



EMISSION MONITORING SYSTEMS

We *care* about the environment

USER MANUAL



NOVAplus BIOGAS

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Inspect Shipment for Damage

Carefully inspect the entire shipment for damage in the presence of the shipper's agent, removing packaging material if necessary. Note any damage to packaging and/or goods on Packing List and have it signed by the shipper's agent prior to accepting the shipment. Submit damage claim to MRU immediately.

NOTE: Damage claims not received by MRU within 3 days of receipt of shipment will not be accepted.



Important notice!

This high quality electronic analyzer utilizes batteries that discharge even when the analyzer is not in use. Therefore it is very important to charge the batteries (Li-Ion) every 6 months, ***even if the analyzer is not in use.***

Failing to properly charge the batteries will void your warranty!

Save the original box and the packing material for use if the analyzer must be shipped in the future.

The products described in this manual are subject to continuous development and improvement and it is therefore acknowledged that this manual may contain errors or omissions. MRU encourages customer feedback and welcomes any comments or suggestions relating to the product or documentation.

Please forward all comments or suggestions to the Customer Feedback Department at the following address:

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Homepage: www.mru.eu

This manual is intended solely as a guide to the use of the product.

MRU shall not be liable for any loss or damage whatsoever arising from content errors or misinterpretation of information's from this manual or any mis-use resulting from the use of this manual.

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 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.

Intended use

The NOVAplus BIOGAS with optional flue gas measurement is only used for its application!



MRU analyzer is not a personal safety device and the ambient air monitoring feature is only indicative.

To enter in confined spaces or hazardous area, the persons must be equipped with a certified personal safety gas detector

Safety instructions

Biogas or other similar gases (landfill gas, bio-methane, coal seam gas etc) is containing flammable component CH₄ and toxic component as well (H₂S and CO₂).

Analyzers sample a certain volume of the biogas, and vent it to the ambient air.

For this reason, there are two aspects which must be considered:

- 1) toxicity danger of sample gas
- 2) flammable (explosion) danger of sample gas

1) Inhaling toxic gases is harmful to health and can even cause death in some cases.

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

2) Regarding flammable gases (e.g. CH₄ methane) and hazardous area of operating the instruments, user must also be able to recognize the area classification and be aware of using the instrument there. This area classification is country specific, please observe and notice it.

- MRU instruments may be operated in hazardous areas zone 2 by skilled users obeying local guidelines e.g. by using LEL gas detectors
- Stationary instruments are not allowed to be mounted in hazardous areas; these instruments will be placed in safe area only, but never in confined placed, always in outdoor area or room with forced ambient air ventilation.

Only trained personnel should carry out installation of stationary instrument and/or maintenance, service and repair. Opening the stationary analyzer cabinet can expose personnel to mains voltage!

2 INTRODUCTION

2.1 The NOVAplus BIOGAS

The NOVA BIOGAS analyzer is used for:

- for BIOGAS simultaneous measurements of O₂, CH₄, CO₂, H₂S and optional the BIOGAS pressure
- optional for combustion measurements of the engine: O₂, CO, NO, NO₂ and CO₂ (NDIR) including the calculation of: mg/m³, NO_x as mg/m³ NO₂, true NO_x-measurement $NO_x = NO + NO_2$, referencing (normalisation) to user settable value

It can also be used (when optionals are activated or external equipment is used) for a number of measurement tasks, such as:

- Flow velocity measurement
- Differential measurement of pressure and temperature
- Combustibles detection with external HC sensor
- Automatic measurement with data logging

You will find a list of all optionals for this analyzer on our web page or you can contact MRU or our local representative. The NOVAplus BIOGAS Analyzer is available in different versions. This manual will describe all versions indicating optionals and features not always available on all versions.

2.2 The company MRU GmbH

Your analyzer is produced by the MRU GmbH in Neckarsulm Germany (founded in 1984), a medium sized company that specializes in developing, producing and marketing high quality emission monitoring analyzers. MRU GmbH produces a wide range of instruments, from standard analyzers up to tailor made industrial analyzers. MRU GmbH contact details are listed on the previous page.



Factory 1 (service department, development division, administration)



Factory 2 (Product division)

2.3 Important general information

This analyzer is not designed to be used for continuous measurements.

Before using the analyzer verify the condition of the various parts of the analyzer, such as the probe, the ambient air conditions, the condensate separator, star filter and the connectors for damage and/or blockages.

When starting up the analyzer it will take between 1 – 3 minutes to set to zero depending on the condition of the sensors and of ambient.

The minimum zeroing time of the analyzer to achieve correct measurement values can be expected by 1.5 minutes!

Caution: Exposure to acids; aggressive gases such as sulphur; vapours such as thinners, gasoline, alcohol and paint, etc. can damage, reduce the life of, or destroy the sensors.

The life of the sensors depends on how they are used, maintained and treated. Typical average life expectations are: O₂ - 2 years; CO - 2 - 3 years and NO - 3 years.

The use of the analyzer for regulatory purposes is subject to special regulations (for example a periodical examination of the analyzer). Please obtain the appropriate regulations from your local responsible authority.

2.4 Important information about the users/operation manual

The users/operation manual is an important part of this delivery. It will explain how to use this analyzer properly and sets forth safety and environmentally friendly procedures.

It is the responsibility of all users to read and familiarize themselves with this manual, paying particular attention to the safety instructions.



The most important safety details are listed in chapter 3 (Safety Information). Additional safety details in other chapters are clearly marked with an **attention** sign.

3 SAFETY INFORMATION

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

3.1 Safety regulations

1. The NOVAp^{plus} BIOGAS may only be used as indicated in this manual.
2. Our analyzers are checked according to the following regulations:
VDE 0411 (EN61010) and **DIN VDE 0701** before they leave the MRU GmbH factory.
3. MRU technical products are designed and manufactured according to **DIN 31000/ VDE 1000** and **UVV = VBG 4** of the professional guilds for fine mechanics and electrical engineering.
4. MRU GmbH assures that the analyzer complies to the essential requirements of the legal regulations of the member states of the electro-magnetic compatibility (**89/336/EWG**) and to the low-voltage regulations (**3/23/EWG**).



