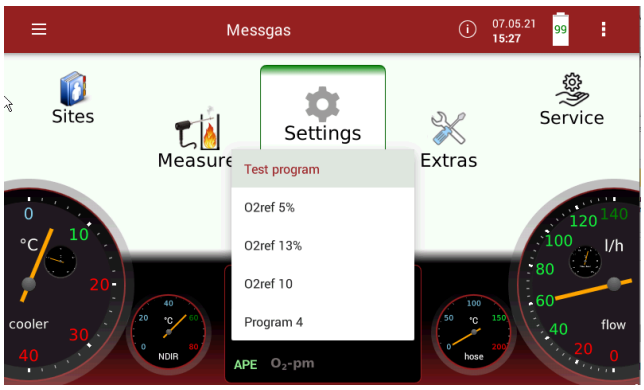


► Exit the menu

► Press Selected measuring program.

☞ See also chapter 4.2 Operating panel, Page 19.

☞ The changed program name is shown in the display.



5.9.Analog output setup (4-20mA)

There are 8 Analog outputs (4-20 mA) available.
Each Analog output (channel) is assigned a measured variable and an output range.

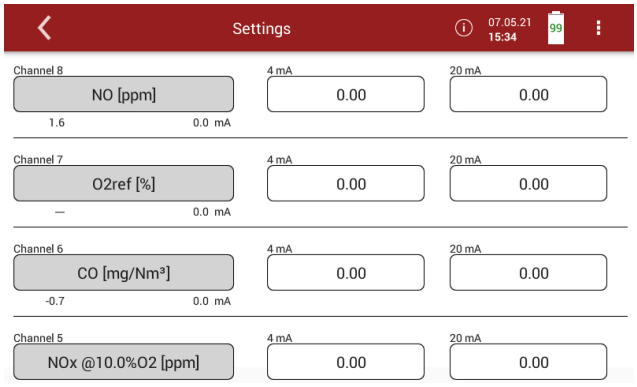
Setting channel

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

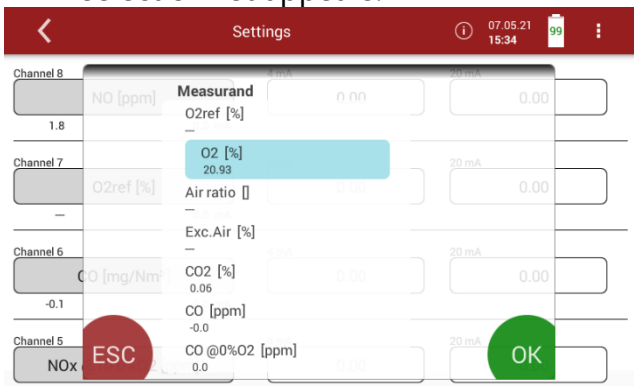
► Press Analog output setup (4-20mA).

⇨ A window appears.



► Choose the desired channel.

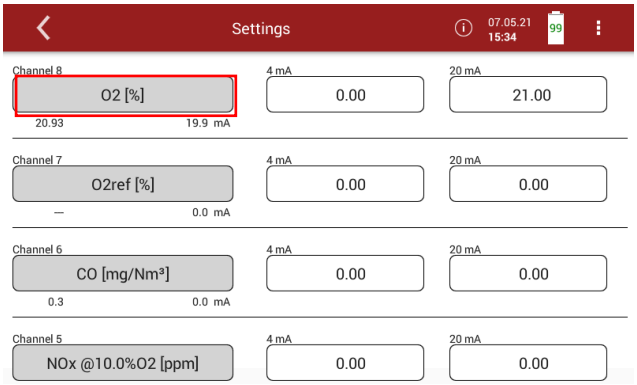
⇨ A selection list appears.



► Choose the desired measurrand.

► Press "OK".

⇨ The measurand is assigned to the desired channel.



Setting lower / higher limit

	NOTE
	Setting lower limit (4mA) This setting determines the lower end value, corresponding to 4 mA. If the measured value falls below the set value, the Analog output stops at 4 mA.

	HINWEIS
	Setting higher limit (20mA) This setting determines the higher end value, corresponding to 20 mA. If the measured value rises above the set value, the value remains at 20 mA.

► Open the menu Settings.

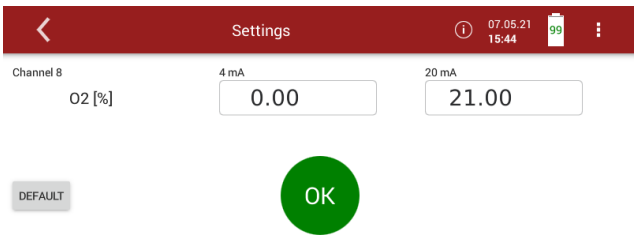
☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Analog output setup (4-20mA).

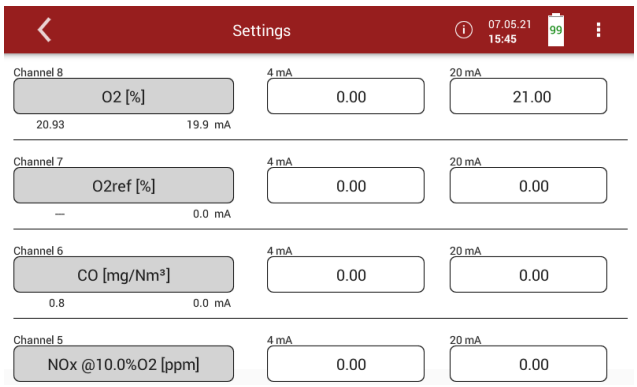
⇨ A window appears.

► Press the 4 mA or 20 mA field to set the limits for a specific channel.

⇨ A window appears.

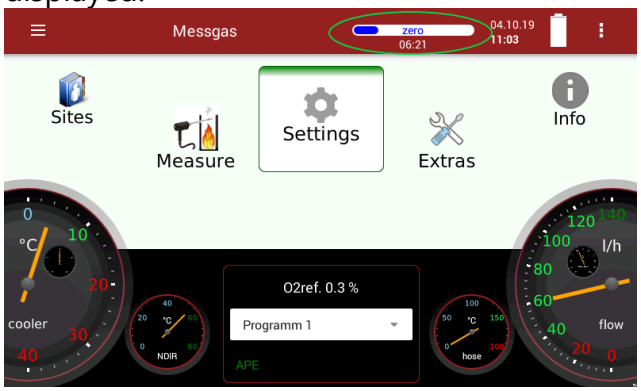


► Enter the desired values for the lower and higher limit.
► Press „OK“.
► Press "Default" to set the default values for the lower and upper limits.
⇨ The lower and higher limit are assigned to the desired channel.



Setting Analog outputs during zeroing

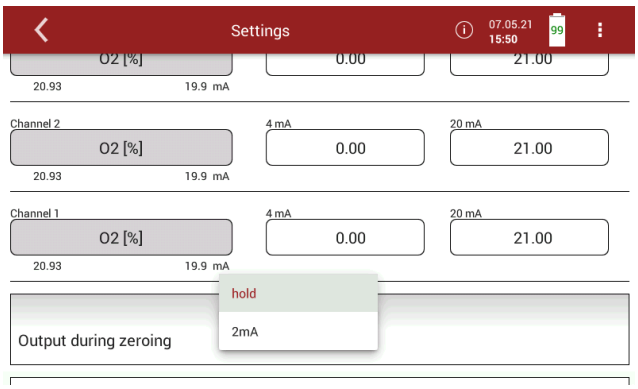
Zeroing starts automatically. The display shows „zero“.
The remaining time until the Zero point measurement ends is displayed.



The following settings are possible:
•Hold - The outputs kept the last values from before zeroing
•2 mA - The outputs change to 2 mA to indicate the zero point

► Open the menu Settings.
☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press „Analog output setup (4-20mA)“.
⇨ A window appears.
► Scroll to "Output during zeroing"
► Press the field.
► Choose the desired option.
►



Pin assignment of the 4-20 mA interface (Analog IN/OUT)

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

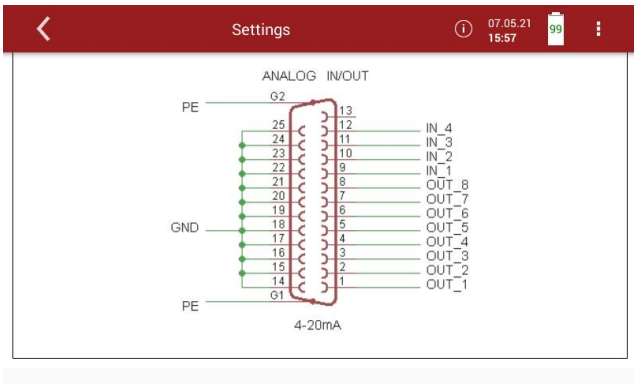
► Press „Analog output setup (4-20mA)“.

⇨ A window appears.

► Press„Analog output setup (4-20mA)“.

⇨ A window appears.

► Scroll to graphic representation of the pin assignment of the 4-20 mA interface.



⇨ The setting is saved.

5.10.Analog input setup (4-20mA)

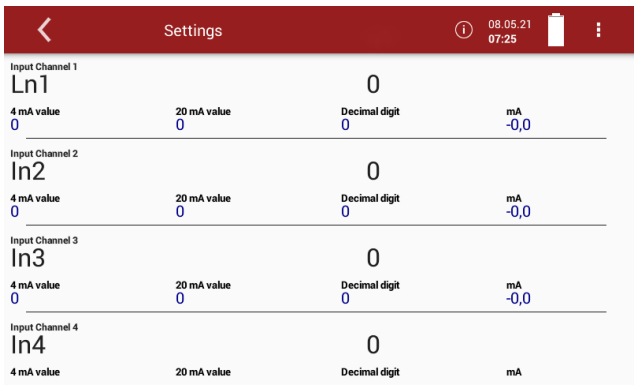
There are 4 Analog inputs (4-20 mA) available.
Each Analog input (channel) is assigned a measured variable and an output range.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Analog input setup (4-20mA).

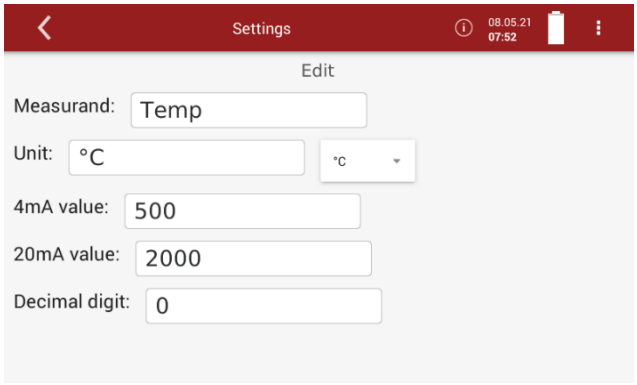
⇨ A window appears.



▶ Choose the desired channel.

⇨ A window appears.

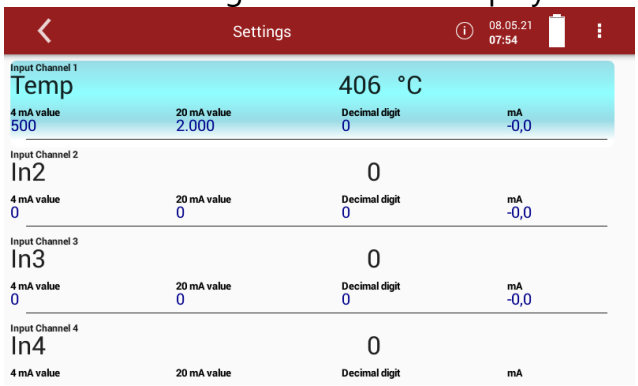
▶ Enter the desired values.



▶ Go back.

⇨ The values appear in the selection list.

⇨ The incoming measurand is displayed.



5.11.Connecting analyser with WIFI (WLAN)

▶ Insert a WLAN-Stick into the Analyser.

▶ Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

▶ Press WIFI.

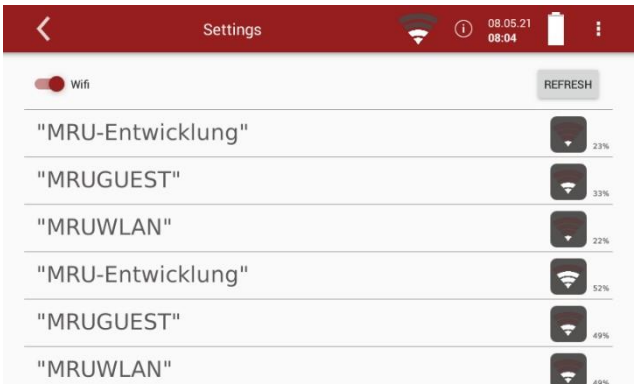
☞ A window appears.

▶ Switch on the WLAN.

⇨ The available WLAN connections are displayed.

NOTE

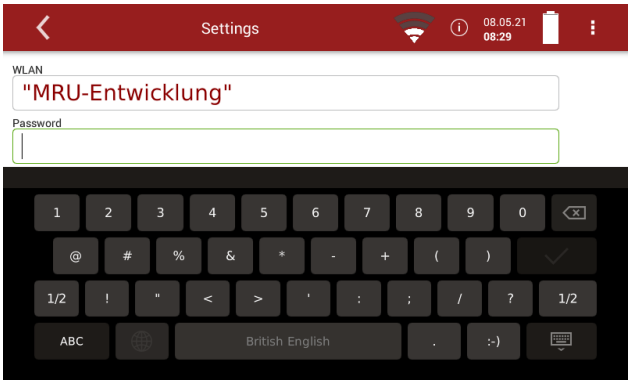
Press the button REFRESH, if no WLAN connection is displayed



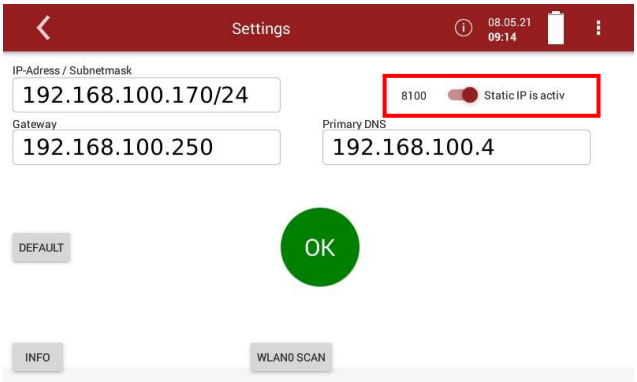
► Select the desired WLAN-Connection.

⇨ A window appears.

► Enter the WLAN password.



► Press „OK".

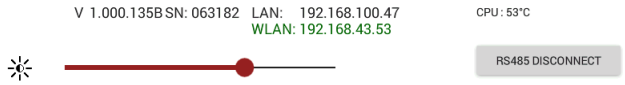


⇨ A connection to the WLAN network is established.

⇨ A WLAN symbol appears in the display.

► Touch the WLAN icon to see the WLAN IP.

► Alternatively, press the context menu button to display the WLAN IP.



► Use the displayed WLAN -IP for MRU4win (in this example 192.168.43.53).

☞ See also Chapter 15.4 Connecting analyser with MRU4win, Page 111.

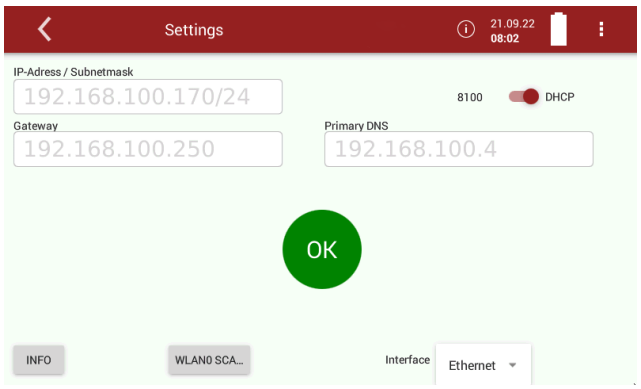
5.12.Getting information about the network

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

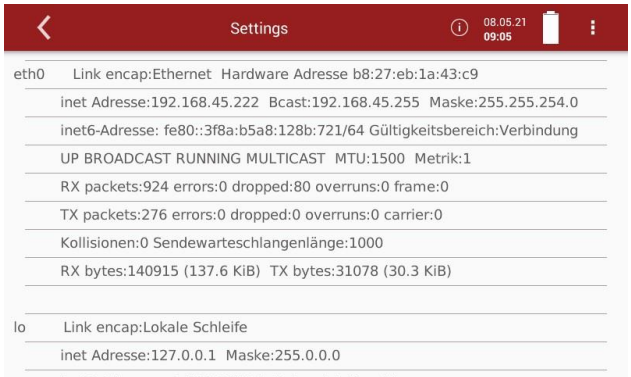
► Press Network.

⇨ A window appears.



► Press INFO

⇨ Information about the network appear.



5.13.Assigning a static IP address

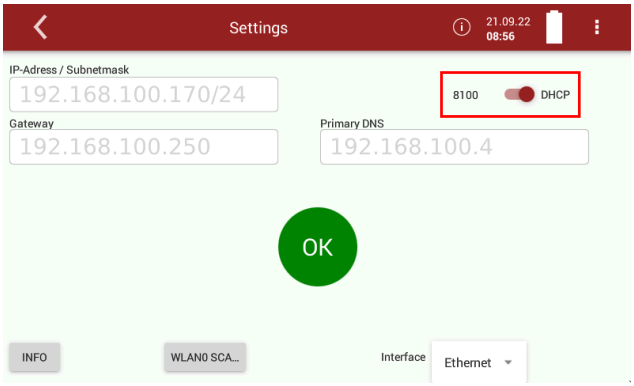
You have the possibility to assign a static IP address via Ethernet or WLAN.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Network

⇨ A window appears.



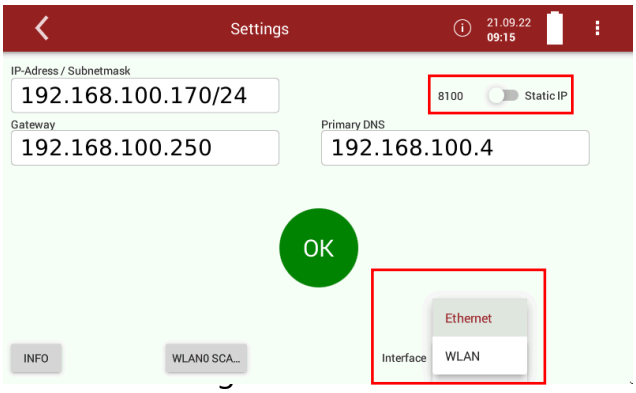
NOTE

If the switch is set to DHCP, the input fields IP address/subnet mask/gateway and Primary DNS are disabled. If the switch is set to DHCP, you cannot assign a static IP address.

► Set the switch to "Static IP".

⇨ The fields for „IP-Adress/Subnetmask“,„Gateway“ and „Primary DNS“ are activated.

⇨ You can assign a static IP address.



► Enter the value for “IP-Adress / Subnetmask, “Gateway” and “Primary DNS”.

► Select the desired interface.

► Press “OK”.

⇨ A window appears.

► Choose the desired option.

⇨ The change takes effect after a restart.

5.14.Serial connectivity (RS485/USB)

You have the option of transferring data wirelessly with MRU4Win to a PC/notebook.
Use the USB Bluetooth converter set (# art. no. 12992).
The USB-Bluetooth converter set consists of two pre-paired and configured converters. The distance can be up to 300m depending on local conditions.

NOTE

Ensure that the analyser is switched off before plugging the USB Bluetooth converters into the USB port.

► Plug a USB Bluetooth converter into the USB port of the analyser.
► Switch on the analyser.
► Plug the second USB Bluetooth converter into the switched-on PC.

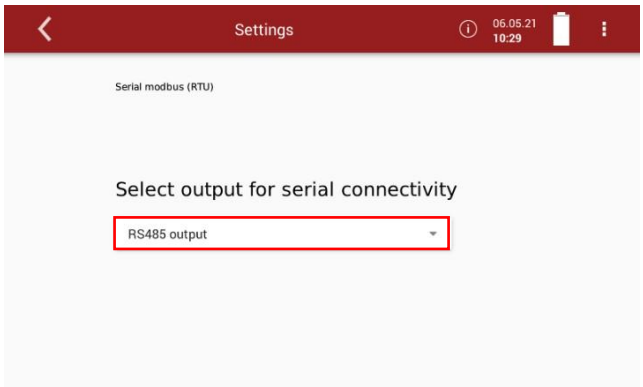
⇨ The middle LED (Connect) should flash on both converters. The two converters are connected.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Select Serial connectivity (RS485/USB)

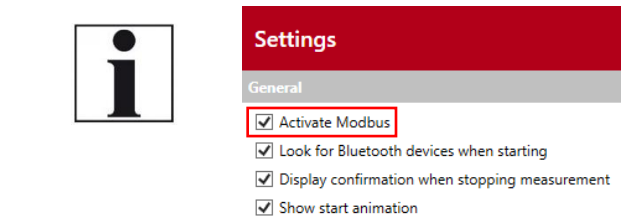
⇨ A window appears.



► Select “use USB-Port (ttyUSB4)
► Start MRU4Win.

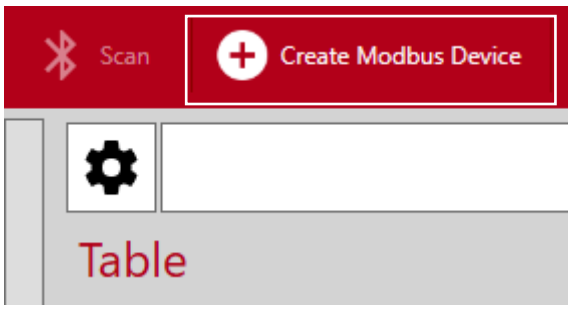
NOTE

Ensure that under "Settings/General" the setting "Activate Modbus" is checked.



► Select Live measurements.

⇨ The menu Live measurements appears.

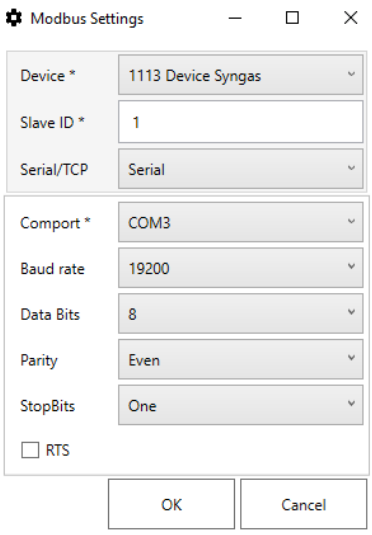


► Click Create Modbus Device.

⇨ The window Modbus Settings appears.

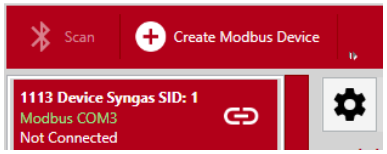
► Enter the following parameters:

- Device = 1113 Device Syngas
- Slave ID = Slave ID of the analyser. In this example the Slave ID is 1.
- Serial / TCP = Serial.
- Comport = The converter creates a new Comport. Please enter this Comport in MRU4Win. In this example the Comport is Com 3. You can find more information in the MS Windows Device Manager.
- Baud rate = 19200
- Data Bits = 8
- Parity = Even
- StopBits = One



► Click OK

⇨ The Modbus Device is created.



► Click

⇨ The connection is established.

5.15.Default settings

You can reset the analyser to factory default.

NOTE

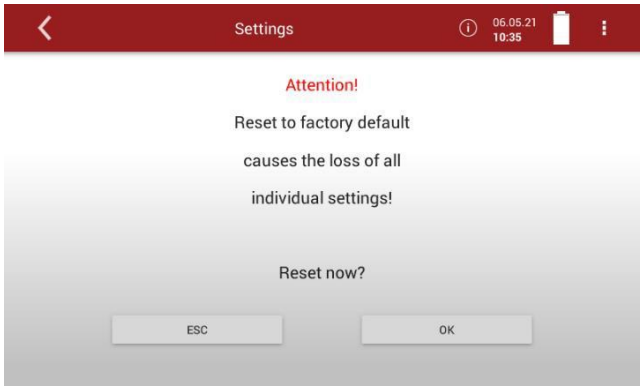
Note that when the analyser is reset to factory default all individual settings are lost.

► Open the menu Settings.

☞ See also chapter 5.1 Open menu Settings, S. 24.

► Press Default settings

⇨ A window appears.



► Press OK.

⇨ The analyser is reset to factory default

5.16. Configuration of measurement program

The Analyser provides in the Measure menu various measurement programs, which can be selected in the main window. Each measuring program defines the properties of the measuring window:

Test program

The measured value window shows predefined values and cannot be changed. Can be used in instrument testing to obtain standardized displays, e.g., can easily be checked with test gases.

Measurement program

The measured value window can be freely set with regard to the displayed measured values.

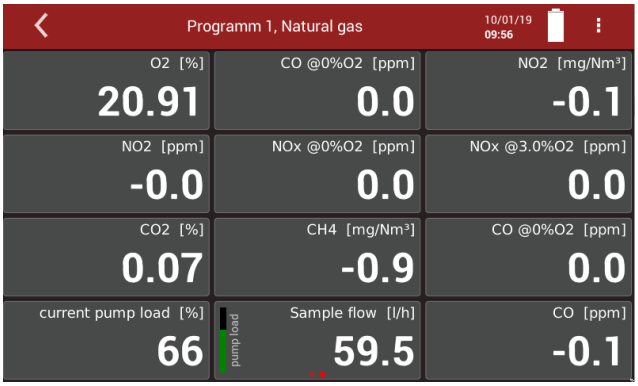
Further measuring programs

The measurement window for gas analysis can be configured and adapted to your needs. The measuring window initially displays 12 measured values, by a scrolling gesture it will display more values.

Moving a value field

► Touch the menu Measure

⇨ The measurement window appears.



► Touch and hold the value field.

⇨ Value field will be framed.

► Move the value field to a different position.

⇨ The other value fields move automatically.

Assign a measured value

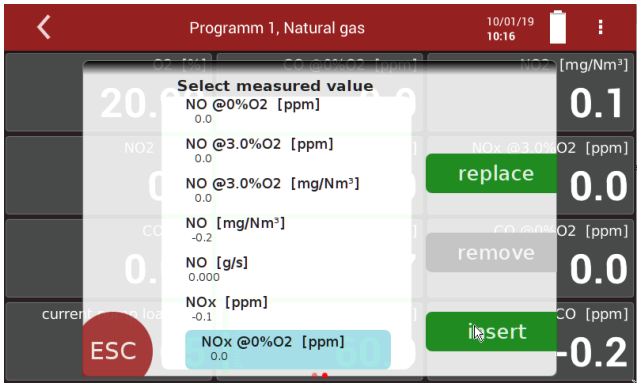
► Touch the menu Measure

⇨ The measurement window appears.

► Double touch the value field.

⇨ A selection list appears.

► Touch the desired measurand.



⇨ You can replace the selected value field with the selected measured value.

⇨ You can insert the selected measured value in place of the selected value field. The previously selected value field moves accordingly.

► Touch „replace “or „insert “.

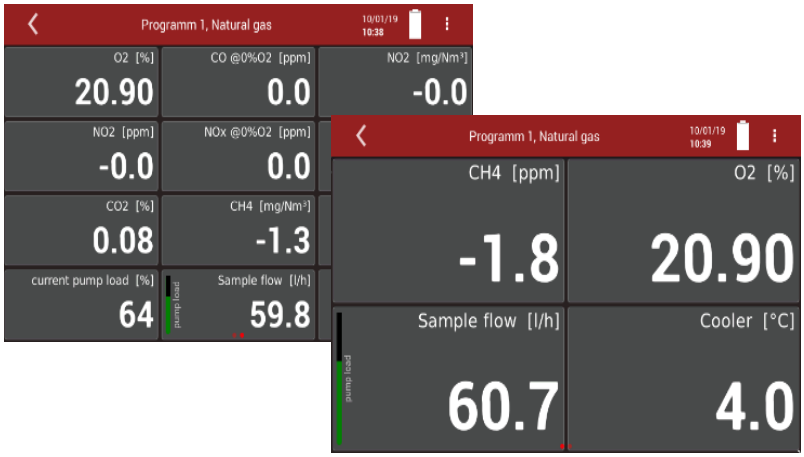
Setting zoom

► Touch the menu Measure.

⇨ The measurement window appears.

► Swipe left on the Touchscreen.

⇨ The measured values are displayed in the zoom display.



6 Measurement

6.1.Preparing measurement

⚠ CAUTION

Acid from the condensate

Acid burns may result from weakly acidic liquids from the condensate.

► If you come into contact with acid, wash the area immediately using a lot of water.

► Note the safety data sheet for phosphoric acid (10%).

⚠ DANGER

Risk due to toxic gases

There is a risk of poisoning.

Noxious gases are sucked in by the measuring device and released into the ambient air.

► Only use the measuring device in well ventilated spaces.

⚠ DANGER

Danger due to flammable sample gas

In the event of a fault, the H2-TCD used can generate a spark and ignite sample gas if necessary.

► In the event of a fault, the H2-TCD used can generate a spark and ignite sample gas if necessary.

Setting up the measuring point

► Place the analyser on a stable surface.
► Unroll the heating hose completely.
► Ensure that the heating hose is not twisted in itself.
► Ensure that all couplings and hose connectors are properly connected.

NOTE

Please note that heating hoses with 110V and 230V are offered.

► Check the voltage supply of the heating hose before commissioning.

► You can operate a 230V heating hose with 110 volts, but with limited heat capacity.

⚠ DANGER

Risk due to improper use

Risk of death due to electric shock

► Do not operate a 110V heating hose with 230V.

Operating temperature

The internal gas cooler operates at 5°C, which is the dew point of the sample gas to the sensors. Components along the gas line may be damaged if they are colder than 5°C and condensation appears internally. Therefore, if the analyser has been stored very cold (below 0°C), it is essential to wait for the analyser to warm up in a warm environment in order to avoid such condensation! In such cases, take a typical warm-up time for the instrument of one hour into account, especially when wet flue gases are to be measured.
If the operating temperature is not within the permissible range, a corresponding message is displayed.

Power supply

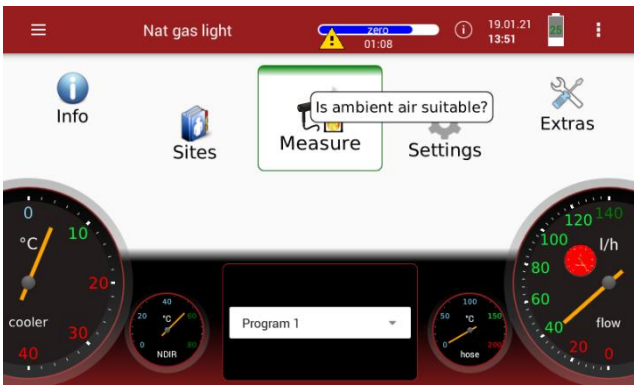
The analyser can be operated with an internal battery to warm up the instrument or to use internal instrument functions. A mains connection is required for the measurement including heated gas sampling probe and heating hose.

Switch-on, warm-up phase, zero point

After switching on, the instrument can always be operated, even if no gas analysis can take place during the warm-up phase. The instrument independently performs the following actions during the warm-up phase:

- Heating the probe and the heating hose
- Warm up the NDIR bench
- After the operating temperatures have been reached, the gas pump is switched on and the analyser takes the zero point with fresh air.
- After the zeroing, the analyser is ready for operation

If a new zero point is required by further heating the instrument, it can be started via the context menu.
If the ambient air is contaminated during the last two minutes of zeroing, the zero point is extended by approx. three to ten minutes.
If there is no serious zero point after the zero-point extension, a message appears in the display.



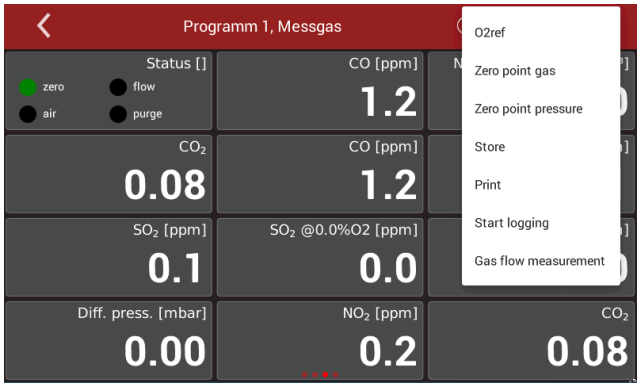
In this case, check the ambient air. If the Setting "Analyser start with – stored zero point "is activated the ambient air is not checked

☞ See also Chapter 5.4 Device settings, Page 26.

Repeated Zero point

It is possible to start a manual zero-point measurement.

► Touch the menu „Measure ".
► Touch the „Context menu "(19).
⇨ A selection list appears.

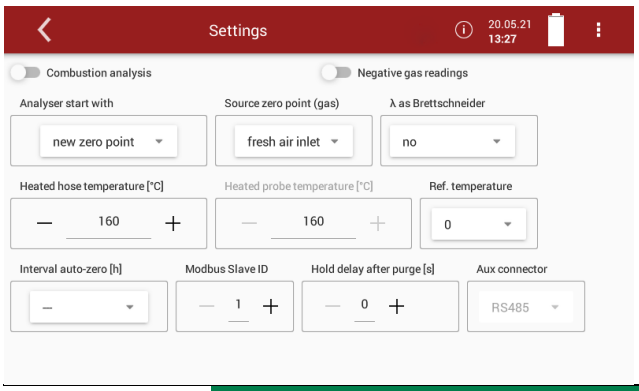


► Press Zero point gas.
► Confirm the zeroing of the gas sensors.
⇨ The Zero-point gas starts.
⇨ The Zero-point gas takes 8 minutes

Automatic zero point

It is possible to set zero-point intervals.
The analyser automatically performs a zero-point measurement within the set interval.

► Set the desired interval auto-zero [h] in the menu Device settings.
See also Chapter 5.4 Device settings, Page 26.



NOTE

Please note that a manually initiated zeroing sets a new time point grid. This depends on the set interval auto-zero [h] in the menu Settings.

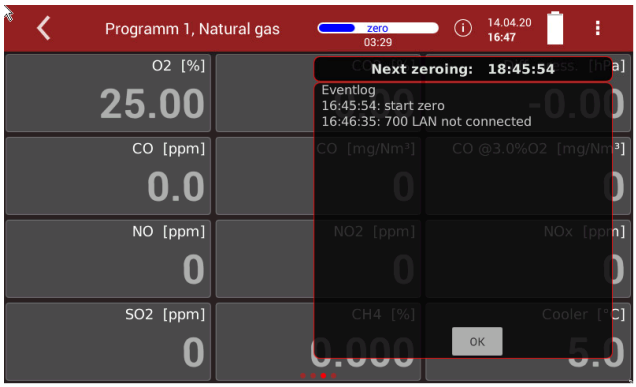
Example:

You have set a zero-point interval [h] of 4 h. The last automatic zeroing took place at 2 pm. The next automatic zeroing would be at 6 pm. At 4 pm you carry out a manually initiated zeroing. The time grid is shifted. The next automatic zeroing takes place at 8 pm.

You can display the time of the next automatic zeroing.

► Touch ⓘ

⇨ A window appears.



If the automatic zeroing is switched off "--- "appears in the display.

Use last valid zero point

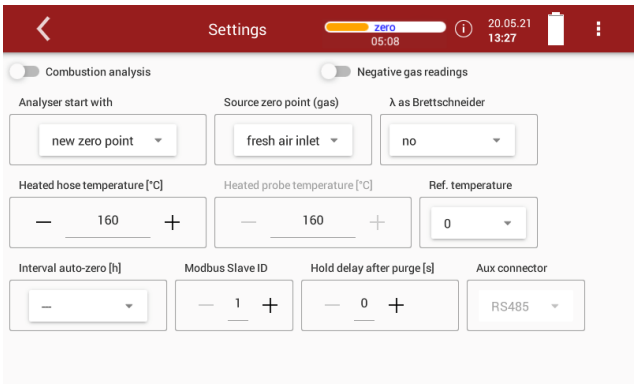
You can set whether the analyser takes a new zero point or continues to work with the latest valid zero point.

► Set in menu Device settings, the Setting " Analyser start with" to "stored zero point".

☞ See also Chapter 5.4 Device settings, Page 26.

⇨ No new zero point is taken after switching on.

⇨ The zero-point bar is orange in this case.



NOTE

Please note that for the O2 sensor, regardless of this setting, a zero-point measurement is performed after each switch-on.

Select Source zero point (gas)

You can select whether zero-point gas is always sucked in via the fresh air inlet.
You can set whether zero-point gas is sucked in optionally via the fresh air nozzle or the probe.

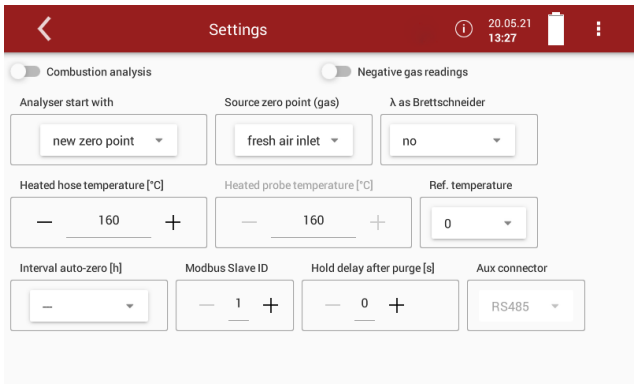
► Open the menu Settings.

☞ See also Chapter 5.1Open menu Settings, Page 24

► Press Device settings

⇨ A window appears.

► Press „Source zero point (gas)".



► Choose the desired option.

⇨ If the option "fresh air inlet" is selected, zeroing is carried out via the fresh air inlet.

⇨ If you select the option "selectable", you have to make further settings.

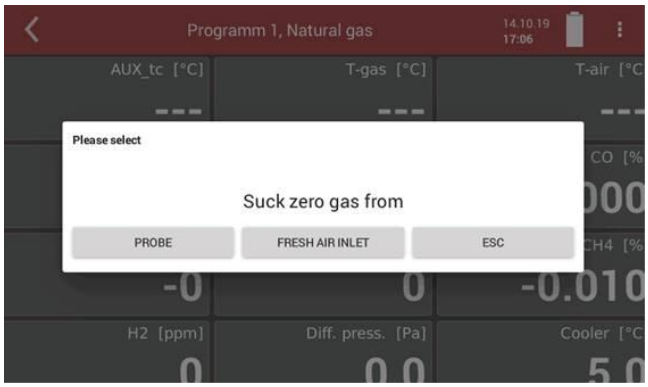
► Go to the menu "Measurement".

► Touch the context menu (19)

⇨ A selection list appears.

► Touch „Zero point gas".

⇨ A window appears.



► Choose the desired option.

⇨ The zero gas is sucked in either via the probe or the fresh air inlet.

NOTE

After switching on, the first zero point is always taken via the fresh air inlet.

Charging state of the battery

The battery symbol in the display indicates approximately the remaining capacity of the battery.
From 2% remaining capacity, the charging indicator starts to flash red. If the instrument is not connected to the mains power supply within one minute, the analyser switches off to prevent battery discharge.
Even when the battery is discharged, the instrument can be operated completely on the power supply.

Connections to the analyser

☞ See Chapter 3.4 Connectors, Page 14.

► Connect the gas sampling probe to Sample gas inlet port (12) (gas coupling and round plug).
► Note that acidic condensate is discharged from the condensate outlet port (9).

NOTE

► Always connect a collection container to the condensate output (9).
► Ensure that the collection container has a sufficient empty volume.
► Dispose of acidic condensate and phosphoric acid in accordance with national and, if necessary, local disposal guidelines.

► Please note that measuring gas may leak at the analyser side or at the Sample gas outlet port (10).
Connect an external pump to the Sample gas outlet port (10), if an electrochemical sensor is installed.
The pump capacity should be approx. 112,5 ln/h, and thus 25% above the typical sample gas flow rate of 90 ln/h.
Connect a hose to the Sample gas outlet port (10), if no electrochemical sensor is installed.
If the "active VENT" option is installed, an internal gas pump feeds the sample gas completely to the Sample gas outlet port (10) and no sample gas enters the enclosure. A discharge gas hose can be connected to the Sample gas outlet port (10).
► Ensure that pollutant-free ambient air can be drawn in at the fresh air inlet (11). If necessary, connect a hose here to bring in such fresh air.

► In the case the option active vent is installed, note that the sample gas at the exit may be diluted with ambient air and is therefore not adequate to be reused in the process

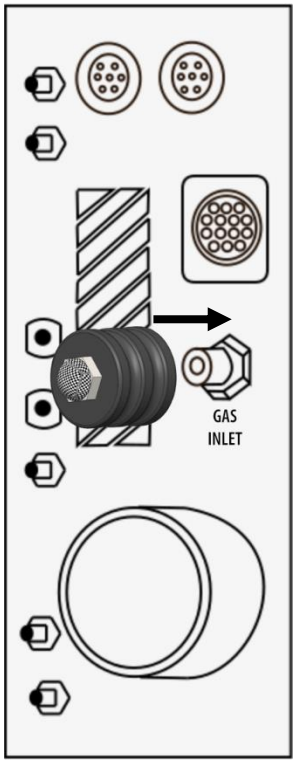
The flow rate of the gas should be within 90 ln/h.
Otherwise, please check probe and filter for clogging.
Check also whether there is a device alarm.
Temperatures of NDIR and heating hose should be within the specified range in order to guarantee a sufficient measuring accuracy.

☞ See Chapter 13 Specifications, S. 104.

Attach clip-on filter

If you operate the analyser without a heated hose, dirt may collect in the gas inlet.

► In this case, plug the supplied clip-on filter onto the gas inlet (12).



Controlling Filters

The filters (probe filter and round filter) must be checked before and after each measurement.

6.2. Take a measurement

Setting O2 reference and Fuel type

► Touch the menu „Measure “.

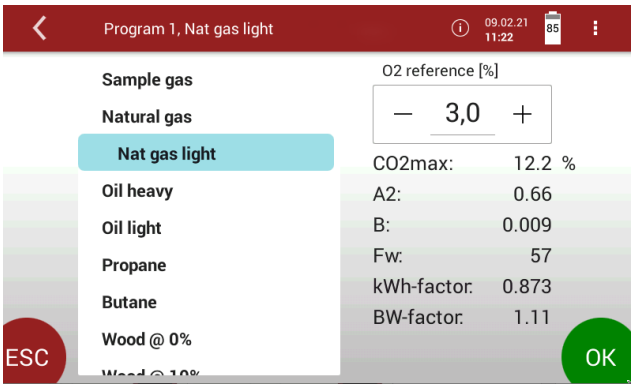
⇨ The measurement window appears.

► Touch the „Context menu “(19).

⇨ A selection list appears.

► Touch „O2ref / Fuel type).

⇨ A window appears.



► Adapt the O2 reference to your sample gas.

► Touch „OK“.

⇨ The setting is saved.