3.2 Specific safety regulations

1. Use only the battery charger supplied with the analyzer for this instrument
2. No part of the analyzer, including the metal probe tube and all other metal parts & accessories are to be used as electric conductors.
3. The analyzer is not to be used in or under water.
4. The analyzer is not to be placed near or directly exposed to open fire or heat.
5. The specified probe temperature range is not to be exceeded, as the probe, temperature sensory mechanism and sensor could be damaged or destroyed.
6. The analyzer shall void dropping.
7. **Attention:** Caution: Moisture, being pumped out of the condensates trap can be slightly acidic. In case of skin contact IMMEDIATELY: clean affected parts of the body.



Avoid getting liquid in eyes.

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

After measurement, vent the analyzer with ambient air and allow the probe to cool.

A hot probe could cause burns or ignite flammable material.

8. 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.



3.3 Guideline for Li-Ion Batteries

- The battery pack is not Aplus for end users
- Li-Ion rechargeable battery pack for NOVAp^{plus} BIOGAS
- Do not heat or throw the battery pack of in fire.
Do not charge and leave the battery pack at the high temperature.
- Do not deform, short-circuit, disassemble or modify the battery pack
- Do not allow the battery to be immersed in or wetted with water or sea water
- Do not subject the battery pack to a strong impact or throw it
- Do not cut, squeeze, tear at the cables of the battery pack
- Do not carry or store the battery pack together with material which have sharp edges or is electrical conductive in the same custody
- Not letting (+) terminal come in contact with (-) terminal or metal

The above items may cause heat, fire and explosion

Your quality management MRU GmbH

4 RETURNED GOODS

Packing regulation of 12.07.1991

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

4.1 Return of hazardous waste

- Waste Disposal>Returns/Warranty -

MRU GmbH is required to accept the return of hazardous waste such as electro-chemical sensors that cannot be disposed of locally. Hazardous waste must be returned to MRU prepaid.

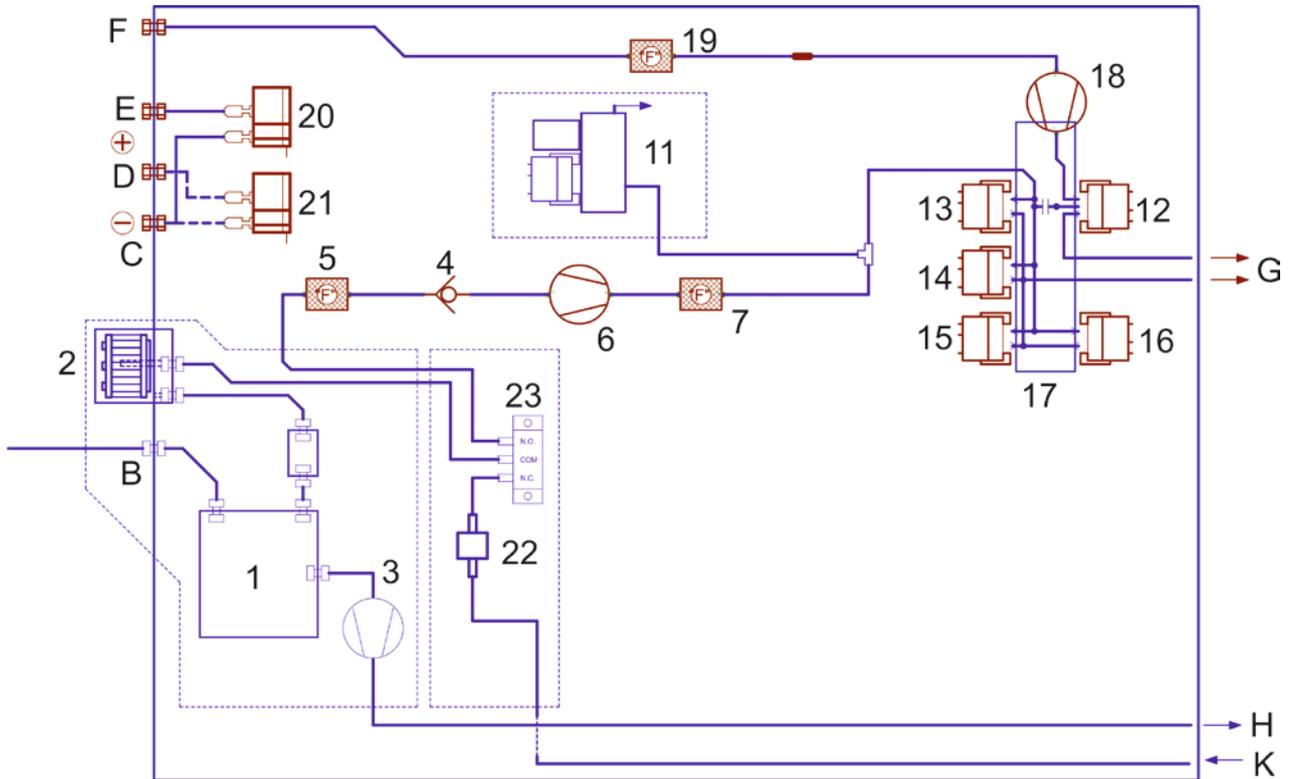
4.2 Return of analyzer according to ElektroG

MRU GmbH is required to accept the return, for proper disposal, of all analyzers delivered after 13th of August 2005. Analyzers must be returned to MRU prepaid.

5 MEASUREMENT PRINCIPAL

A partial volume of the biogas is sucked and analyzed using NDIR and electrochemical sensors on its ingredients.

5.1 Gas flow diagram with gas cooler



Position	Description	Position	Description
B	Gas inlet	7	Filter
C	Differential pressure -	11	NDIR bench
D	Differential pressure +	12	O2 sensor
E	Draft	13	CO sensor
F	Fresh air inlet	14	NO sensor
G	Gas outlet	15	NO2 sensor
H	Condensate outlet	16	SO2 sensor
K	Fresh air inlet for zeroing	17	Sensor chamber
1	Gas cooler	18	Purge pump
2	Star filter unit	19	Filter
3	Hose pump	20	Pressure sensor
4	Non return valve	21	Pressure sensor
5	Filter	22	Air filter
6	Gas pump	23	Valve for zeroing

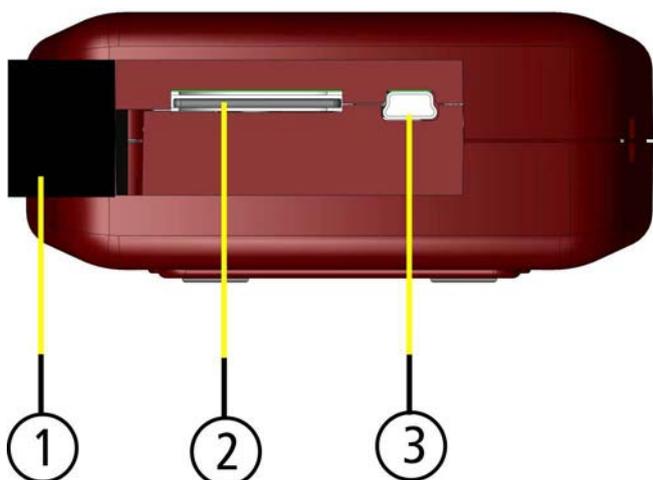
6 ANALYZER DESCRIPTION

6.1 Remote control unit (RCU) front



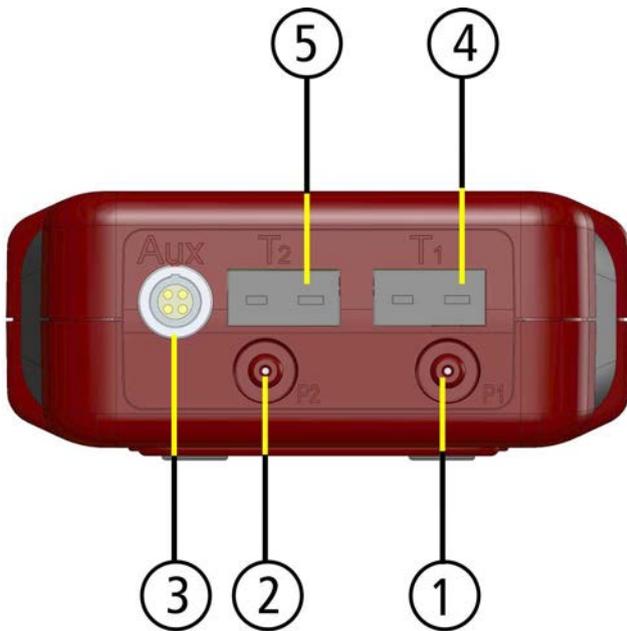
1	Display
2	Keypad

6.2 Remote control unit (RCU) Connectors - top



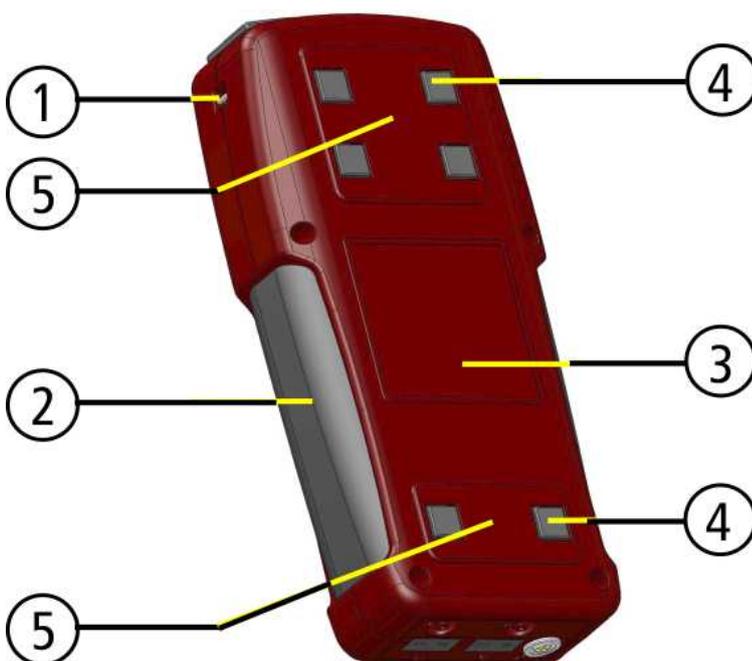
1	Cover
2	SD-card slot (only by using a MRU-SD-CARD we can assure the compatibility of all analyzer functions)
3	USB port