Setting CO purge limit

Electrochemical sensors operate within a specified range and may be damaged due to overload. In the application of flue gas, the CO value may cover a broad range. Therefore, the instrument provides for a protection of the CO sensor including a switch-off valve and purge pump.
During this protection is active, the CO measurement is only supported by a high-range CO sensor or the NDIR bench optionally.

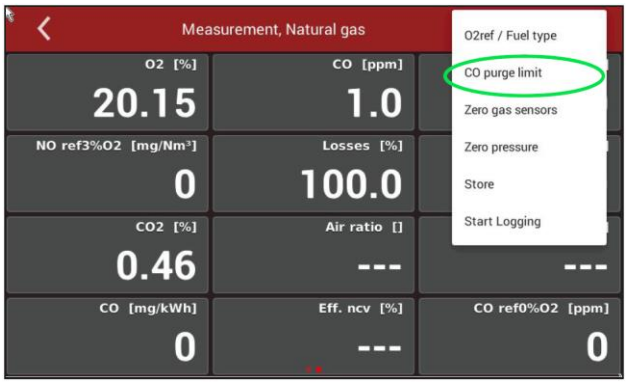
► Touch the menu „Measure “.

⇨ The measurement window appears.

► Touch the context menu (19).

⇨ A selection list appears.

► Touch „CO purge limit“.



A window appears

► Set the desired CO threshold value.

► Touch “OK”.

⇨ The setting is saved.

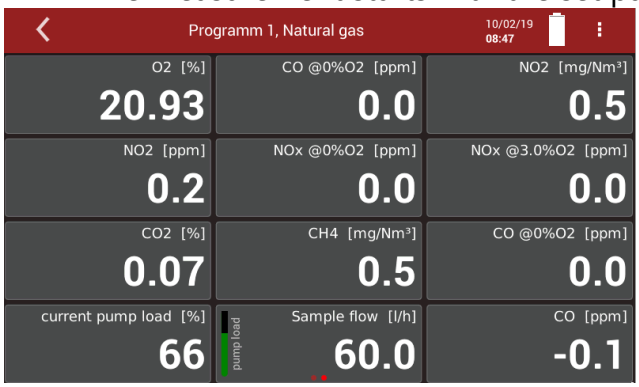
The stored ppm value determines the CO shutdown threshold. If the measured value reaches this threshold, the second fresh air purge pump starts and the CO sensor is separated from the gas path by a valve. If the value falls below 20 % of the threshold value during flushing, the CO sensor is again supplied with sample gas.

Starting the measurement

► Touch the menu Measure.

⇨ The measurement window appears.

⇨ The measurement starts with the set parameters.



Storing measured values

You can assign the measured values to the corresponding site and save them.

► Touch the menu Measure.

⇨ The measurement window appears

► Touch the “Context menu” (19).

⇨ A selection list appears.

► Touch „Store “.

⇨ A selection list appears.

► Choose the desired site.

⇨ The measured values are stored.

The measurement continues until you switch off the analyser.

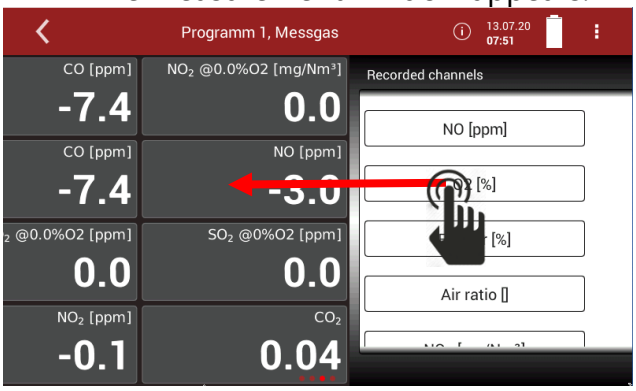
☞ See also Chapter Recalling stored measurements, Page 70.

Select channels for graphic display

You can select a maximum of eight channels and have them displayed graphically.

► Touch the menu

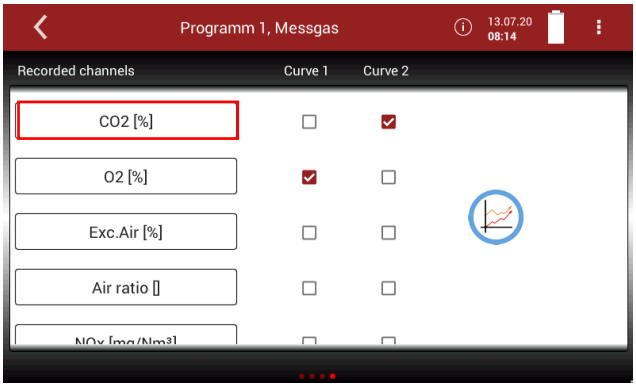
⇨ The measurement window appears.



► Touch the display.

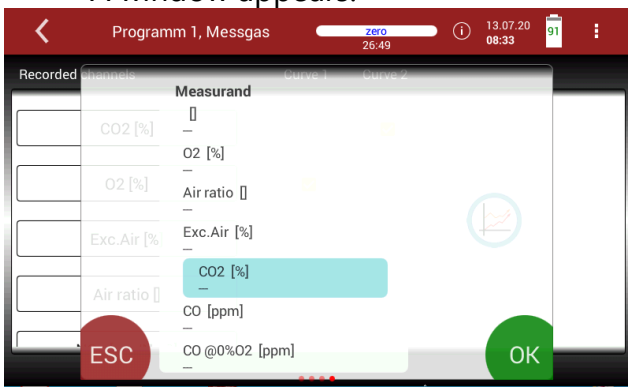
► Move the window to the left.

⇨ The window with "Recorded channels" appears.



► Press a measurand that you want to replace.

⇨ A window appears.



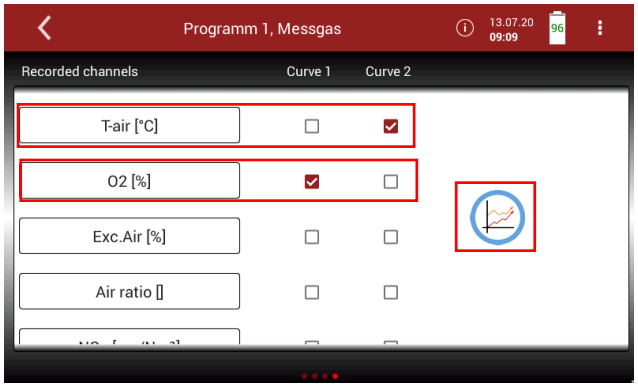
► Select the desired measurand.

► Press OK.

⇨ The measurand is replaced.

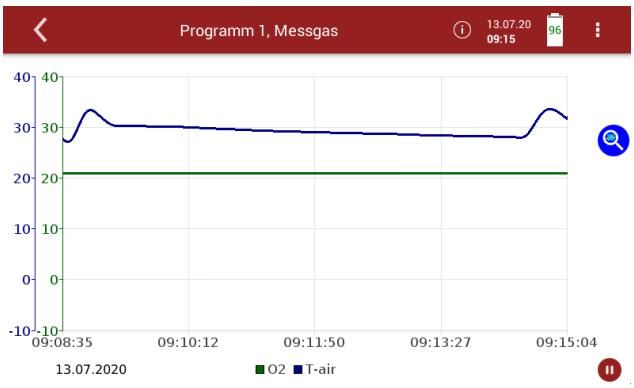
You have the possibility to display two measurands simultaneously as a curve.

► Set check marks at "Curve 1" and "Curve 2" for the measurands you want to display as a curve.



► Press the graphic symbol.

⇨ A diagram appears.

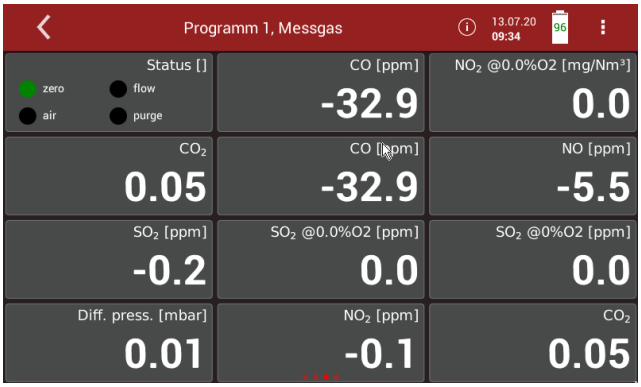


► If necessary, touch ⏸ to stop the graphical display.
The measurement will be continued in the background.
► If necessary, touch ▶ to continue the graphical display.

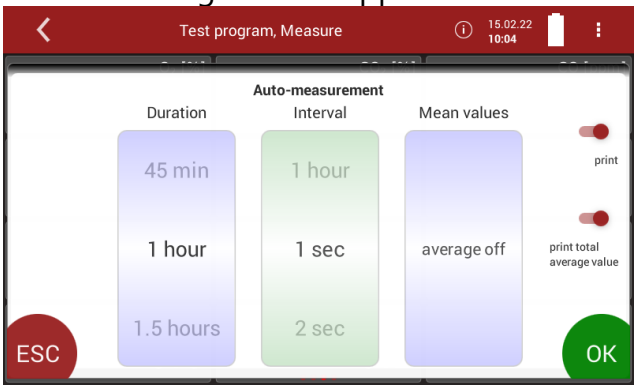
Starting Auto-measurement

You can record the measured values for a defined period and have them displayed graphically.

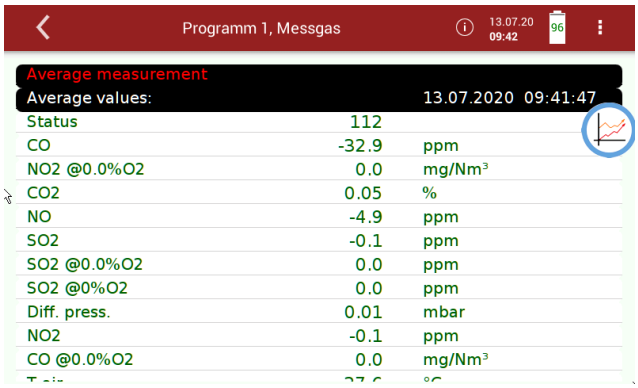
► Touch the menu Measure.
⇨ The measurement window appears.



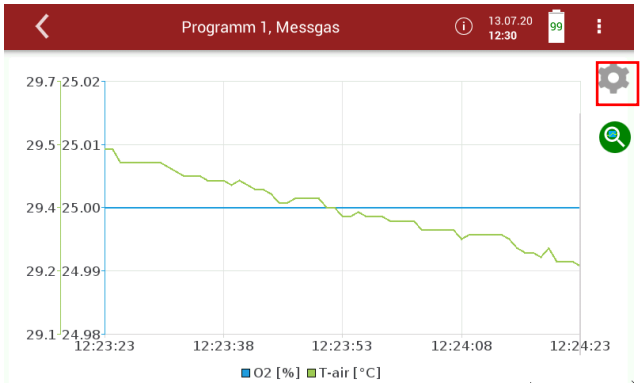
► Touch the "Context menu" (19).
⇨ A selection list appears.
► Touch „Start logging "
⇨ A setting window appears.



► Set the desired measurement duration.
► Set the desired interval.
► Specify whether a mean value is to be calculated.
► Touch „OK “
  ⇨ The window „Please select site “appears.
► Select the desired site.
  ⇨ The Auto-measurement starts automatically.
  ⇨ The Auto-measurement ends automatically.
  ⇨ A protocol of the Auto-measurement appears



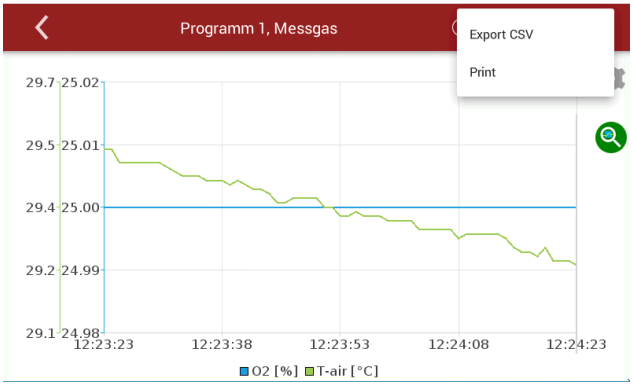
► Press the graphic symbol.
  ⇨ A diagram appears.



► If necessary, press the gear wheel symbol to display other measurands in graphical form.

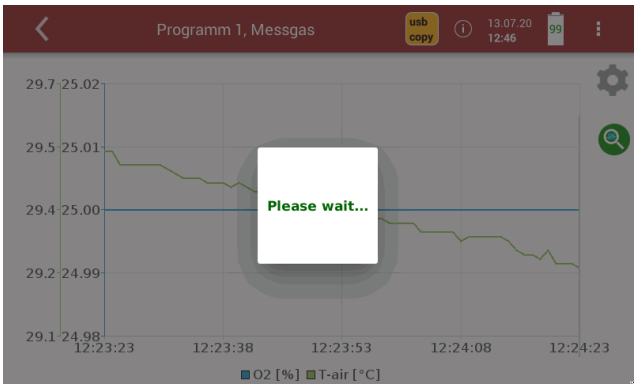
You can also export or print the data of the automatic measurement.

► Insert a USB-stick into the analyser.
► Touch the context menu.
  ⇨ A Selection list appears.



► Select Export CSV or Print.

⇨ The data is exported or printed



NOTE

If a zero point was taken during a Auto-measurement (manually initiated or by a set time interval), the measured values are kept constant in the display. Immediately before the end of the zeroing, the real measured values are displayed again.

Stopping Auto-measurement

The Auto-measurement can be stopped manually at any time.

► Touch the context menu (19) while the measurement is recorded.

⇨ A selection list appears.

► Touch „Stop logging “

⇨ The Auto-measurement is stopped.

7 Data memory

7.1. Organizing data memory

Base of the data memory of the analyser is a set of sites stored in the instrument. Every site exists of a unique site number and 12 freely usable text lines which can have, e.g., the address, customer name etc.

- The instrument can store up to 1.000 different sites.
- Sites can be created in the instrument and be changed.
- Measurements are stored by assigning them to a site.
- Measurements can be, on this occasion, singles flue gas measurements or other measuring programs available in the instrument.

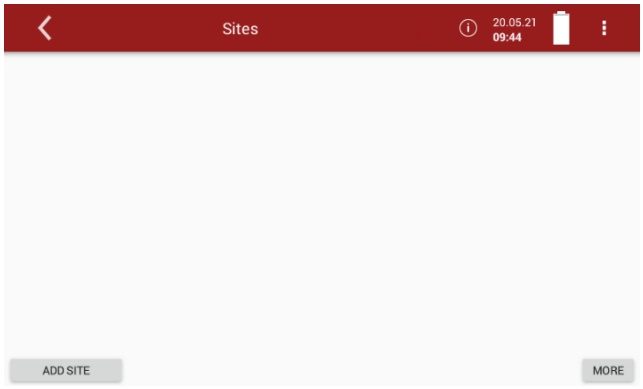
7.2. Managing sites

In the menu Site, you can add a new site, make changes on an added site, delete a site and display a list of saved sites.

Adding a new site

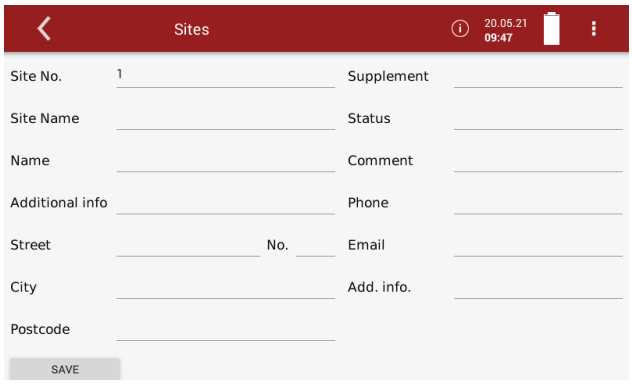
► Press the menu Sites.

⇨ An window appears.



► Press ADD SITE.

⇨ A window appears.



► Enter the site data.

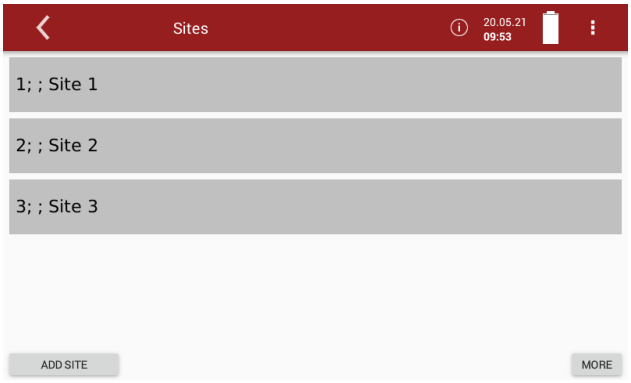
► Touch „SAVE “.

⇨ The site is saved.

Changing site data

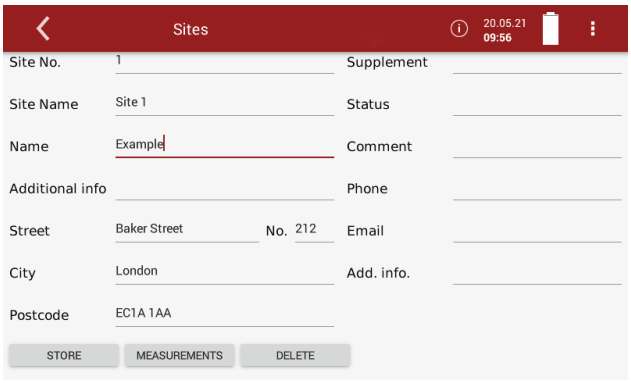
► Touch the menu Sites.

⇨ A selection list appears.



► Select the desired site.

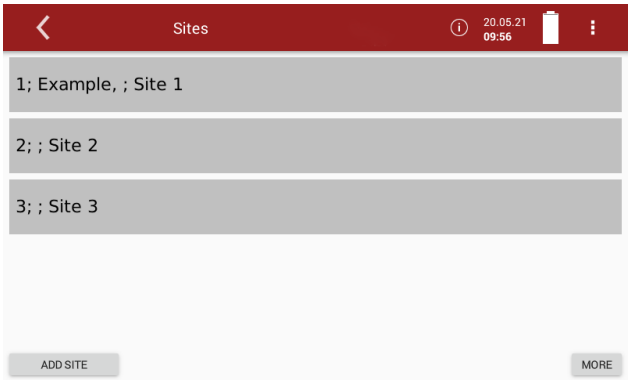
⇨ A window appears.



► Change the desired data.

► Touch „STORE “.

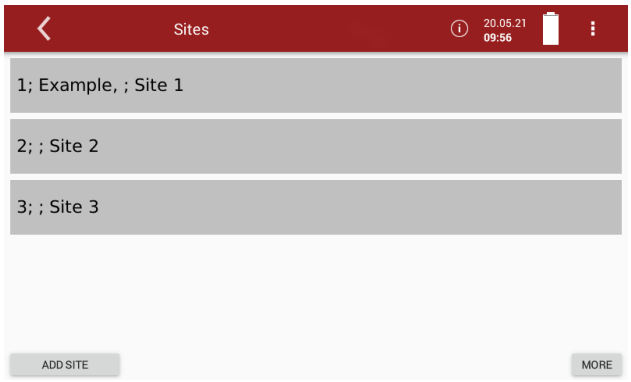
⇨ The changes are stored.



Deleting sites

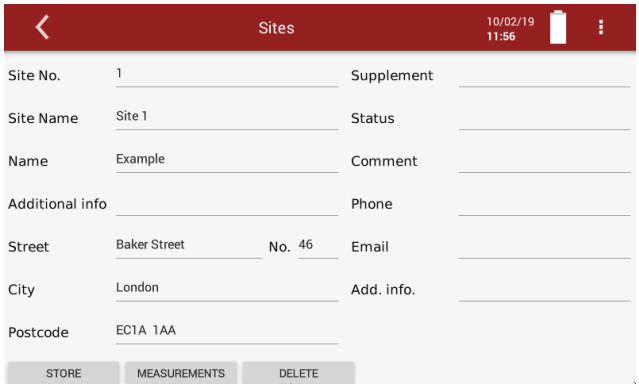
► Press the menu Sites.

⇨ A selection list appears.



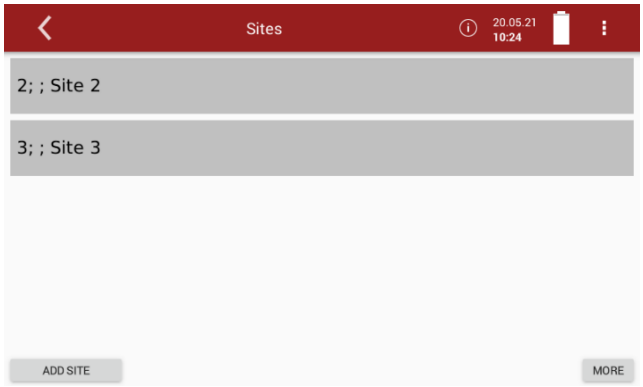
► Select the desired site.

⇨ A window appears.



► Press Delete.

⇨ The site is deleted.



Recalling stored measurements

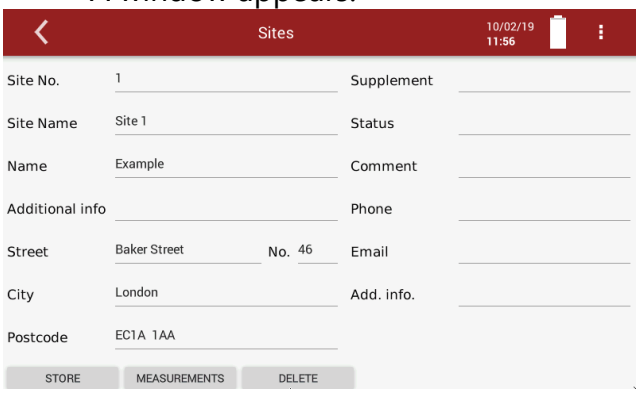
Stored measurement can be displayed individually for each site.