6.3 Remote control unit (RCU) bottom side (option)



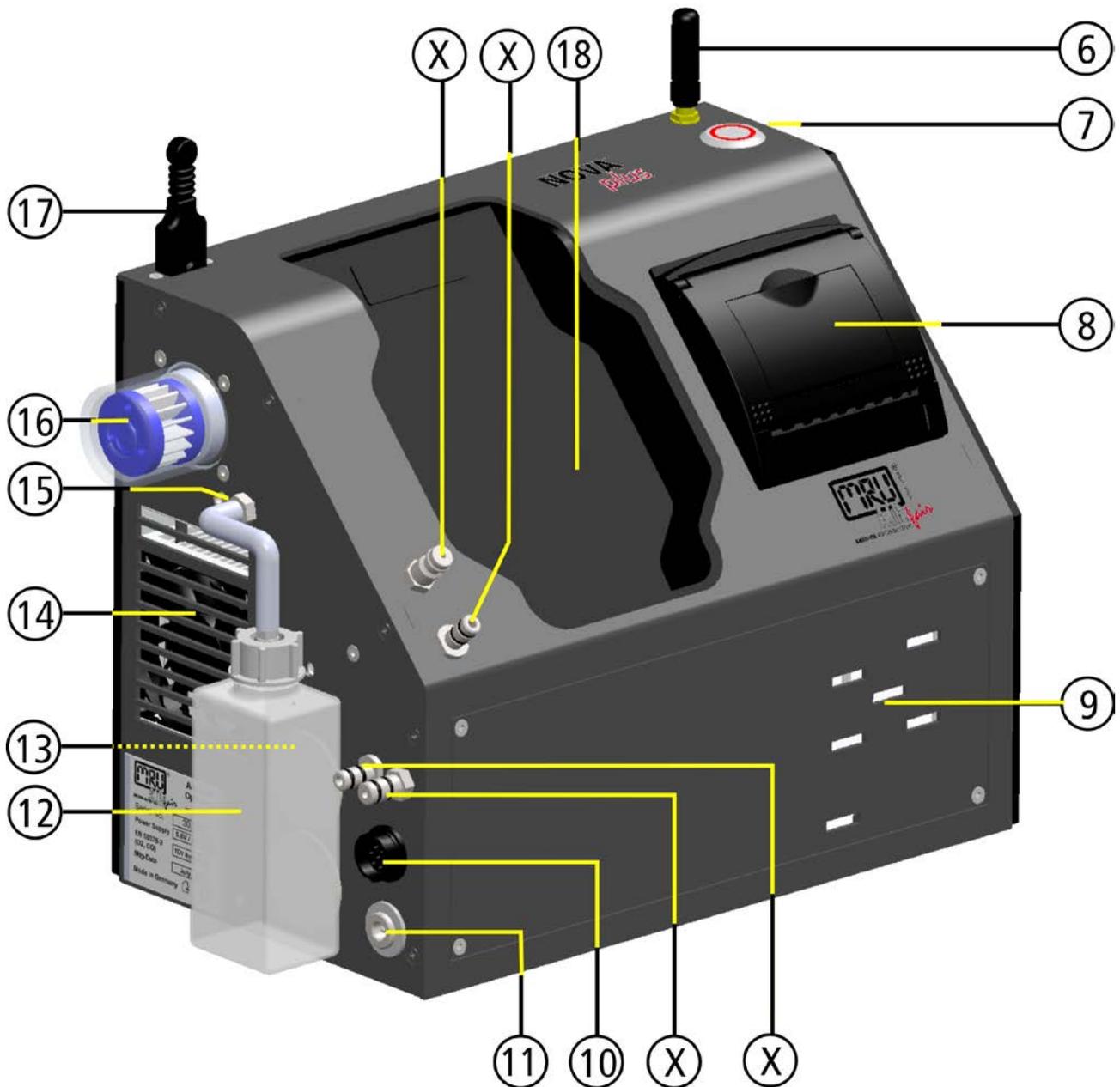
1	Pressure connection 1
2	Pressure connection 2 (Diff. pressure)
3	AUX connector
4	Temperature connection 1
5	Temperature connection 2

6.4 Remote control unit (RCU) back side



1	Eyes for shoulder strap
2	Handle strip
3	Contactless battery charging
4	Analyzer feet
5	Fixing magnets

6.5 Base unit with gas cooler (option)



6	Aerial	13	LED condensate container
7	ON-/OFF key button	14	Fan gas cooler
8	Built-in speed printer	15	Outlet for condensate
9	Gas outlet	16	Star filter
10	Connector T-gas	17	Connector T-Ambient air (combustion air)
11	Charging socket	18	Charging frame for Remote control unit
12	Condensate container	X	Connectors see chap. 6.9

6.6 Connectors depending on the options (gas cooler)



Connector	2	3	4	5
Models				
1 pressure sensor standard	draft / pressure -	gas inlet	pressure +	
2 pressure sensors Option Diff. Pressure measurement with 2nd internal pressure sensor	draft	gas inlet	pressure -	pressure +

7 ACCESSORIES

7.1 Gas sampling probes (optional for flue gas measurements)

The NOVAplus BIOGAS is available with different probes, both with fixed and exchangeable probe tubes. A complete list of available probes can be found in the current price list of this analyzer.