► Touch the menu Sites.

⇨ A selection list appears.

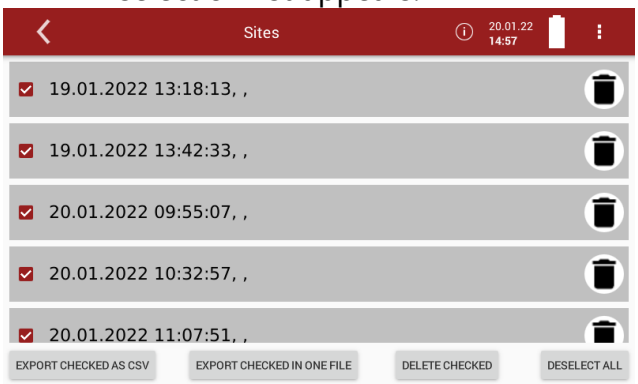
► Touch the desired site.

⇨ A window appears.



► Touch „MEASUREMENTS “.

⇨ A selection list appears.



► Touch the desired measurement.

⇨ The measurement window appears.

Delete stored measurements

There are two ways to delete measurements.

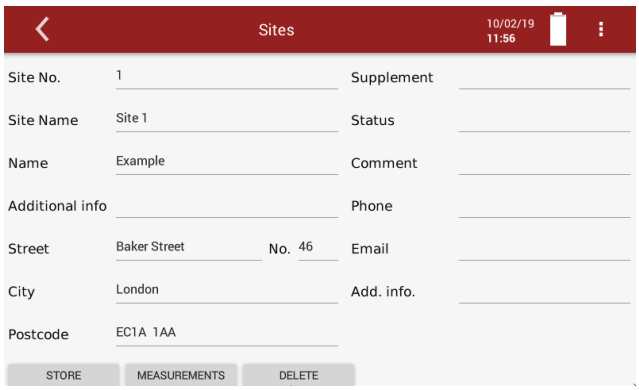
- You can delete measurements individually.
- You can select several measurements and delete them at the simultaneously.

► Press the menu sites.

⇨ A selection list appears.

► Press the desired site.

⇨ A window appears.



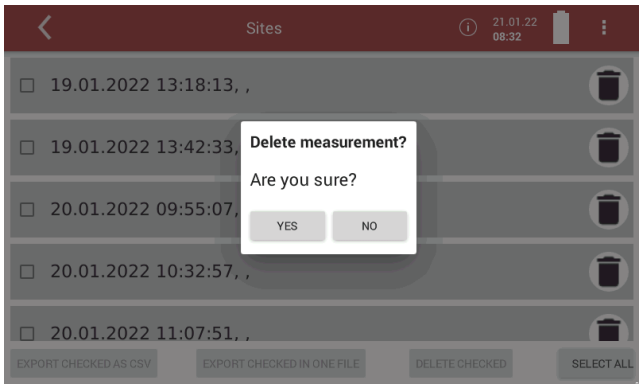
► Press MEASUREMENTS.

⇨ The stored measurements are displayed.

Delete single measurements

► Press

⇨ A message appears.



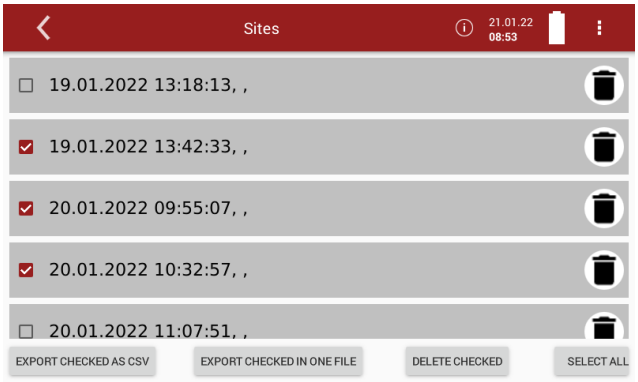
► Press YES

⇨ The selected measurement is deleted.

Delete several measurements

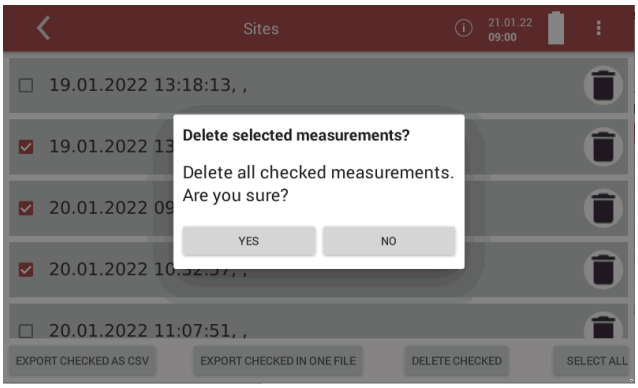
► Select the measurements you want to delete.

⇨ The button DELETE CHECKED becomes active.



► Press the button DELETE CHECKED.

⇨ A message appears.



► Press YES.

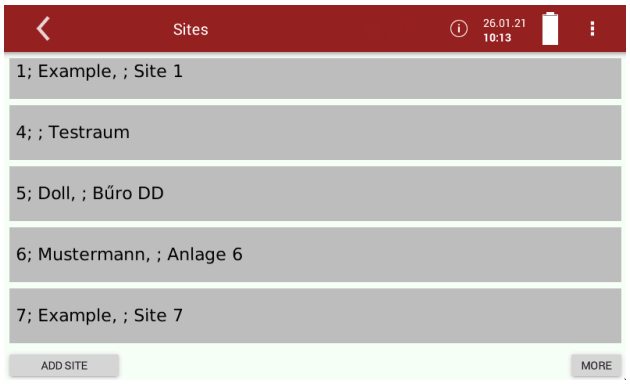
⇨ The selected measurements are deleted.

7.3. Data transfer via USB (CSV export)

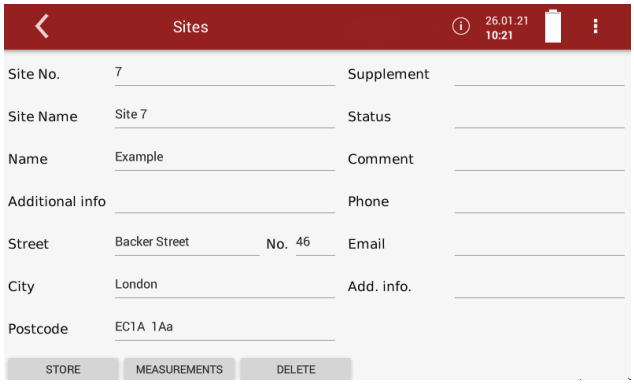
The data exchange format is CSV. A character-separated values (CSV) file is a simple text format for a database table. The analyser uses a semicolon ';' as value separator. CSV is a simple file format that is widely supported, so it is often used to move tabular data between different computer programs, for example Microsoft Excel™ or Access™, that support the format.
The following functions are available

- Export of flue gas measurements

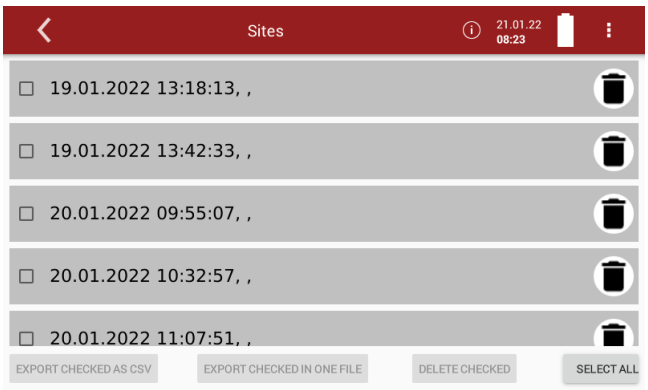
► Insert a USB-stick into the analyser.
► Press the menu Sites.
⇨ A selection list appears



► Select the desired site.
⇨ A window appears.



► Press MEASUREMENTS
⇨ The stored measurements are displayed.



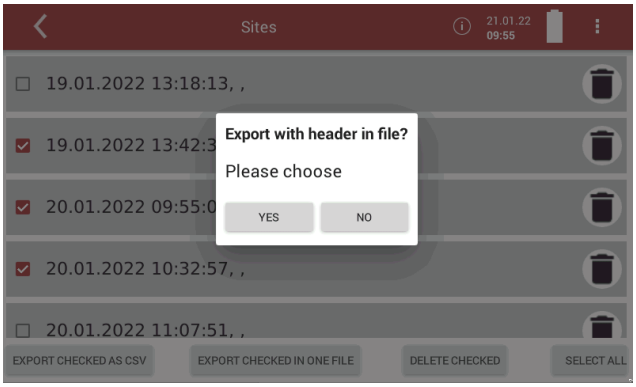
You have the option to export measurements as single files.
You have the option of exporting several measurements in one file.

► Select the desired measurement.

⇨ The button EXPORT CHECKED AS CSV becomes active
⇨ The button EXPORT CHECKED IN ONE FILE becomes active.

► Press EXPORT CHECKED AS CSV or EXPORT CHECKED IN ONE FILE.

⇨ Depending on the selection, the measurements are exported individually or all selected measurements are exported in one file.
⇨ A message appears



► Select, if you want to export with header in file.

⇨ The directory 1113Export is created on the USB stick.
⇨ The selected measurements are stored in the 1113Exportdirectory.

► Open the CSV file.

(Do not use dat-files or internal log files)

Export with header

1	Device data:	MGAprime	063450		
2	Site data: Site 1 Example				
3	Date	Time		O2ref %	O2 %
4	20.05.2021	10:31:01	---	10	20,92

Export without header

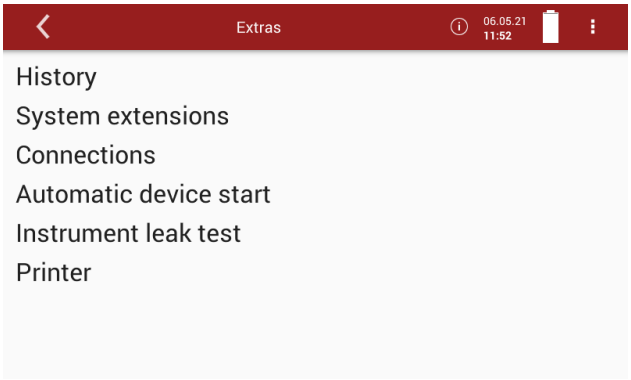
1	Date	Time		O2ref %	O2 %
2	20.05.2021	10:31:01	---	10	20,92
3	20.05.2021	10:31:48	---	10	20,91
4	20.05.2021	10:32:21	---	10	20,93
5	20.05.2021	10:40:29	---	10	20,93

8 Extras

8.1.Open menu Extras

▶ Press Extras

⇨ A list appears



▶ Select the desired menu item.

8.2.History

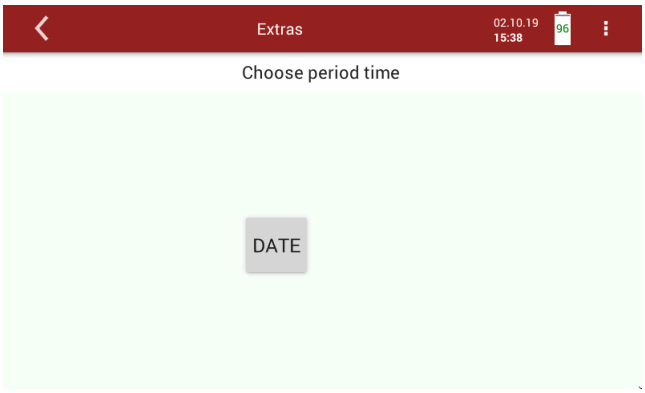
▶ Open the menu Extras.

☞ See also chapter 8.1 Open menu Extras, S. 76

⇨ A selection list appears.

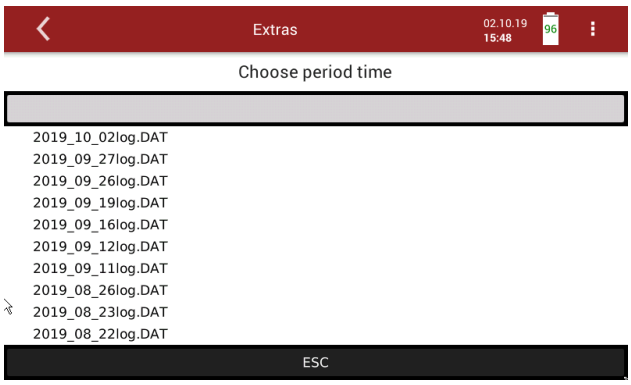
▶ Press „History“.

⇨ A window appears.



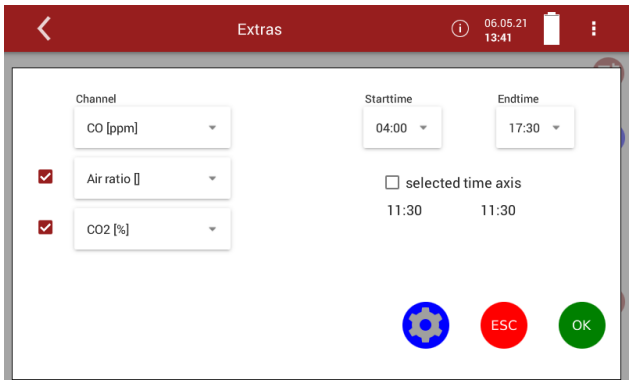
▶ Press „DATE“.

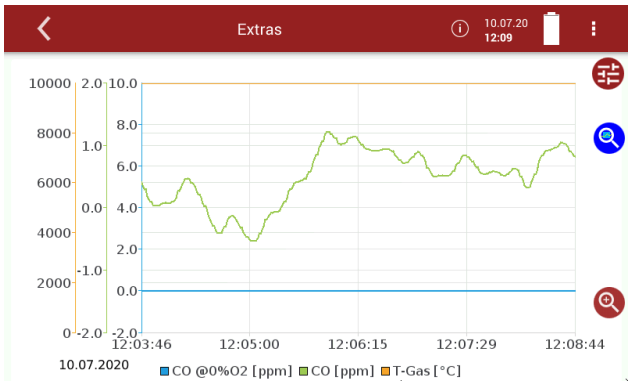
⇨ A selection list appears.



► Choose the desired period time.

⇨ The chosen time period is displayed graphically.



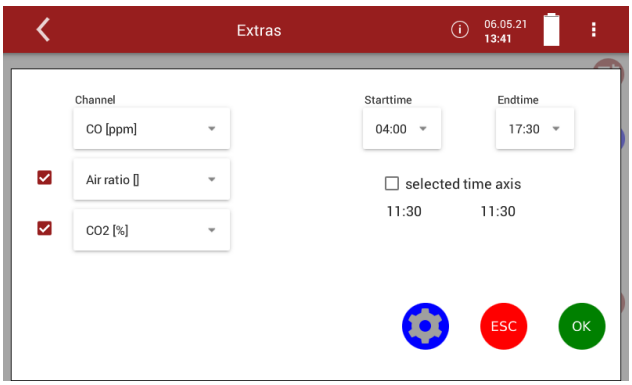


► If necessary, press

⇨ A window appears.

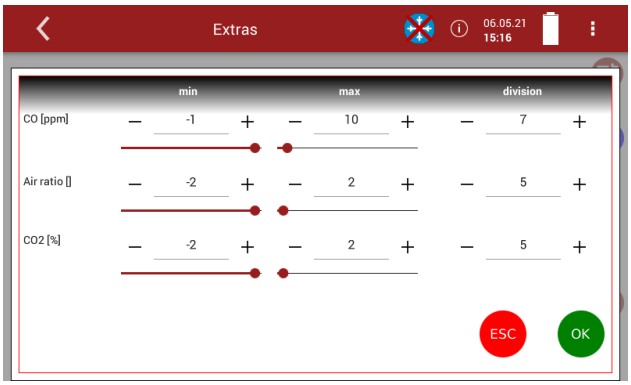
⇨ You have the possibility to change the displayed channels and to have them displayed graphically.

⇨ You have the possibility to change the Starttime and the Endtime. You can activate or deactivate the selected time axis.



► If necessary, press

⇨ A window appears



► You can set min. and max. and the division of the selected channels.
► Press Ok, to exit the window.

8.3.System extensions

You have the possibility to expand the analyser with options.
For this you will receive an option file from the manufacturer.

► Copy the options file onto a USB stick.

NOTE

You can also save the option files in subfolders. The analyser will search the folder structure on the USB stick up to the second hierarchy level. Save the option file in the folder structure above, if the option file is not is displayed

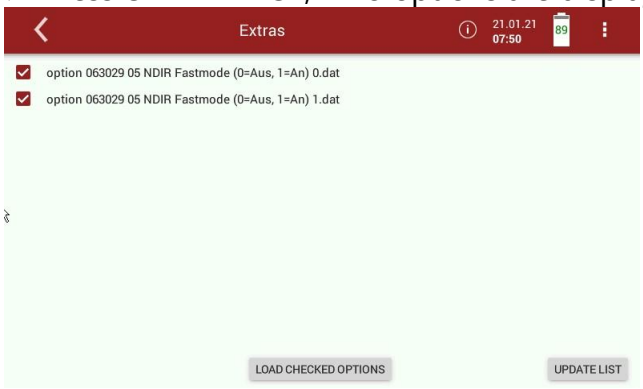
► Insert the prepared USB stick into the analyser.
► Open the menu Extras

☞ See also chapter 8.1Open menu Extras, Page 76.

► Press System extensions

⇨ A window appears.
⇨ The options stored on the USB stick are displayed.

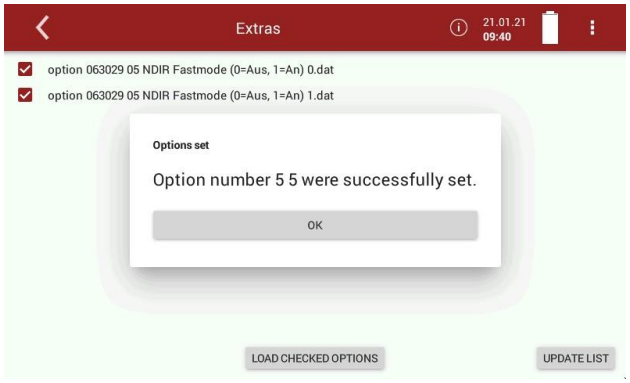
► Press UPDATE LIST, if no options are displayed.



► Select the desired Options.
► Press LOAD CHECKED OPTIONS.

⇨ A message appears.

► Press OK.



⇨ The option was successfully set.

► Perform a restart.

⇨ After the restart, the option is available.

8.4.Connections

You can view the connections on the display of the analyser.

► Open the menu Extras

☞ See also chapter 8.1 Open menu Extras, Page 76.

► Press Connections.

⇨ The Connections of the analyser are displayed.

☞ See also chapter 3.4 Connectors, Page 14.

8.5.Automatic device start

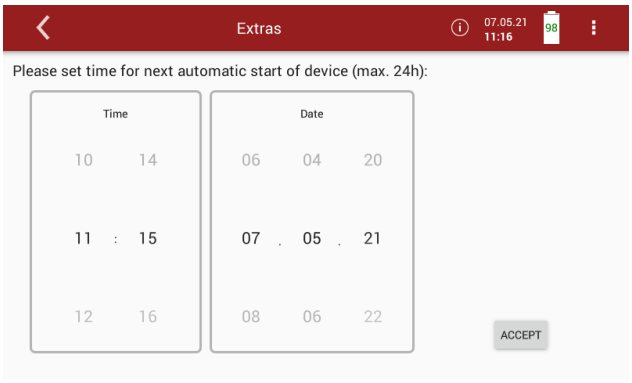
You have the possibility that the analyser performs an automatic device start at a time determined by yourself.

► Open the menu Extras

☞ See also chapter 8.1 Open menu Extras, Page 76.

► Press Automatic device start

⇨ A window appears.



► Set the desired time for the automatic device start.

NOTE

Note that you can set an automatic device start for max. 24 hours into the future.
A message is displayed if the time interval is too long.

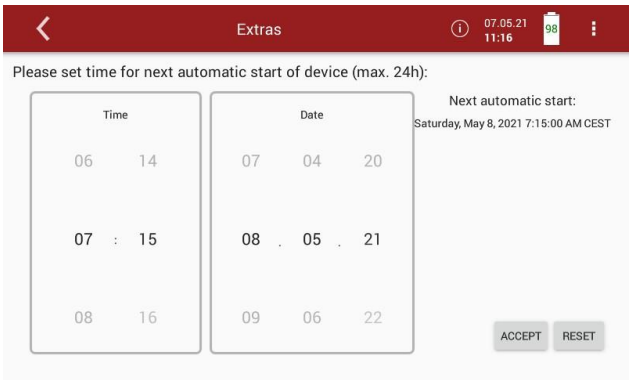
► Press ACCEPT.

⇨ A message appears.

► Accept the message.

⇨ The time of the next automatic device start is taken over andshown in the display.

⇨



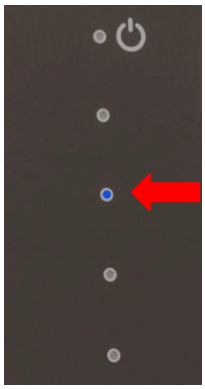
If you have activated an automatic device start, a message appearswhen the analyser is switched off.

► Pull the heating hose out of the analyser.

► Pull the probe out of the analyser.

► Press Yes.

⇨ The system will shut down.



After the analyser has shut down, an LED lights up to indicate that an automatic device start has been set

8.6.Instrument leak test

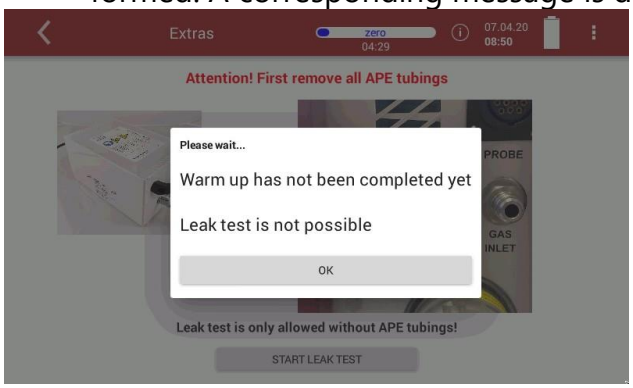
The analyser device has an integrated leak test to check the tightness of the gas paths.

► Check all plug connections for correct fit.
► Check all hoses and hose connections (from the probe tip to the gas inlet of the analyser) for leaks.
► Open the menu Extras

☞ See also chapter 8.1 Open menu Extras, Page 76.

► Press Instrument leak test.

⇨ A window appears.
⇨ If the analyser is still in the warm-up phase, no leak test can beperformed. A corresponding message is displayed.

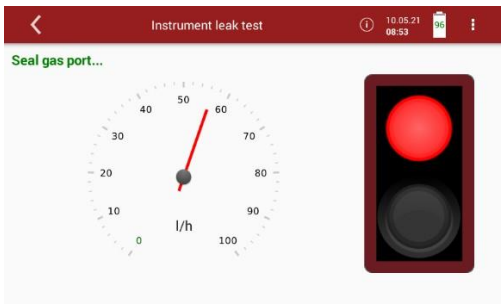


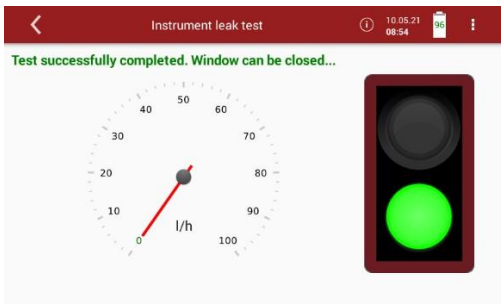
► Press OK.
► Wait until the warm-up phase is completed.
► Press START LEAK TEST

⇨ A message appears.

► Seal the gas port.

⇨ The leak test is performed





Or if the complete gas path is to be checked for leaks:

NOTE

With dirt and soot particles on the probe tube the test cap will not seal properly.

► The probe tip must be cleaned before you start this test.

► Seal off the tip of the probe a leak proof test cap.

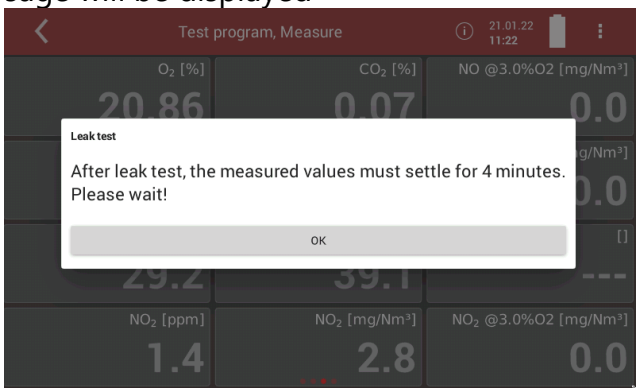
⇨ If the system is tight, the traffic light is green and the l/h pointer is 0.

► Exit the window.

NOTE

Note that measured values are invalid for four minutes after the Instrument leak test.

If you open the menu Measure, a corresponding message will be displayed



8.7.Printing measurement results

In the menu Printer, you can select the type of connection between an optional printer and the analyser.

You have 2 options to connect the printer:

- USB - connect with USB wire
- WiFi0 - internal WiFi

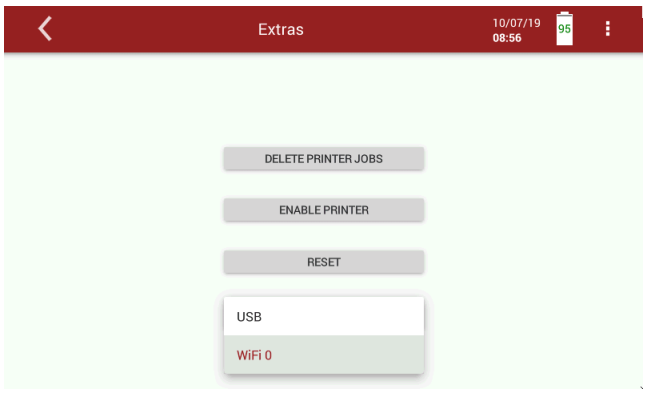
► Open the menu Extras

☞ See also chapter 8.1 Open menu Extras, Page 76.

► Press Printer.

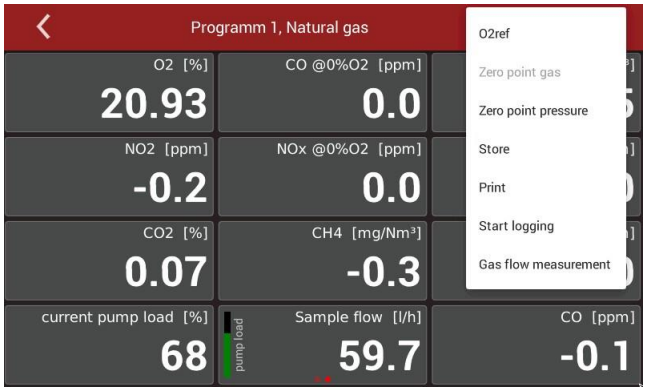
⇨ A window appears.

► Choose the desired option.



Printing current measurement results

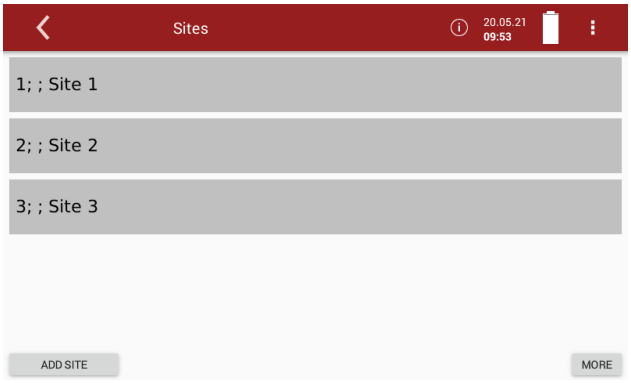
► Switch on the printer.
► Go to the menu Measurement.
  ⇨ The measurement window appears.
► Press the “Context menu” (19).
  ⇨ A selection list appears.



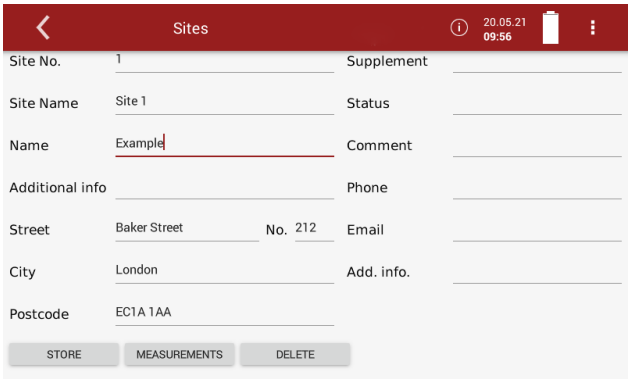
► Press Print.
  ⇨ The measurement is printed out with a slight delay.

Printing stored measurement results

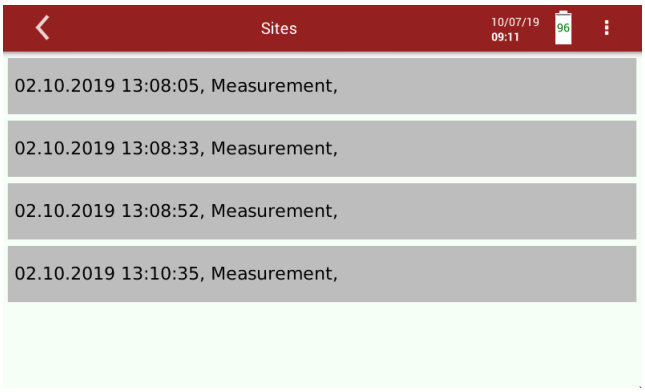
▶ Switch on the printer.
▶ Press the menu „Sites“.
⇨ A selection list appears



▶ Press the desired site.
⇨ A window appears.

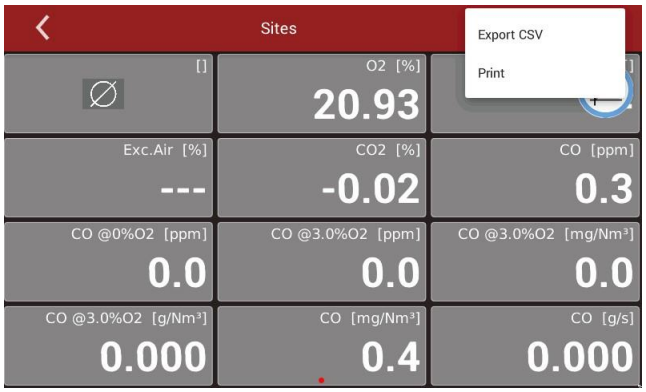


▶ Press MEASUREMENTS.
⇨ The stored measurements are displayed.



▶ Press the desired measurement.
⇨ The measurement window appears.
▶ Press the context menu (19).

⇨ A selection list appears.



► Press „Print“.

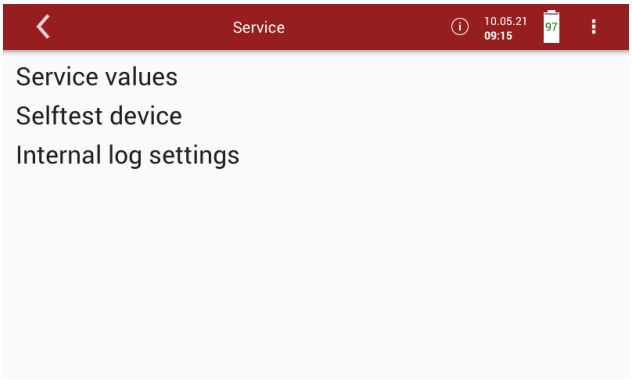
⇨ The measurement is printed out with a slight delay

9 Service

9.1.Open menu Service

► Press Service.

⇨ A list appears.



► Select the desired menu item.

9.2.Service values

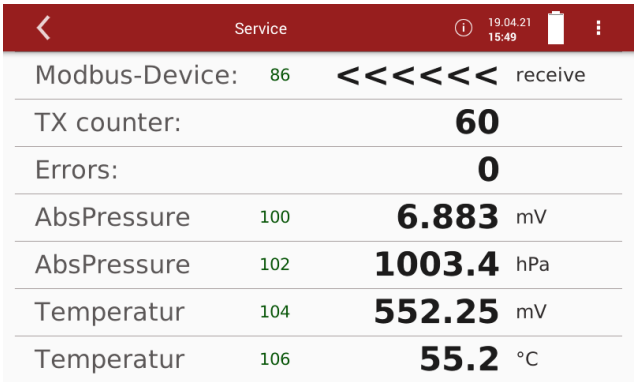
This screen displays a number of internal parameters and their values.In case of unexpected behaviour of the analyser it might be helpful tocommunicate those values to our worldwide service staff: https://www.mru.eu

► Open the menu Service.

☞ See also chapter 9.1 Open menu Service, Page 86.

► Press Service values.

⇨ Internal parameters and their values appear.



9.3.Performing Device selftest

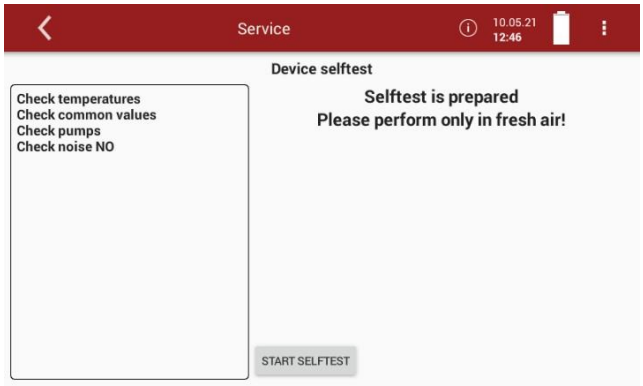
With the Device selftest you can test certain parameters of the analyser.

► Open the menu Service.

☞ See also chapter 9.1 Open menu Service, Page 86.

► Press Selftest device.

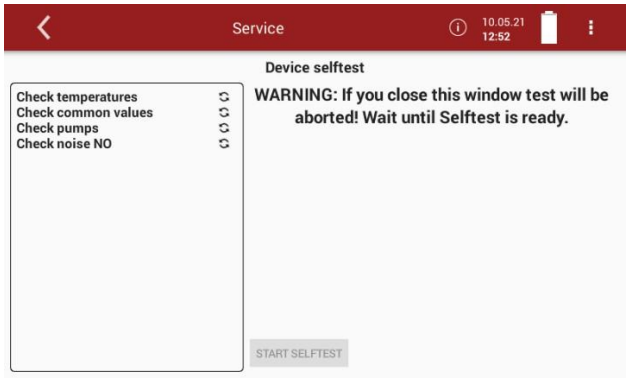
⇨ A window appears.



► Press START SELFTEST.

⇨ The Device Selftest starts.

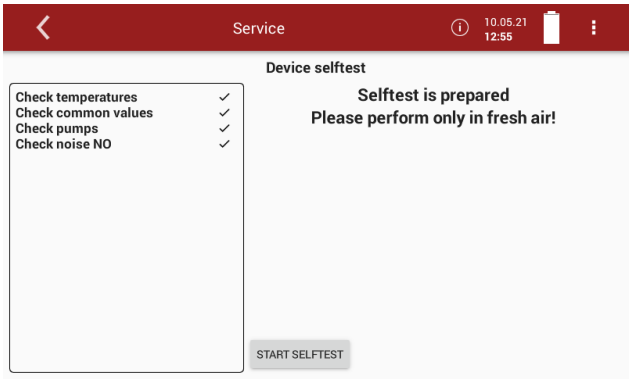
⇨ As long as the Device selftest is running, ⟳ appears in the display.



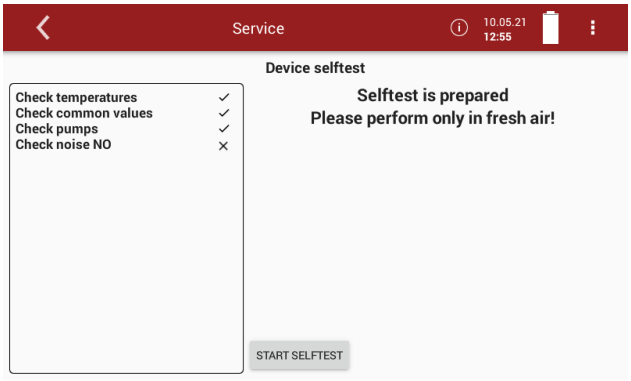
⇨ The Device selftest stops automatically.

⇨ A successful Device selftest is indicated with ✓ in the display for each individual parameter.

⇨



If the Device selftest for a particular parameter was not successful ✕ is shown in the display.



In the case of an Error message, please contact our customer service or contact one of the worldwide MRU service partners via www.mru.eu

9.4.Internal log settings

The analyser stores internal parameters at regular intervals to allow for an optimized support from experienced service staff. These files can be copied to a connected USB stick and sent via email if required to do so.The data will be anonymized. It is not possible to identify sites or measuring points.

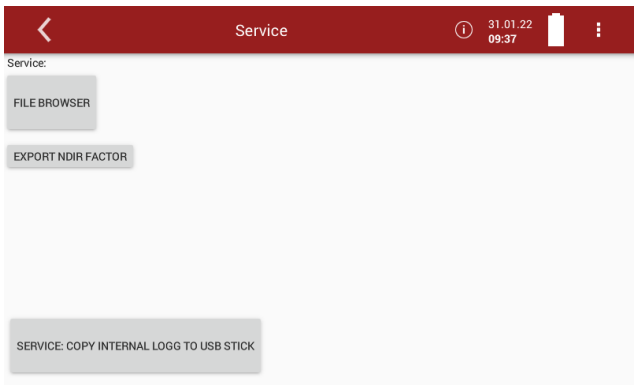
Copying all log data

► Insert a USB-stick into the analyser.
► Open the menu Service.

☞ See also chapter 9.1 Open menu Service, Page 86.

► Press Internal log settings.

⇨ A window appears.

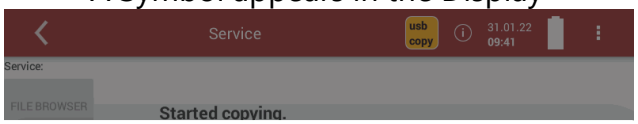


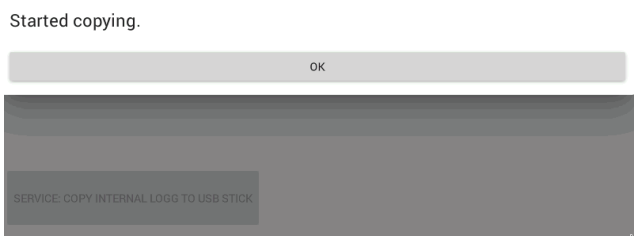
► Press „SERVICE:COPY INTERNAL LOGG TO USB STICK“.

⇨ A window appears.

⇨ The copy process is started.

⇨ A Symbol appears in the Display





► Press OK.

⇨ The directory [serial number] Logg was created on the USB-Stick.

⇨ The log files are saved in the directory [serial number].

⇨ After copying, the display shows "File(s) successfully copied".

► Press OK.

NOTE

If the analyser is operated for a long time, the copying process can take a long time.

Copying single log data

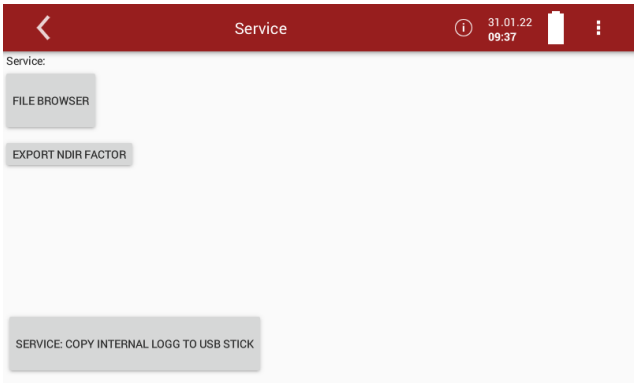
► Insert a USB-stick into the analyser.

► Open the menu Service.

☞ See also chapter 9.1 Open menu Service, Page 86.

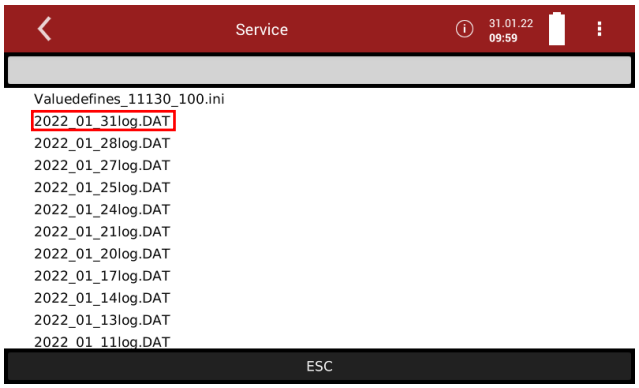
► Press Internal log settings.

⇨ A window appears.



▶ Press FILE BROWSER

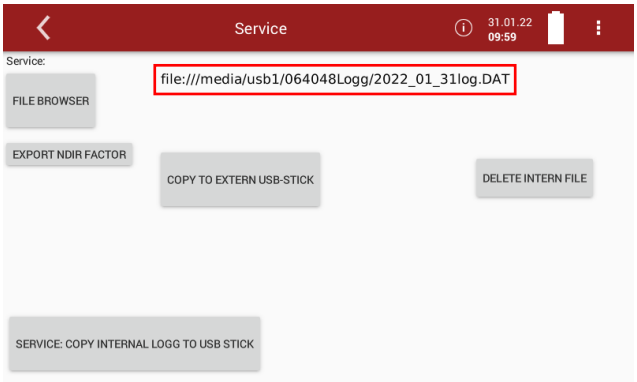
⇨ A selection list appears.



▶ Press the desired log file.

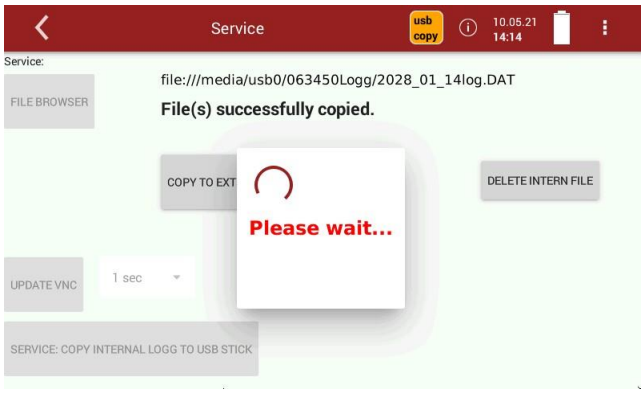
⇨ A window appears.