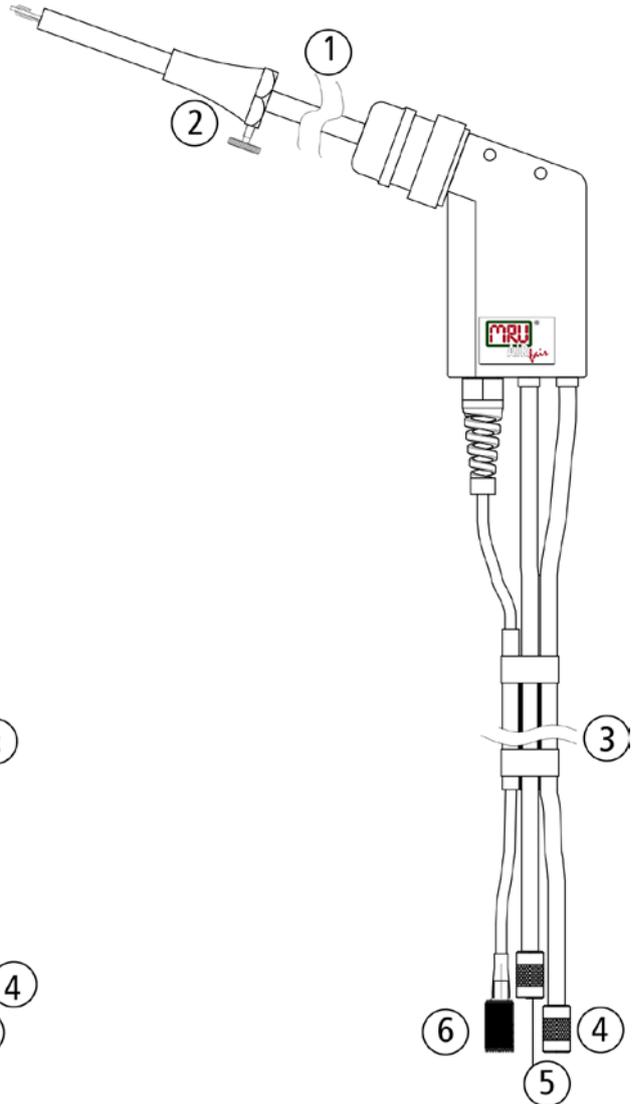
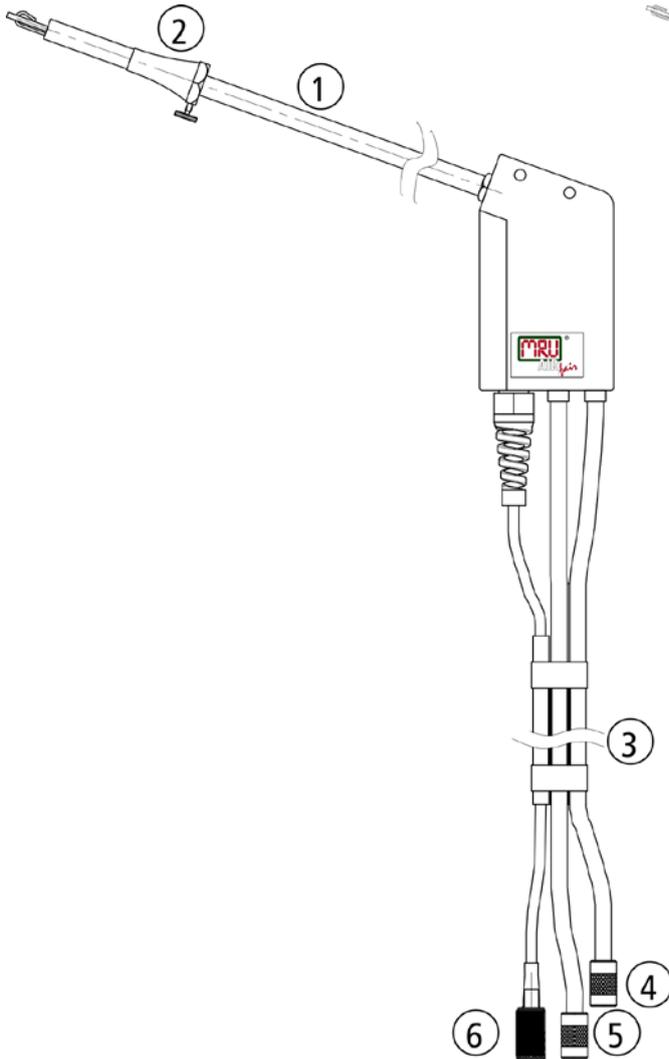
Below are two different probe types:

Probe

with 300 mm probe pipe (fixed)
and 2,7 m sampling line

Probe

with 300 mm exchangeable probe pipe
and 2,7 m sampling line

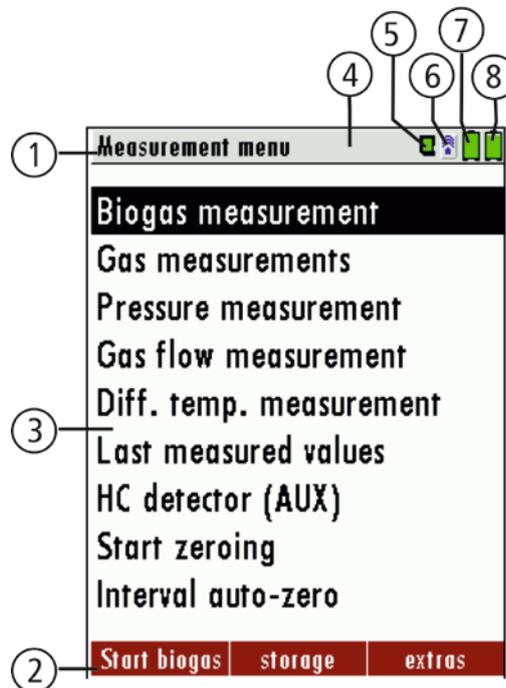


1	Probe tube
2	Probe cone (high grade steel)
3	Hose
4	Connector for sample gas measurement
5	Connector for draft measurement
6	Connector for temperature measurement

8 OPERATING THE ANALYZER

8.1 The Display

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



1	Menu bar
2	Function key bar
3	Display panel <ul style="list-style-type: none"> - Menu - Measurement value,...
4	Zeroing active
5	SD-Card in the slot <ul style="list-style-type: none"> - Indication green Read- and write access - Indication yellow only Read access (SD-Card write protected) Indication red SD-Card is damaged SD-Card is damaged
6	Blue: Bluetooth connection base unit to RCU Red: No Bluetooth connection base unit to RCU Yellow: Base unit is in the update mode (Press ON-key at the base unit for changing to the measurement mode)
7	Battery charge condition base unit
8	Battery charge condition RCU

8.2 Keypad

Description and function of the keys:

<p style="text-align: center;">ON/OFF</p> 	<p>By pressing the ON/OFF button the RCU will start up without delay.</p> <p>By pressing the ON/OFF button the base unit and the RCU (if RCU is placed in the charging doc) will start up.</p> <p>The powering down of the unit is timely delayed to protect the sensors if there is no fresh air inside the system. If there is no fresh air inside the system the analyzer will recommend a purging of the sensors.</p>
<p>Function Keys</p> 	<p>Activates the functions seen on the display (2 function key bar)</p>
<p>Menu Key</p> 	<p>Will show all available functions in the window that is currently in use – also those which have an individual key on the key pad like the printer and the three function keys.</p>
<p>ESC</p> 	<p>Abort or return to the menu above</p>
<p style="text-align: center;">Arrow Keys</p>	<p>Jump in between lines, change values</p>
<p>OK</p> 	<p>Confirmation key, select a marked menu point</p>
<p>Printer Key</p> 	<p>Activates the print out of the measuring results in the measuring screen in a pre-defined format.</p> <p>Linefeed when there is no printable display condition.</p>

8.3 Connection RCU to base unit

Declaration of symbols: : No Bluetooth connection base unit to RCU

: Base unit is in the update mode
(Press ON-key at the base unit for changing to the measurement mode)

: Bluetooth connection base unit to RCU

If the connection breaks off base unit to RCU during a measurement, e.g., because of the distance, the symbol changes the colour from blue to red at the display of the RCU. The measurement in the base unit is not thereby broken off. As soon as the distance base unit to RCU decreases again the connection is rebuilt and the topical measuring values are indicated.

Connecting base unit to RCU

For connecting the RCU with the base unit select the menu settings/device info base

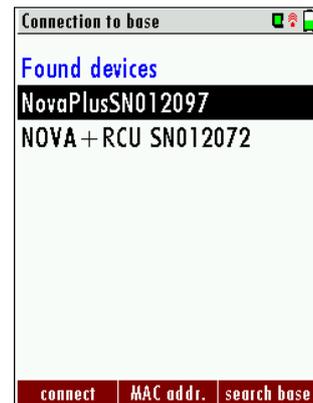


Press „connection“



Select a base unit or search with key F3 base units in your near environment.

Connection menu (the connection RCU <-> base unit is preset factory-provided!)



Press „connect“ F1 for connection with the base unit.



The name consists of NOVAplus BIOGAS and the serial number of the base unit.



MAC Adr.: display the Bluetooth address.

Search: All switched ON base units in the near environment will be displayed.

Delete list: Connection list will be deleted.

Disconnect: Existing connection will be disconnected with the F1 key.

8.4 Reset and Blink codes

Reset of the RCU: press ESC and ON/OFF- button at the same time for a couple of seconds

Reset of the base unit: press ON/OFF- button for about ten seconds (LED switches off)

LED in ON/OFF- button in the base unit:

Illuminated constantly red: operating mode display

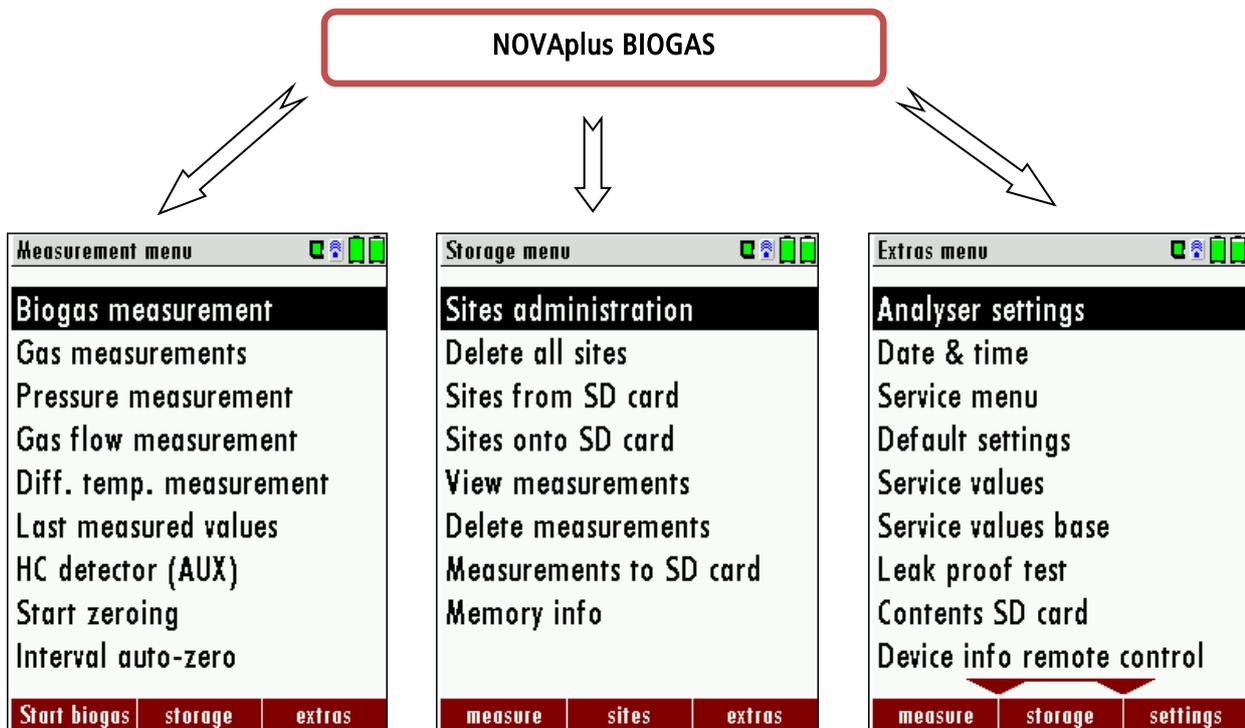
Flashes every five seconds: no connection with the RCU

Flashes every one second: Software update active: Abort by using the ON/OFF-button

8.5 Menu configuration

The NOVAp^{plus} BIOGAS organizes all available actions in three main menus:

- Menu Measurement → all tasks for the measurement programs of the analyzer. Here you can select all installed and available measurement programs.
- Menu Memory → all tasks for the management of the data memory available.
- Menu Extras → all the other available tasks – for management and customizing your analyzer.



The topic „Biogas measurement“ is a standard feature in every analyzer and is explained in chapter 12. Other menu points are optional and will be explained either in this manual or in an additional manual or flyer.

Please read chapter 13 for details.

Please read chapter 14 for details.

You can jump in between the 3 main menus with the 3 function keys (according to the displayed name on the screen).

9 FIRST USE OF THE INSTRUMENT

After the analyzer 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.