⇨ The desired log file appears in the window.



▶ Press COPY TO EXTERN USB-STICK.

⇨ A window appears.



⇨ The copy process is started.

⇨ The directory [serial number] Logg was created on the USB-Stick.
⇨ The log files are saved in the directory [serial number].
⇨ After copying, the display shows "File(s) successfully copied".

► Press „OK

Export NDIR – Factors

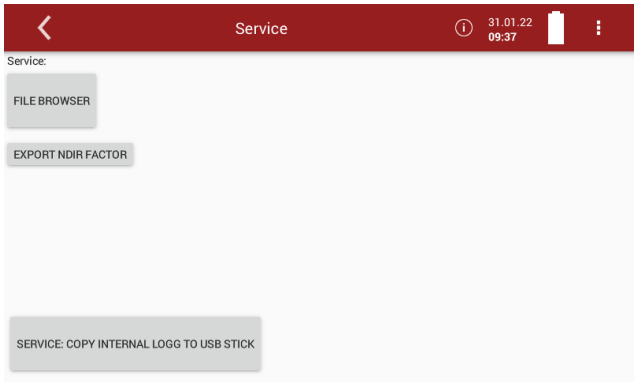
If your analyser has an NDIR cuvette, you can export the NDIR factors to a USB stick.

► Insert a USB-stick into the analyser.
► Open the menu Service.

☞ See also chapter 9.1 Open menu Service, Page 86.

► Press Internal log settings.

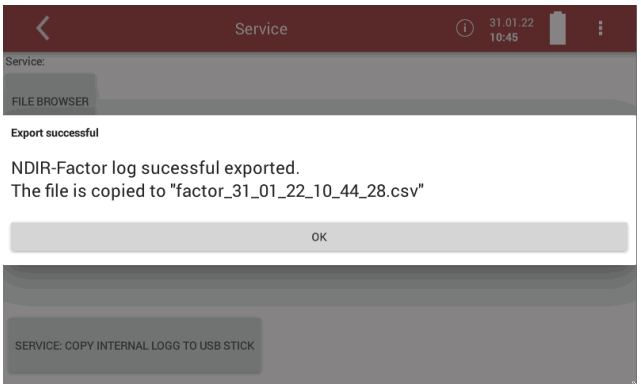
⇨ A window appears.



► Press EXPORT NDIR FACTOR.

⇨ The NDIR factors are exported.
⇨ On the USB stick, the folder NdirFactors is created.
⇨ The NDIR factors are stored in the folder NdirFactors.

⇨ A message appears.



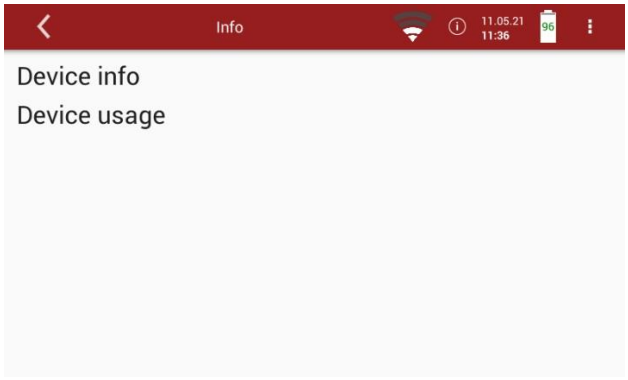
► Press OK.

10 Info

10.1.Open menu Info

► Press Info.

⇨ A window appears.



► Select the desired menu item.

10.2.Calling up device info

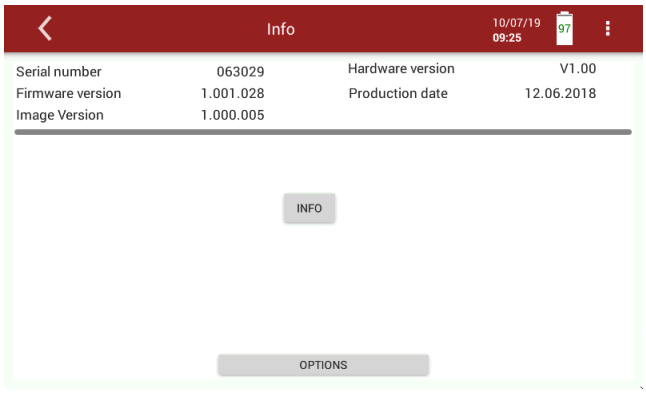
In the menu Device info, you can, for example, display the serial number, the firmware version and version information for installed mod-ulesand installed options.

► Open the menu Info.

☞ See also chapter 10.1 Open menu Info, S.93.

► Press Device info.

⇨ A window appears.



► Press INFO

⇨ A window appears.

⇨ Version information for specific modules is displayed

▶ Exit the window.
▶ Press OPTIONS.

⇨ A window appears.
⇨ The installed options are displayed.

10.3.Device usage

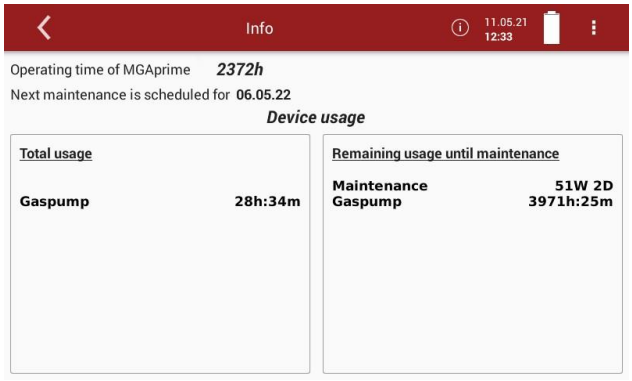
You have the possibility of displaying the operating time of the analyser, the total usage of certain analyser components and the remaining usage time until the next maintenance.

► Open the menu Info.

☞ See also chapter 10.1 Open menu Info, S.93.

► Press Device usage.

⇨ A window appears.



If a device component has exceeded the prescribed service life, the analyser should be maintained immediately at a service centre.

11 Maintenance and cleaning

11.1. Cleaning and maintenance

The analyser needs only low maintenance effort for long value preservation:

⚠ CAUTION

Acid from the condensate

Acid burns may result from weakly acidic liquids from the condensate.

► If you come into contact with acid, wash the area immediately using a lot of water.

► Note the safety data sheet for phosphoric acid (10%).

After every measurement:

► Remove the gas sampling tube from the analyser, so that the hose can dry.

► Check the filter in the probe head. Replace the filter if necessary.

Occasionally:

► Clean the probe and the probe hose.

► If the analyser was not used for a longer period of time, charge the battery first.

► Charge the battery approximately every 4 weeks.

► Check the round filter at the front of the instrument. Replace the filter if necessary.

11.2. Service check

An annual service check and if necessary, adjustment of the sensors at an MRU service department (www.mru.eu) are recommended for the preservation of value.

11.3.Change Filter mat

The filter mat (#14334) must be checked at regular intervals.
Replace the filter mat (#14334) when dirty.

Position	Description
1	Cover
2	Filter mat
3	Grid

► Remove the cover from the device.
► Remove the grid.
► Remove the filter mat.
► Check the filter mat and replace the filter mat if it is dirty.
► Place the filter mat in the cover
► Place the grid on the filter mat.
► Attach to the device.

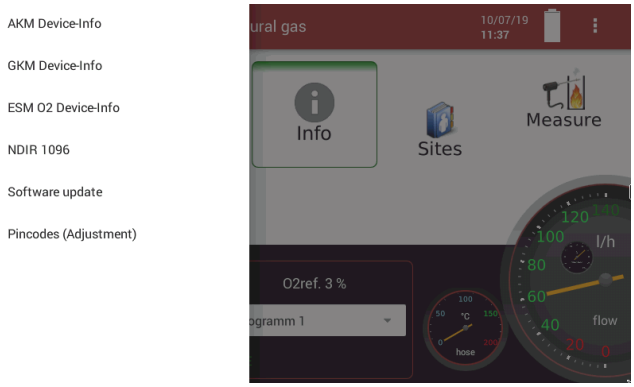
12 Simple service work

12.1. Information of the analyser components

Information about analyser components is helpful in case of service or inquiries.

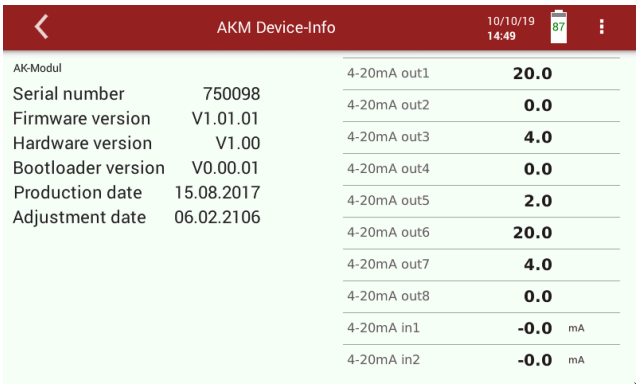
► Touch ☰ .

⇨ A selection list appears.



► Choose the desired component of the analyser.

⇨ The information about the component of the analyser is displayed.



12.2. Updating the firmware

If necessary, you will receive a new released data package from the manufacturer for updating the firmware and the individual modules. The data package consists of a ZIP data package. The data package has the ending .mru.

Update main firmware

► Copy the data package to a USB stick.

NOTE

You can also save the data package in subfolders. The analyser will search the folder structure on the USB stick up to the second hierarchy level. Save the data package in the folder structure above, if the option file is not is displayed

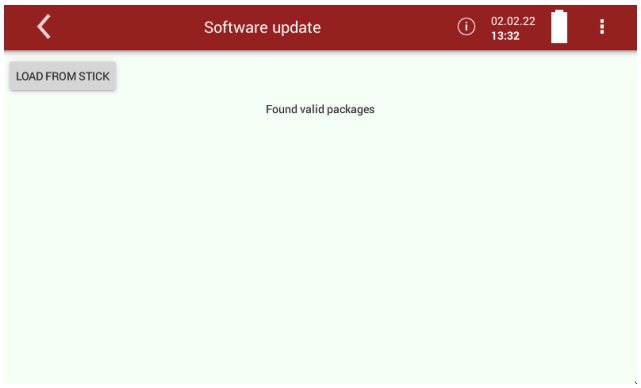
If necessary, you will receive a new firmware version released by the manufacturer.

► Copy the file ‚1113All.zip"to a USB stick in the rootdirectory.

NOTE

Note that the main firmware (1113 Update) must be saved on the top folder level of the USB stick.
Software of the modules must be in the subfolder"1113 Moduleupdate

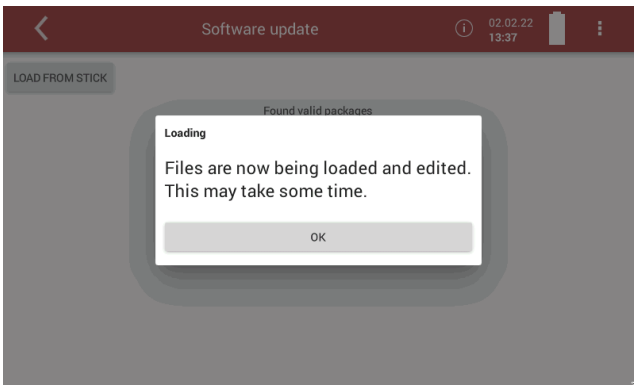
► Connect the analyser to the power supply.
► Switch on the analyser.
► Insert the prepared USB-stick into a USB socket of the analyser.
► Press ☰
⇨ A selection list appears.
► Press Software update.
⇨ A window appears.



NOTE

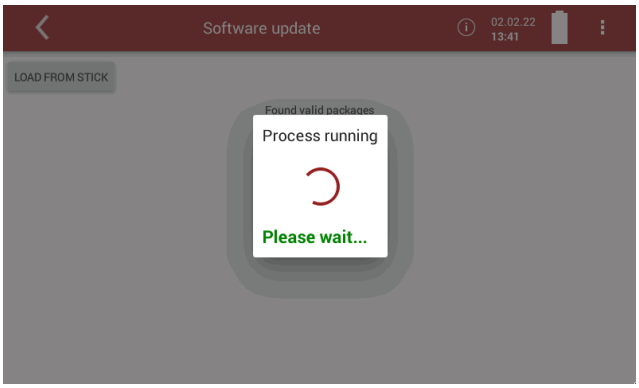
Please note that you must first update the main firmware. After the restart you can update the modules.

► Press LOAD FROM STICK.
⇨ A message appears.



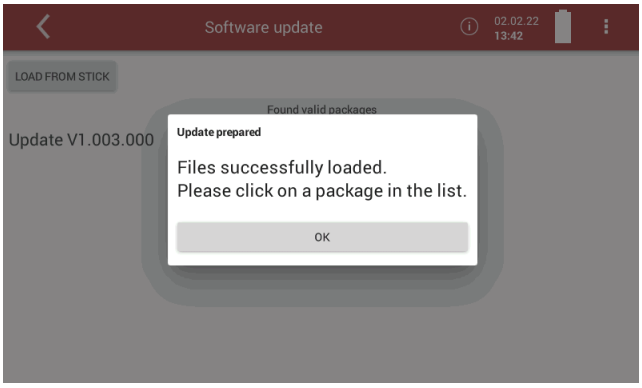
► Press OK.

⇨ A window appears.



► Wait until the loading process is completed.

⇨ After the loading process is completed, a message appears.

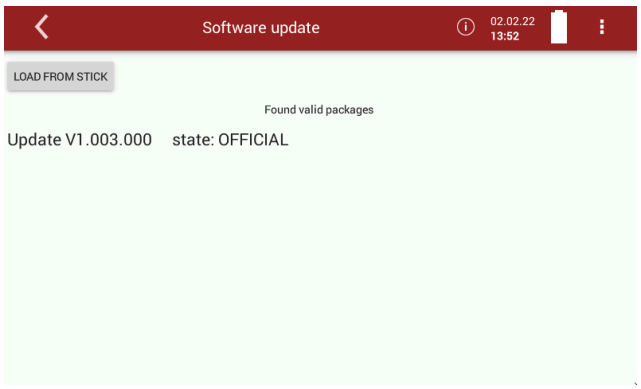


► Press OK.

⇨ The valid data packages found are displayed.

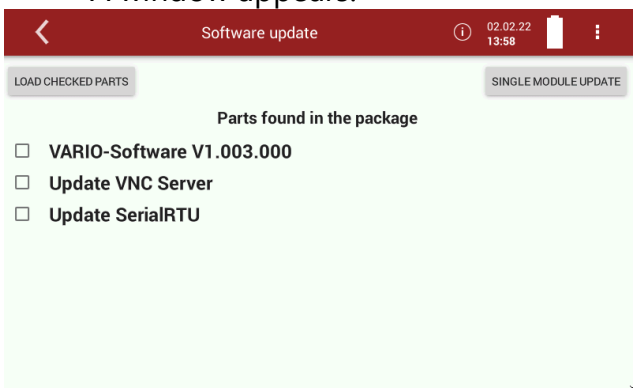
NOTE

If no data package is displayed, save the received data package again on a USB stick.
If the data package is not displayed again, contact customer service or one of the MRU service partners worldwide.

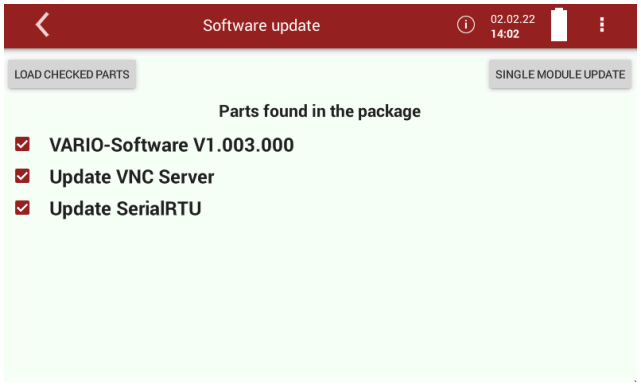


► Select the desired data package.

⇨ A window appears.



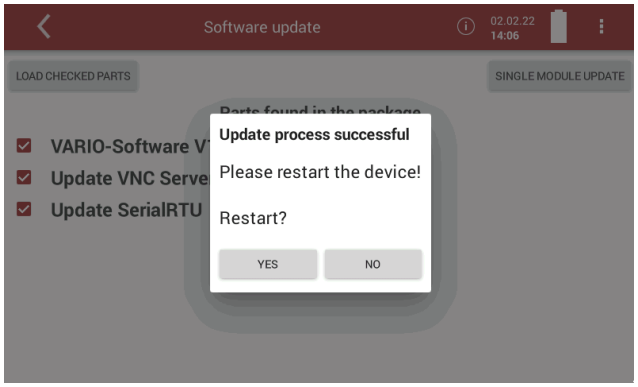
► Select parts of the data package that you want to update.



► Press LOAD CHECKED PARTS

⇨ A message appears.

⇨ To conclude the update process, the analyser must be restarted.



► Press YES.

⇨ The analyser performs a restart.

⇨ You can now update the software of single modules.

Update firmware of single modules

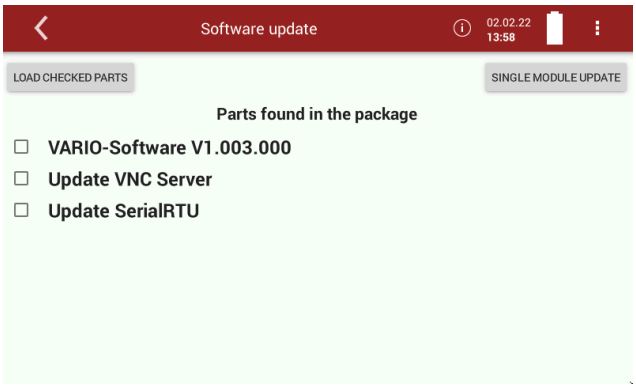
NOTE

Note that you must first update the main firmware. After restarting, you can update the firmware of single modules.

► Go to the window Software update.

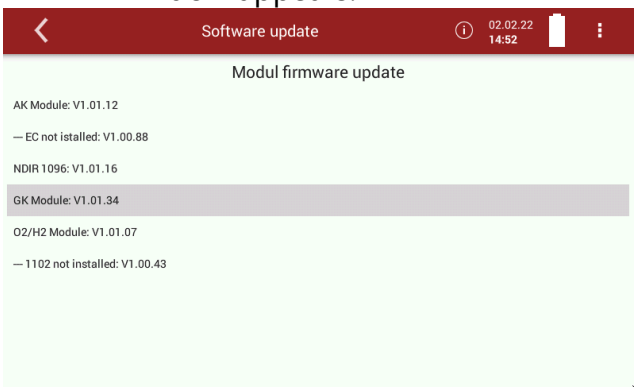
☞ See also chapter Update main firmware, Page 98.

► Perform the steps as described in the chapter Update main firmware until the following window appears.



► Press SINGLE MODULE UPDATE.

⇨ A window appears.



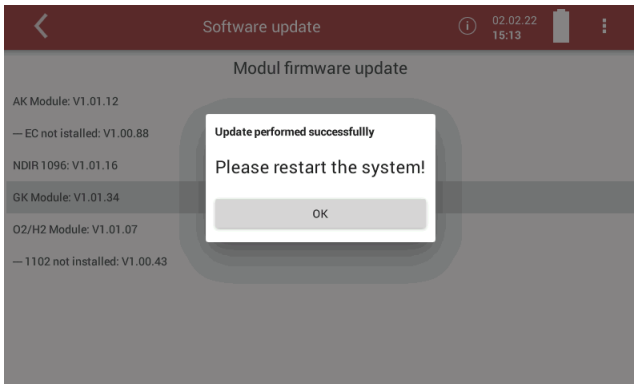
► Select the desired module that you want to update.

⇨ A message appears.

► Press YES.

⇨ The update is started.

⇨ After the update has been performed successfully, a message appears.



► Press OK.

► Please restart the system.

13 Specifications

The technical data listed here may differ depending on the analyser configuration.

• means: included in the standard scope of each analyser
O means: optional possible, availability depends on device configuration

13.1. General data

Deutsch	Angabe	English
Betriebstemperatur	+5°C .. +45 °C	Operating temperature
Rel. Luftfeuchtigkeit bei Betrieb, nicht-kondensierend	90%	Rel. Humidity, non-condensing
Lagertemperatur	-20 °C .. +50°C	Storage Temperature
Akku intern, Kapazität, Betriebszeit ohne Gaskühler und Heizschlauch Akkukapazität optional	Li-Ion, 48Wh, 6 h 96 Wh	internal Battery Pack, capacity, operating hours w/o gas cooler and heated sample line optional capacity of battery pack
Ladezeit (Li-Ion 48 Wh)	2h = >90%; 4h = 100%	Charge time (Li-Ion 48 Wh)
Ladezeit (Li-Ion 96 Wh)	3h = >90% 5h = 100%	Charge time (Li-Ion 96 Wh)
Display	7 *touch, < 750 cd/m²* 800*480 px	Display
Stromversorgung (ohne Heizschlauch)	86 .. 265Vac / 47…63Hz / 105W	Power supply (w/o heated sample line)
Gewicht Gerät (inkl. 2 EC-Sensoren)	7,5 kg	Weight unit w/ 2 EC sensors
Gewicht Gerät im Koffer (inkl. 2 EC-Sensoren)	16 kg	Weight unit w/ 2 EC sensors plus case
Maße ohne Koffer (BxHxT)	43cm x 29cm x 15cm	Size unit w/ocase (WxHxD)
Maße inkl. Koffer (BxHxT)	52cm x 51cm x30 cm	Size incl. Case (WxHxD)
Gehäusematerial	Aluminium / TPU	Housing Material
Schutzart	IP20	IP degree of protection

13.2.Gas sampling and conditioning

Deutsch	Angabe	English
max. Unterdruckbereich der Gas-pumpe	350 hPa	Max suction range gas pump
typischer Gasdurchfluss	60 l/h	gas flow typ.
Einfach - Gaskühler	•	**Single Stage Gas cooler**
Temperatur Peltierkühler (an Netz und Akku)	5 °C	Temperature Peltier cooler (during grid and battery operation)
Akkubetriebszeit mit Gaskühler (1 Akkupack)	1hr45min	Batt operating hours with gas cooler (1 Batterypack)
Kondensatentsorgung aus dem Gaskühler	•	Condensate removal from gas cooler
Automat. Feuchtealarm	•	Humidity supervision and alarm
Interne Durchflussmessung	•	internal gas flow measurement
Gasausgang (Vent Anschluss)		**Gas outlet (Vent port)**
passiv, Anschlussgröße	6mm	passiv

13.3.Sensors for gas concentration, temperature and pressure

Deutsch	Angaben zur Messgenauigkeit	English
Elektrochemischer Sensor	**O_2 Long Life**	**Electrochemical Sensor**
Messbereich	0 - 25 Vol.%	Measuring Range
Auflösung	0,01 Vol. %	Resolution
Genauigkeit abs.	± 0,2 Vol. %	Abs. accuracy
Ansprechzeit t90	20s	Response time t90
Jahre erwartet Lebensdauer an Luft	5	Years expected Lifetime (@air)
Elektrochemischer Sensor	**H_2S**	**Electrochemical Sensor**
Nominaler Messbereich	0 – 2000 ppm	Nom. Measuring Range
Überlastbereich	<5000 ppm	Overload Range
Auflösung	1 ppm	Resolution
Genauigkeit abs. /vom Mess-wert	± 5 ppm / 10% (0 ... 500 ppm) 15% (> 500 ppm)	Accuracy abs./reading
Ansprechzeit t90	40s	Response Time t90
Paramagnetischer Sensor	**O_2**	**Paramagnetic Sensor**
Messbereich	0..25 Vol%	Measuring Range
Auflösung	0,01 Vol%	Resolution
Genauigkeit	0..25 Vol.% ± 0,1 Vol.% 25 .. 100 Vol.% ± 0,2 Vol.%	Accuracy

WLD Wärmeleitfähigkeitsdetektor	**H2 #11092**	**TCD (thermal conductivity detector)**
Nominaler Messbereich	0 – 100%	Nom. Measuring Range
Auflösung	0, 1%	Resolution
Genauigkeit abs. /vom Messwert	± 0,2 / 2%	Accuracy abs./reading
Ansprechzeit T90	< 15s	Response Time T90
Temperatur	**T_A**	**Gas Temperature**
Messbereich mit Gasentnahmerohr aus Edelstahl	0 - 800°C	Measuring Range with high grade steel probe pipe
Messbereich mit Gasentnahmerohr aus Inconel Kurzzeitig (bis zu 20 Minuten)	0 - 1100°C 0 - 1350°C	Measuring range with Inconel probe pipe Short time only (up to 20 mins)
Genauigkeit abs. / vom Messwert	±2°C / 1%	Accuracy abs. / reading
Umgebungstemperatur	**T_I**	**Ambient Air temperature**
Messbereich	0 - 100°C	Measuring Range
Genauigkeit abs.	± 1 °C	Accuracy
Differenzdruck		**Differential pressure**
Messbereich	± 120 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Barometrischer Druck	**P_{abs}**	**Barometric Pressure**
Messbereich	300 .... 1200 hPa	Measuring Range
Genaugkeit	± 3 hPa	Accuracy

13.4. Specifications of NDIR technology

Art.Nr.	Gas	Range	Resolution	Accuracy	T90
10774	CO	100%	0,01%	±0,3% Vol% / 2%	40s
	CO2	100%	0,01%	±0,3% Vol% / 2%	40 s
	CH4	100%	0,01%	±0,3% Vol% / 2%	40 s

13.5.Calculated values and accessories

Deutsch	Angabe	English
Strömungsgeschwindigkeit	**v**	**Velocity**
basierend auf Differenzdruck-messung mit Prandtlrohr		*based on differential pressure measurement with Pitot tube*
Messbereich typisch	3 m/s ... 100 m/s	typical measuring range
Genauigkeit bei 3 m/s	1 m/s	accuracy at 3m/s.
Genauigkeit > 12 m/s (vom Messwert)	± 1%	accuracy > 12 m/s (reading)
Auflösung	0,1 m/s	resolution
Absolutdruckmessung	•	absolute pressure measurement

13.6. Data communication

Deutsch	Angabe	English
USB-Anschluss, nur Master (Anschluss Zubehör, Stick usw)	**O**	USB interface master only (for connection to USB stick or accessories)
Unterstützung externer SD-Kartenleser	**O**	Support of external SD card reader
Ethernet, RJ45	**O**	Ethernet RJ45
WLAN	**O**	WLAN
Bluetooth	**O**	Bluetooth
RS485 (AUX-Anschluss, nicht-isoliert, zum Anschluss ext Sensormodule)	**O**	RS485 (AUX socket, for connection of external sensor modules)
RS485 (isoliert, für Anbindung an PC)	**O**	RS485 (isoliated, for connection to PC))
Analog I/O: 4x input, 8x output, 4... 20 mA	**O**	Analog I/O: 4x input, 8x output, 4... 20 mA

13.7. Fuel type list

This list is for Germany only.
Fuel types from other countries can be obtained from MRU GmbH:
Web page: www.mru.eu

Germany O2max 20,96				
Fuel	**CO2max**	**A1**	**A2**	**B**
Test gas	0,0	0,00	0,00	0,000
Natural gas (LL)	11,8	0,37	0,66	0,009
Natural gas (E) (*)	12,1	0,37	0,64	0,009
EL heating oil	15,4	0,50	0,68	0,007
S heating oil	15,9	0,50	0,66	0,007
P/B liquid gas	13,7	0,42	0,63	0,008
Propane	13,7	0,43	0,66	0,007
Butane	14,1	0,45	0,67	0,007
Biodiesel	15,7	0,46	0,62	0,005
Dry wood	20,3	0,60	0,62	0,009
Pellets	20,3	0,74	0,77	0,000
Coal	19,1	0,59	0,65	0,009
Lignite	19,4	0,39	0,42	0,009
Peat	19,8	0,66	0,70	0,010
Coke oven gas	10,8	0,29	0,60	0,011
Coal gas	11,7	0,35	0,63	0,011

(*) – is not included, you can create it with the values specified in the table under Self-Determined Fuel if required.

14 Options

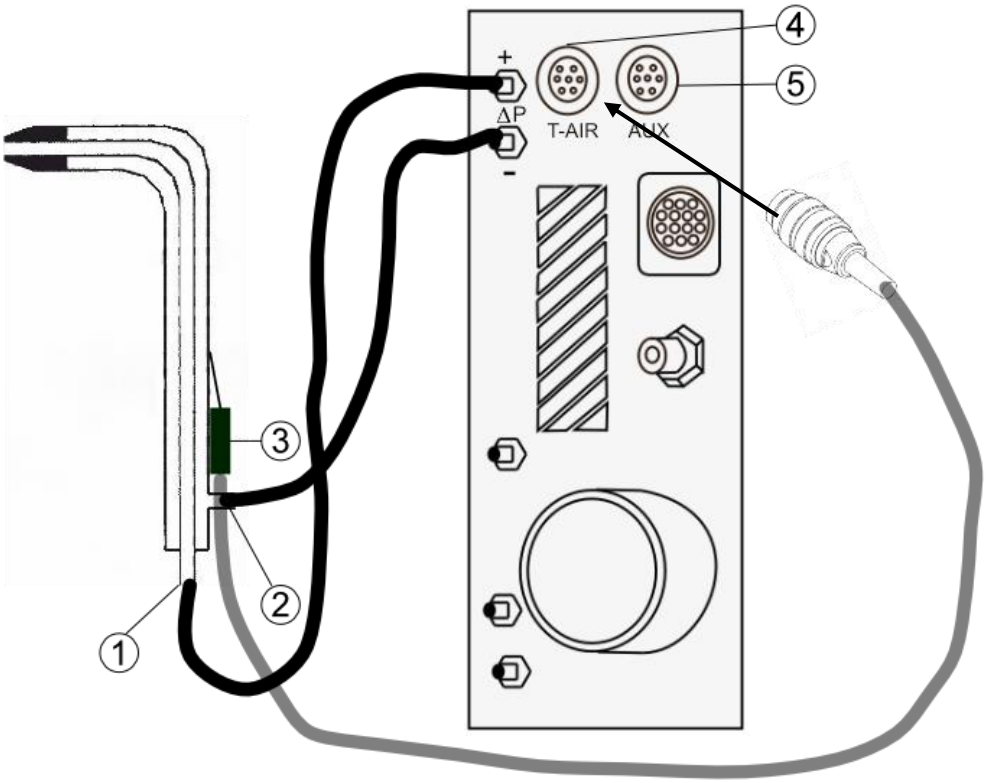
14.1.Gas flow measurement

With the option Gas flow measurement further measured values areavail-able:

- v-flow
- Flow rate

Connect analyser to Pitot tube

The following sketch shows an example of the connection of the analyser to a Pitot tube with thermocouple.



Position	Description
1	Connection total pressure
2	Connection static pressure
3	Thermocouple
4	Connection T-AIR
5	Connection AUX

NOTE

Note that you can use either the connection T-AIR or the connection AUX.

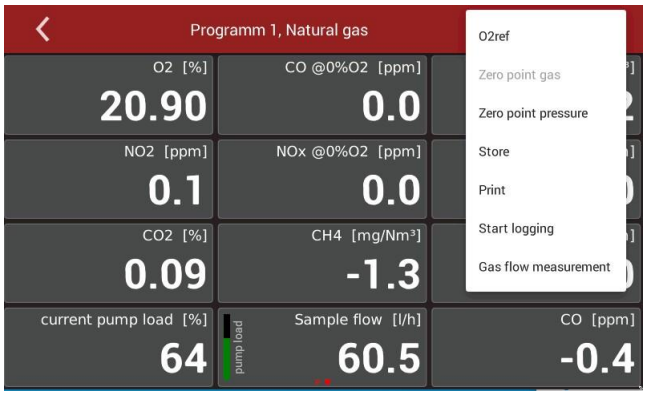
Parameter for gas flow measurement

► Press the menu Measure.

⇨ The measurement window appears.

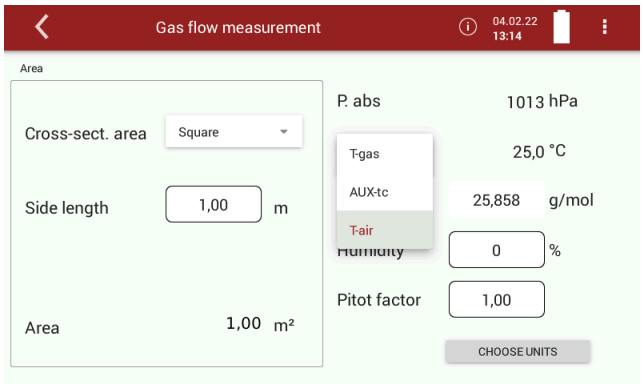
► Press the “Context menu” (19).

⇨ A selection list appears



► Press Gas flow measurement.

⇨ A setting window appears



NOTE

You have the following options for measuring the temperature:

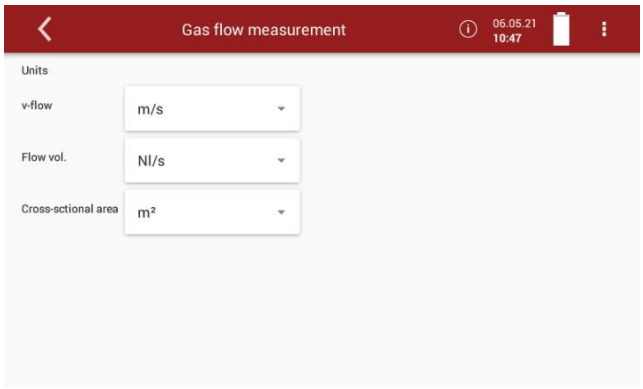
- Via the probe (T-gas)
- Via the connection T-AIR (T-air)
- Via the connection AUX (AUX-tc)

☞ See also chapter Connect analyser to Pitot tube, S. 109.

► Change the desired parameters.

► Press CHOOSE UNITS.

⇨ A setting window appears.



► Change the desired unit.
► Go back.

⇨ The change will be saved.

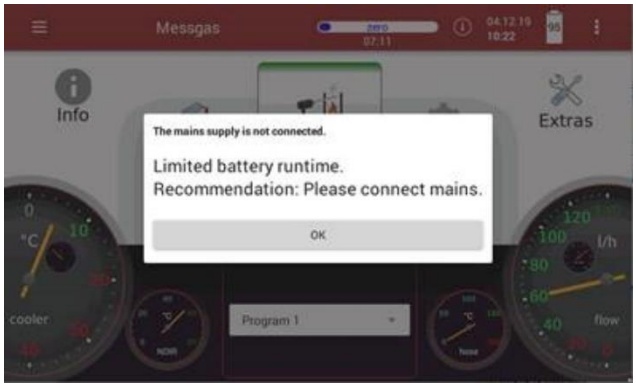
14.2.Operating analyser with Nickel-Metal-Hybrid (NiHM)-Battery

► Please note that the following information is only relevant for you if an optional NiHM-Battery is installed in your analyser.

The NiHM-Battery is mounted in the analyser instead of a LiIon-Battery.

The optional NiHM-Battery is intended for air travel, because the Regulations for the transport of LiIon-Battery during air travel can often be problematic.

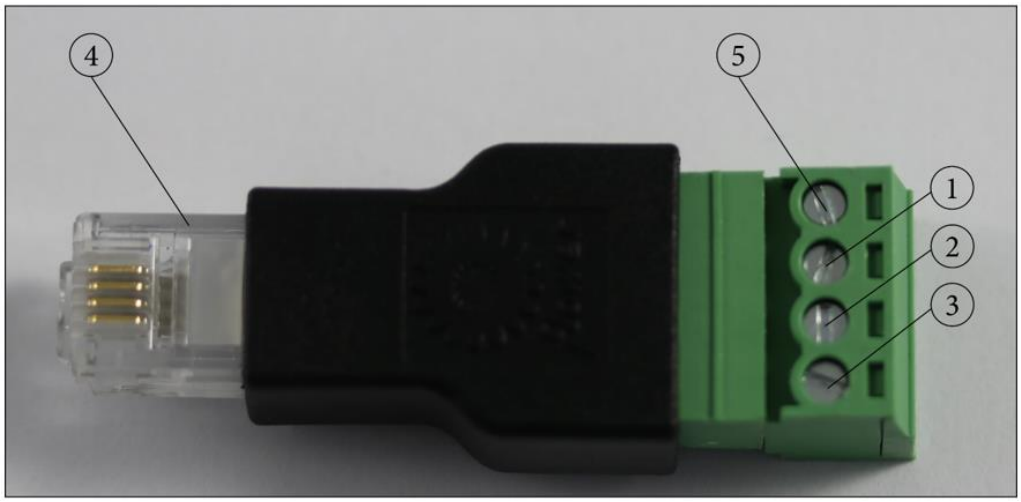
► Note that the NiHM-Battery is not intended for measurement operation, as only a limited Battery life is available.
► Measure only with a connected power supply.
Note that the analyser can be used for about 30 minutes in battery mode.
► Use the analyser in battery mode only for short measuring point changes. Furthermore, short power failures can be bridged by battery mode.
► The analyser displays a message if no power supply is connected.



⇨ The message appears 45 seconds after switching on.
⇨ The message appears after 90 seconds if the power supply unit is removed during operation.

14.3. RS485 Extern (Option)

RS485 interface with modbus RTU protocol for far distance data transfer over cable.



Electrical connections:

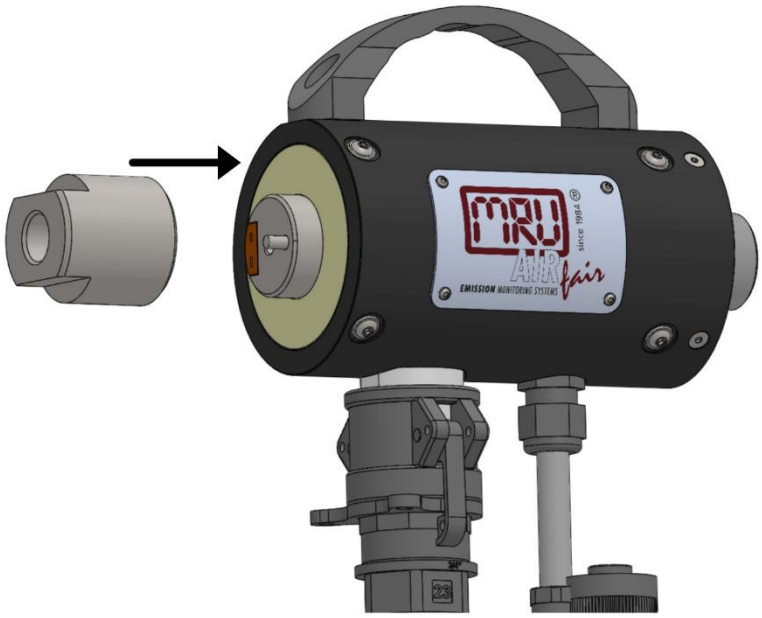
1 = A+
2 = B-
3 = GND
4 = Connector to RS485 port (option)
5 = Not used
NOTE: one twisted pair of shielded cable is user scope

Port settings:

Baud Rate: 19200
Data bits: 8
Parity: Even
Stop bits: 1
Slave ID: 1

14.4.Screw adapter onto HPI-Probe (Option)

With the adapter you have the possibility to use heated probe tubes from other manufacturers.
The adapter is available in 3/8-inch and 3/4-inch sizes.
When screwing the adapter onto the HPI probe, pay attention to the size of your probe tube.



► Screw the adapter onto the HPI probe.
► Screw your probe tube onto the adapter.

15 Appendix

15.1. Error diagnosis regarding the measuring instrument

Fault indication	Possible causes	Repair
Gas cooler is faulty! The system will shut down.	Gas cooler faulty.	Contact MRU service department.
Undervoltage!!! The System will shut down	Battery is discharged.	Connect instrument to power grid.
Power consumption too high Please check heated hose!	Please check heated sample line.	Heated sample line may be damaged. Disconnect the instrument from power grid and visually inspect the sample line. Take care to unroll the heated sample line before operating it.
Please wait – pump is off Warm up has not been completed yet.	Measurement not started as instrument is in warm-up phase.	Wait until warm up phase has terminated.
Flow monitoring! Flow rate too low! Please check filter.	The sample gas flow has fallen below the required limit. Filter or sample line may be clogged. Gas pump may be faulty Flow sensor may be defect.	Check sample line and all filters on dust or water. Replace filters.
Gas cooler is drying out.	Typically occurs when dry test gas or dry ambient air is measured over a longer period of time (several minutes) instead of flue gas. Can only occur during operation without acid injection.	Use a test gas humidifier. Use acid injection.

15.2.Condensate alarm

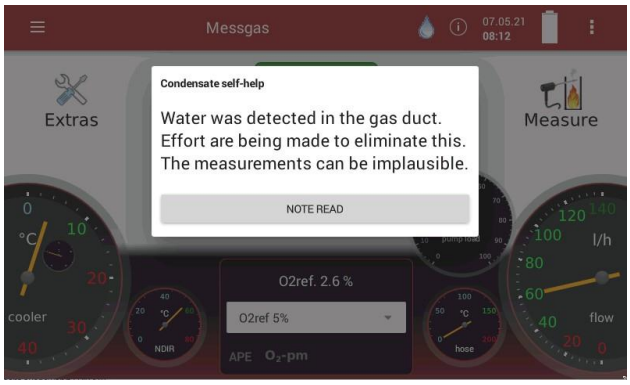
A condensate alarm occurs as soon as water is detected in the gas duct.In this case, the measurement can be implausible.
A condensate alarm that has occurred can be eliminated in a two-step process.
After a condensate alarm occurs, the analyser attempts to remedy the problem independently by means of a "condensate self-help" and to switch back to measuring mode

If the "condensate self-help" was not successful and there is still waterin the gas duct, you must start a drying of the gas duct manually.

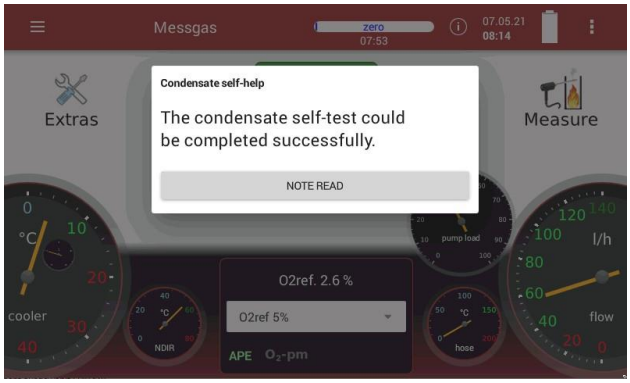
Condensate self help

With "condensate self-help" you do not have to actively initiate any steps. The measuring analyser carries out the "condensate self-help" in-dependently.

As soon as water is detected in the gas duct, the analyser displays amessage.



- ⇨ The “Condensate self-help” is performed.
- ⇨ As soon as the "Condensate self-help" has been successfullycompleted, a message appears.