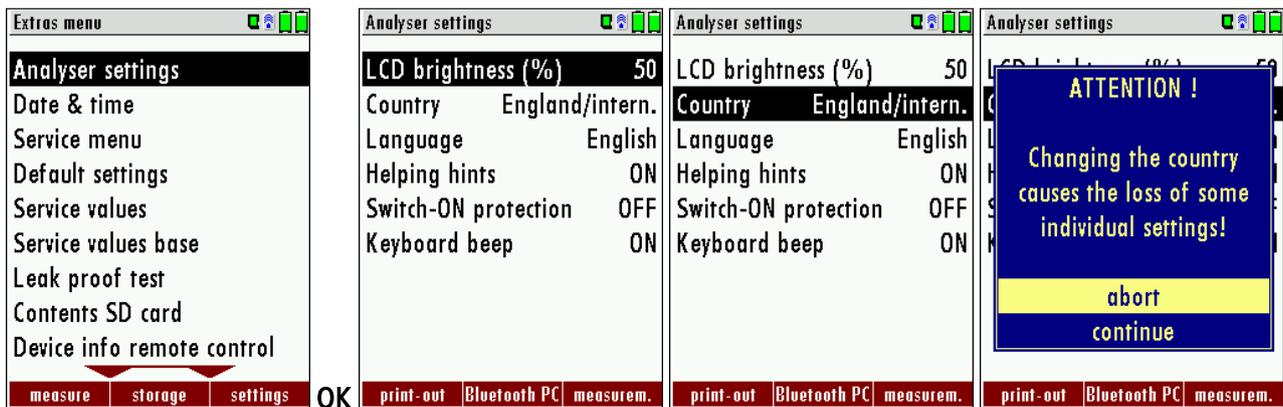
9.1 Analyzer ready for operation

- Unpack the analyzer, read the complete manual
- The analyzer was shipped completely assembled, in working condition and ready for operation. It is recommended that the analyzer is thoroughly inspected for completeness and damage.
- Recommendation: charge the batteries for 8 hours prior to use.
- Check/Change date and time

9.2 Analyzer settings

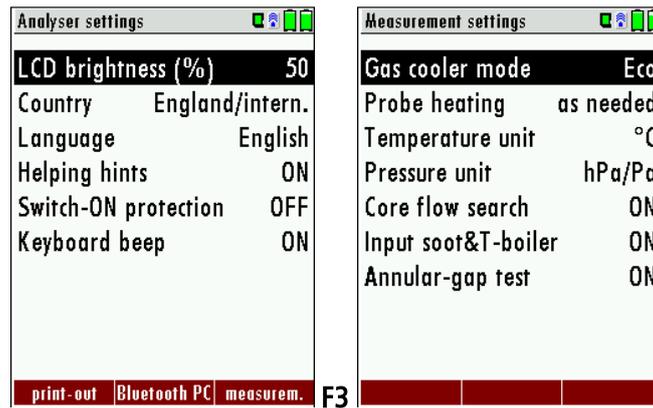
The "Settings" menu allows configuring some instrument specific parameters.

In the main menu "EXTRAS" = "F3 key" - scroll down to "Settings" then press the "OK" key, By selecting a line the parameter value can be changed by the arrow keys.



LCD brightness	5 – 100 %	Display-brightness, depending on the personal judgement of the user, at 20°C a value of ca. 50% is normal
Country	DE/GB/IT/FR/CZ/RO/TR/ES/NO/HU/NL/PL/SI/RU/LV/HR/JAP/	Enables some country specific parameters like fuel types, calculated values etc.
Language	DE/USA/GB/IT/AT/RO/ES/CZ/NO/TR/PL/HU/NL/FR/SI/RU/CH	Select device languages
Helping hints	ON / OFF	Helpful hints activated or deactivated (explanation below)
Swich ON protection	ON / OFF	If activated and if ON key is pressed (possibly inadvertently), then the message „3 seconds OK key press “ displays
Keyboard beep	ON / OFF	Keyboard beeper activated or deactivated

9.2.1 Measurement settings



Gas cooler mode	Full / Eco	full: cooling up to approx. + 5 °C eco: cooling up to approx. 10 °C below ambient temperature (nicht unter +5 °C!)
Temperature unit	°C or °F	Change the unit for temperature in all screens
Pressure unit	hPa/PA, hPa, kPa/Pa, kPa, mbar, mmH2O, cmH2O, inchH2O, mmHG, inchHG, PSI, Pa	Change the unit for pressure in all screens. The meaning of hPa/Pa and kPa/Pa is that the instrument performs a dynamic change of unit depending on the absolute value of pressure.

Explanation for "Helping hints":

Some helpful hints which are very useful for an inexperienced user but are not needed by experienced users, can be activated or deactivated. The following hints will be affected:

"Zeroing finished, Sensors are ready. Analyzer ready for measurement."

"Reminder! Charge batteries at regular intervals!"

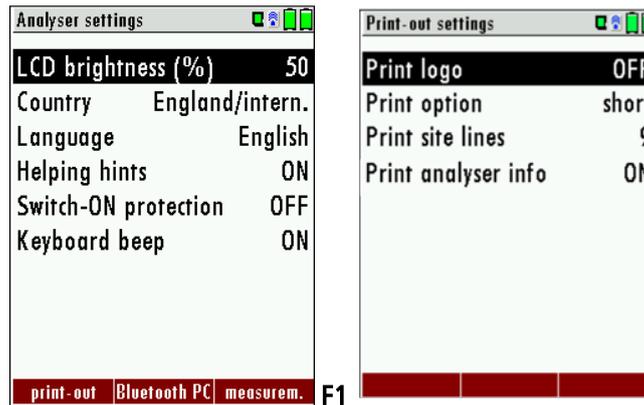
"Measurement stopped/started."