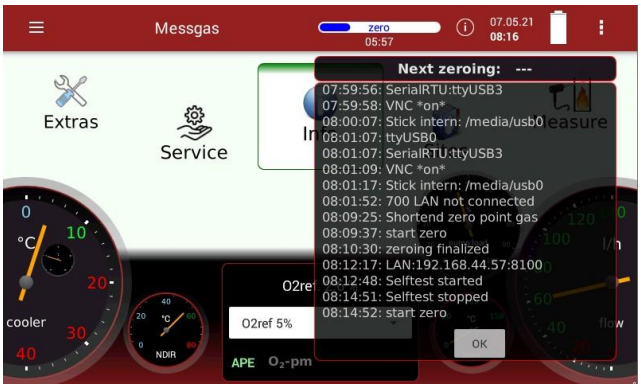


- ⇨ A zero point measurement is started automatically.

You can display the start and end of the "Condensate self-test

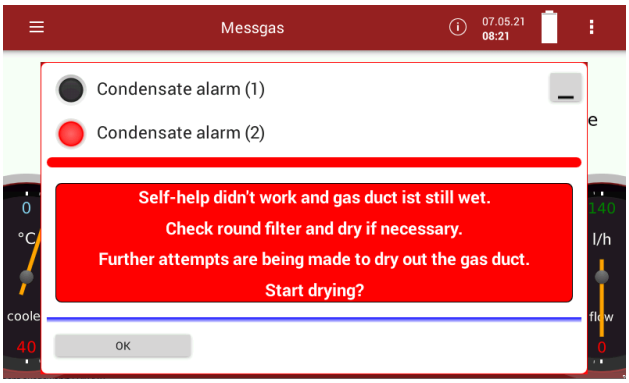
► Press

⇨ A window appears.



Start drying manually

If the "condensate self-help" was not successful and there is still waterin the gas duct, you must start a drying of the gas duct manually.
A corresponding message is displayed and an acoustic signal sounds.



⚠ CAUTION

Acid from the condensate

Acid burns may result from weakly acidic liquids from the condensate.

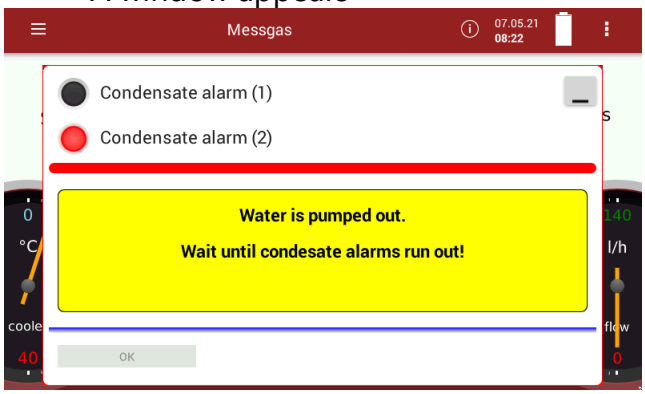
► If you come into contact with acid, wash the area immediately using a lot of water.

► Note the safety data sheet for phosphoric acid (10%).

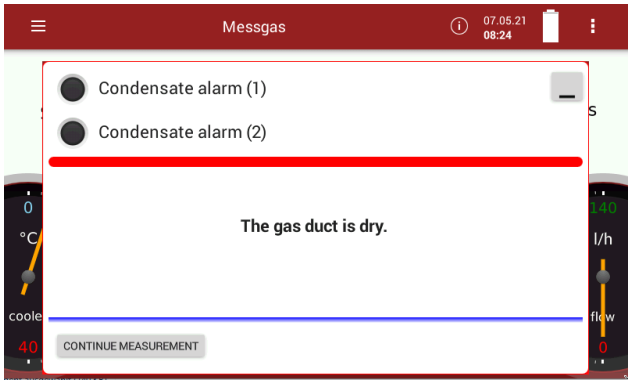
NOTE

► Dispose of acidic condensate and phosphoric acid in accordance with national and, if necessary, local disposal guidelines.

► Remove the round filter.
► Dry the round filter, if necessary.
► Press OK.
⇨ A window appears



► If necessary, repeat the procedure if another message is displayed.
⇨ A message appears, as soon as gas duct is dry again



► Press CONTINUE MEASUREMENT.
⇨ A zero point measurement is started automatically.

15.3. Switching off the analyser in case error

If the touch screen does not respond, you have two options for switching off the analyser:

► Press the ⏻ button during flashing LED for 30 sec. minimum
► After change to continuous lighting, release the ⏻ button
⇨ The instrument will be switching off with reset.

Alternatively, you can switch off the analyser as follows:
► Press the reset button on the right side of the analyser.

☞ See also the illustration in 3.4 Connectors, Page. 14.

15.4. Connecting analyser with MRU4win

The analyser is a Modbus device.

► You can connect Modbus devices with MRU4win via a serial interface (RS 485).

☞ See also Chapter 14.3 RS485 Extern (Option), S.112.

► You can connect Modbus devices to MRU4win via a TCP/IP connection.

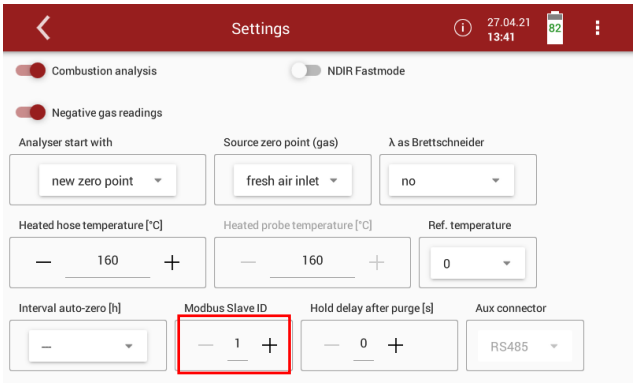
⇨ The TCP/IP connection can be made by LAN or WLAN.

Connecting analyser with MRU4win via serial interface (RS 485).

► Connect the electrical connections of the RS485 interface as described in Chapter 14.3 RS485 Extern (Option), S.112.
► Connect the analyser to your PC via the RS485 interface.
► Open the menu Device settings.

☞ See also chapter 5.4 Device settings, Page 26.

► Set "Modbus Slave ID" to 1.
Please note that the Modbus slave ID is a consecutive number.
If the number 1 is already assigned, assign "Modbus Slave ID" 2 etc. to the analyser.



► You can now create the analyser in MRU4win.

☞ See also Chapter Creating analyser in MRU4win, Page 119.

Connecting analyser with MRU4win via TCP/IP connection

Before you can connect the analyser with MRU4win via a TCP/IP connection, you have to read out the IP address in the analyser.

► Press the analyser to the network.

⇨ The connection can be made via LAN or WLAN.

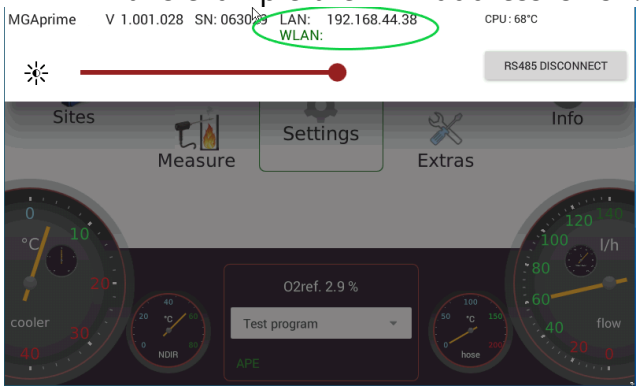
☞ See also Chapter 5.11 Connecting analyser with WIFI (WLAN), Page 43.

► Press the “Context menu” (19).

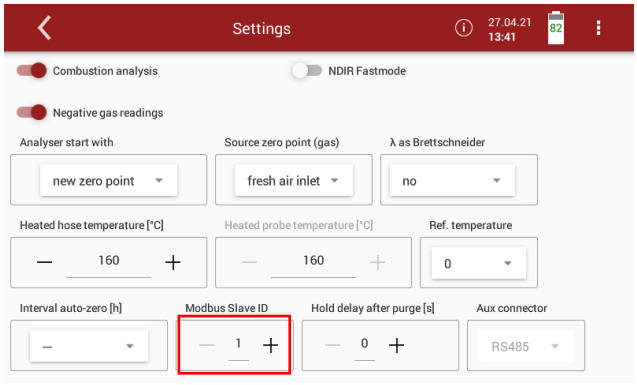
⇨ A selection list appears.

► Press “Display settings”.

⇨ An overview screen appears.
⇨ In the top line, the IP address of the analyser is displayed.
In this example the LAN address is 192.168.44.38.



► Switch to the Settings menu.
► Set "Modbus Slave ID" to 1.
Please note that the Modbus slave ID is a consecutive number.
If the number 1 is already assigned, assign "Modbus Slave ID" 2 etc. to the analyser.

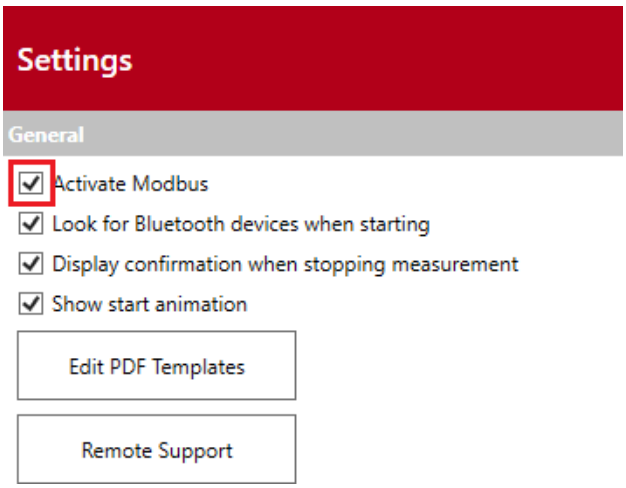


► You can now create the analyser in MRU4win.
☞ See also Chapter Creating analyser in MRU4win, Page 119.

Creating analyser in MRU4win

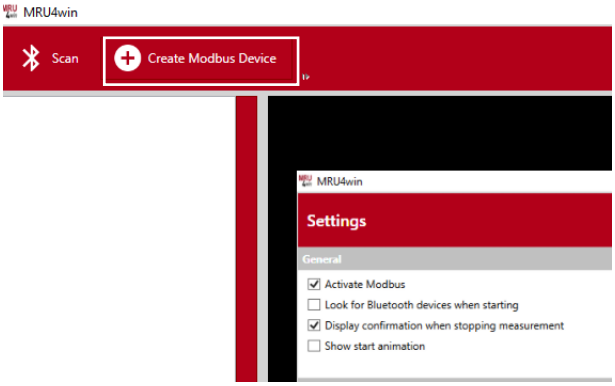
Modbus devices are not automatically identified in MRU4win.
Before you can connect the analyser with MRU4win, you have to create a Modbus device.

► Open MRU4win.



► Set under "General" a check mark at "Activate Modbus".

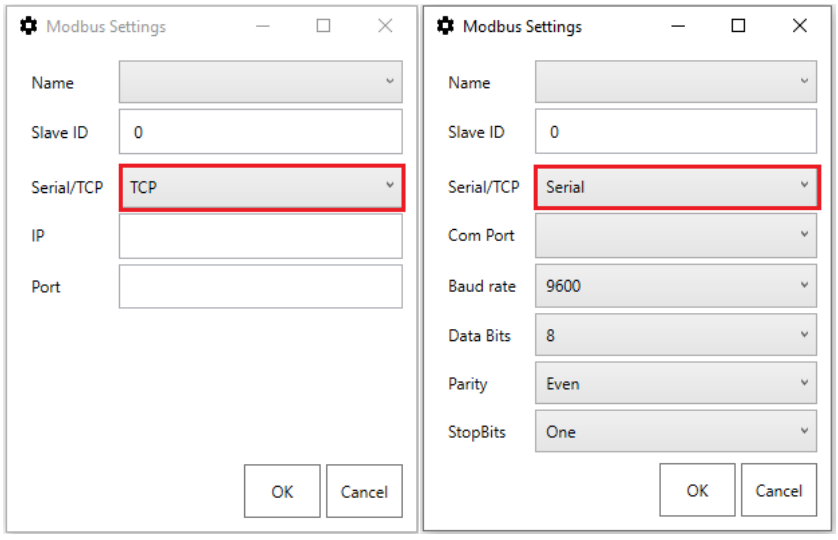
► Click "Create Modbus Device".



⇨ A window appears.

► You can connect the analyser with MRU4win via a serial interface or via a TCP/IP connection.

► Select the desired connection type under " Serial/TCP".
If you select the connection type "TCP", the input window changes.



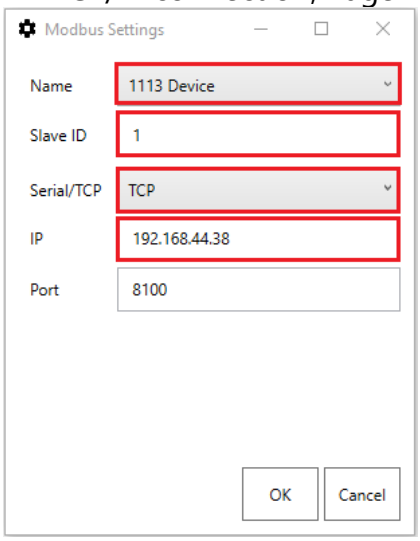
► Choose "Name"

⇨ A selection list appears.

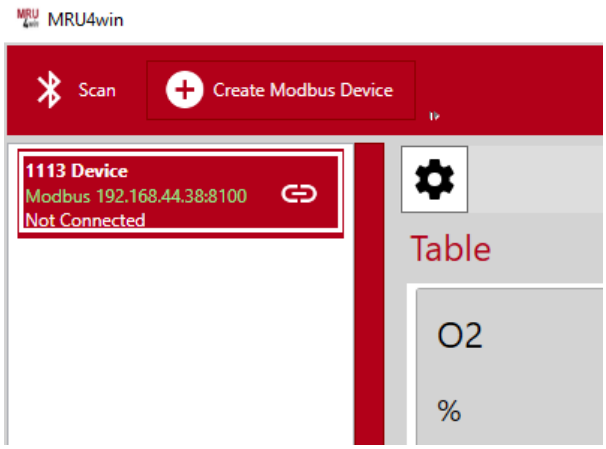
▶ Choose “1113 Device”.
▶ Set "Slave ID" to 1.
Note that the slave ID must match to the "Modbus Slave ID" of the analyser. For example, if the analyser has the "Modbus Slave ID" 2, the "Slave ID" in MRU4win must be set to 2.

▶ If necessary, enter your IP address, if you want to set up a TCP/IP connection.
In this example the LAN address is 192.168.44.38.

☞ See Example in Chapter Connecting analyser with MRU4win via TCP/IP connection, Page 118.



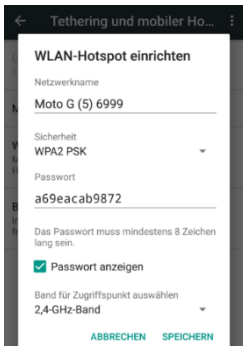
▶ Click “OK”.
▶ Go to “Livemeasurements”.
⇨ The analyser appears in the column of available analysers.

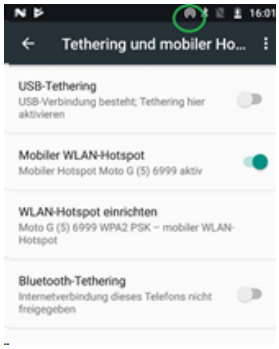


▶ Click on the "Connect-Icon"
⇨ The analyser is connected.

15.5.Remote control of the analyser via VNC

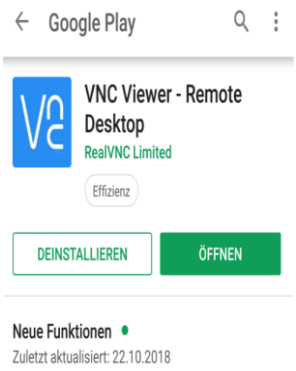
► Activate WLAN-Hotspot (android)

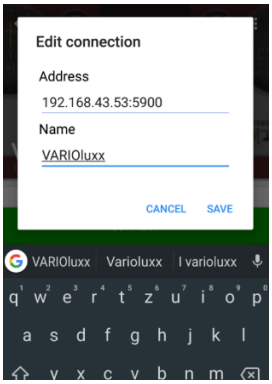




► Install VNC viewer

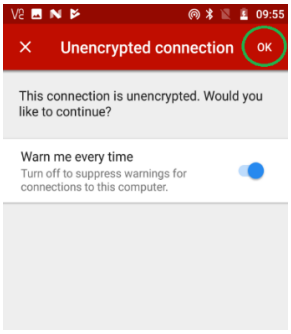
► Configure VNC viewer

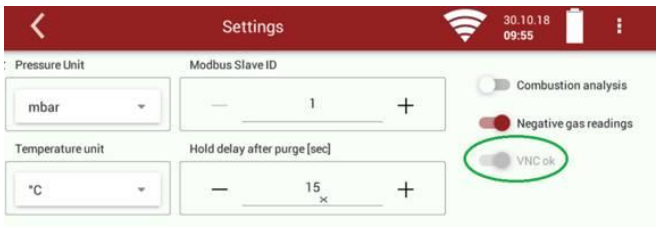




► Connect to device

► Activate VNC on Analyser





► Use remote control via Android device.

NOTE

Please note that due to the increased computing power, the CPU temperature will increase. If the temperature should become too high, the VNC server switches off automatically.

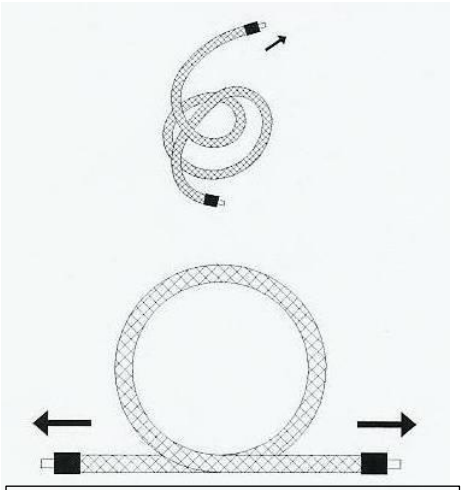
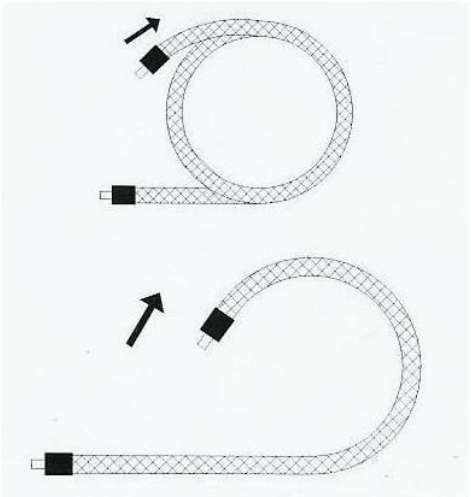
15.6.General Instructions for the heated hose line

For the save operation of the sample line it is important that it is installed correctly. This includes the following points:

- The bending radius as given below is maintained,
- The entire heated hose line is rolled out before put into operation,
- Both ends of the heated hose line are connected correctly,
- For thermal and mechanical reasons, it shall be supported by a cable duct along the line,
- The heated hose line shall be supported close to the analyser cabinet and probe housing, for example by using a separate stilt,
- There are no extreme temperature variations along the line, as the line's temperature is regulated depending on a sensor placed in the mid of the line.

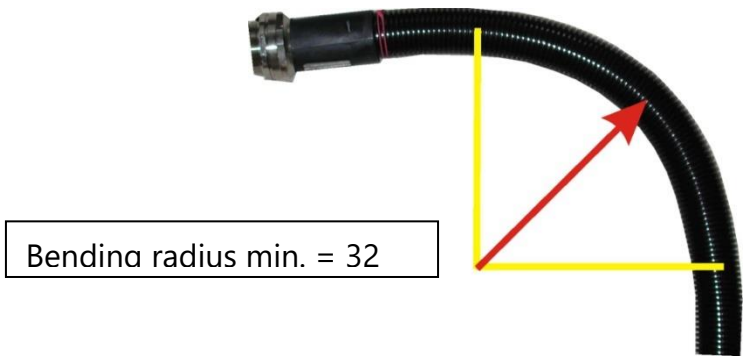
Unrolling the heated hose line

A wrong and careless use of the heated hose line may cause damage. Especially on very long heated hose lines the right unpacking and rolling out is important.

Wrong	Right
	
Don`t tear the heated sampling line out. -> Cause sharp kink.	Roll the heated hose line smooth out.

Bending radius of heated sampling lines

The picture below shows the minimal bending radius.



ATTENTION

Falling below the bending radius will reduce life time of the sampling probe.

15.7. Spare parts

Part number	Spare part
56879A	PTFE Round filter
61158	Probe filter sintered metal 2 µm
61157	Probe filter sintered metal 20 µm
10825	Mineral wool filter element
59799	O-Ring 16 x 1,5
61066	O-Ring 12 x 2
61333	O-Ring 10 x 2
60074	O-Ring 8 x 2

16 Declaration of conformity

MRU AIRfair seit 1984 EMISSIONSMESSTECHNIK	**EU-Konformitätserklärung** ***Declaration of conformity***	CE

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Person authorized to compile the technical documents

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Ort / *city:*	74172 Neckarsulm
Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung / *designation:*	Gasanalysator *Gas analyser*
Produktname / *name:*	**VARIO***luxx*
Funktion / *function:*	Gasanalyse / g*as analysis*

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

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

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

Neckarsulm, 24.05.2017

Erwin Hintz, Geschäftsführer / *Managing Director*

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