9.2.2 Switch-ON protection

If activated and if ON key is pressed (possibly inadvertently), then the message: „3 seconds OK key press “displays

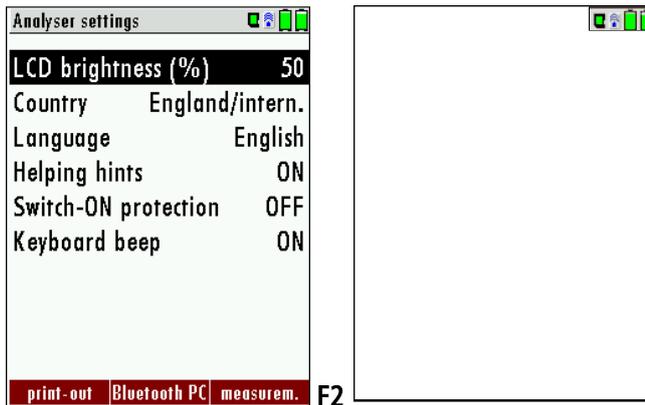
9.2.3 Print-out settings

In the main menu "EXTRAS" item analyzer settings: print-out settings.



- Print logo ON/OFF: Print logo see chap. 14.1
- Print option SHORT/LONG: SHORT: Print-out without area for signature and site information
- Print site lines 0 ... 9: Line 1 (Site no.) is necessary, further lines (freetext) printable if necessary see chap. 13.2
- Print device info: To measuring print out can be shorter designed, while the device info will be left out.
In some print outs (adjustment, service ...) the info will be printed forever.

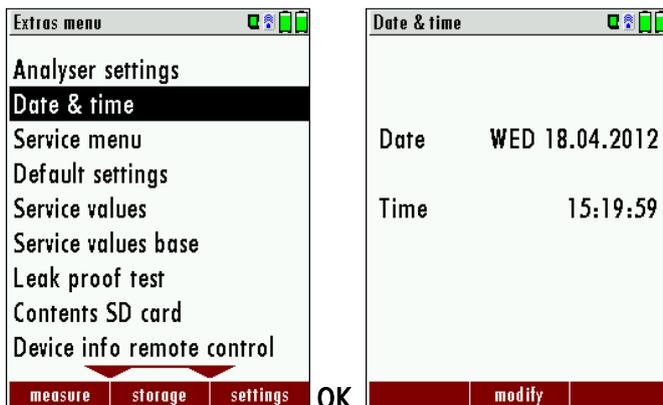
9.2.4 Bluetooth settings



If RemoteData, OnlineView or MRUConnect (PDA) with Bluetooth is used, the SLAVE mode must be selected. The auto connect mode must be switched OUT.

(Further description in the manual part of OPTIONS)

9.3 Setting time and date



F2	Edit
▲, ▼	Change the marked number
◀▶	Move the cursor to the next position
ESC	Back to Extras menu

10 Maintenance and Cleaning

10.1 Cleaning

The NOVAp/us BIOGAS needs to the long value preservation only one very low maintenance need:

- now and then: Cleaning of the probe and the probe tube
- after every measurement: remove gas sampling tube from the NOVAp/us BIOGAS, so that the hose can dry
- after longer disuse load battery first and afterwards approx. all 4 weeks

10.2 Service and Maintenance

- 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.
- With optional gas detector: In the case of a use to the pure leakage detection (maximum value search) a function check of the equipment is enough e.g. over an impact from a search gas bottle. A long-term continuous detector accuracy is guaranteed however only by an annually repeated calibration of the equipment.

10.3 Service-Maintenance Plan

A check of NOVAp/us BIOGAS at our Service Department is necessary:

- after **1000 working hours** or

if it has been more than 11 months since the last check.



When next powered on, you will be reminded to the execution of the annual customer service.

A complete service at a MRU service station (for MRU services station please see: www.mru.eu) contains the function control and calibration and/or cleaning of the following components:

Sensors, pumps, internal/external hose lines, battery, draft sensor, electronics, time and date, temperature sensors, gas sampling probes, condensate separator

11 PREPARATION FOR EACH MEASUREMENT

11.1 Power supply

The analyzer can be used with:

1. with the internal MRU battery (provided)
2. with the MRU battery charger (provided)

External equipment may only be connected while the analyzer is switched off!

11.2 Auto Off

The instrument is automatically switched off after 60 minutes.

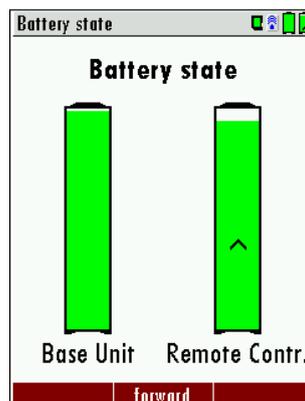


During a measurement or a battery charging cycle the auto off is deactivated.

11.3 Measurement with battery charger/battery charging

When ever you connect the base unit with external poer supply (100..240 V / 50/ 60Hz) the battery of the base unit will be charged.

The battery of the Remote Control Unit (RCU) will be charged, if the RCU is in the charging frame of the mains connected base unit. The battery status screen will appear when the base unit is connected to the battery charger and the RCU is in its charging doc. This screen can also be manually opened with the menu button.



At the moment, if the battery is fully charged and the trickle charge mode begins an acoustic feedback will be played.

11.4 Measurement with battery (Battery monitoring)

The battery symbols in the top right corner displays the current battery charge condition.

Approximately 15 minutes (depending on the analyzer configuration) before the battery is drained, the battery symbol (base unit or RCU) will start to blink red (about once per second).

If the battery is almost drained and the analyzer is not connected to the battery charger within one minute, then the analyzer will switch off automatically to prevent deep discharge of the battery.

11.5 Operation temperature

If the analyzer has been stored at low temperatures, it will require some time to equilibrate to the ambient temperature before being switched on. If it does not equilibrate, condensation will occur inside the analyzer!

If the temperature is out of its operation range (see chap. 15), you will see the following messages on the display.



Once one of these messages appears you will not be able to use the analyzer, the zeroing doesn't start until it has reached the specified operation temperature.

11.6 Connectors and leak tightness

- Check all push on connectors for proper fit.
- Check all hoses, hose connectors and the condensate separator.

The NOVAplus BIOGAS provides an automatic test to check the probe and internal system for leaks (see chapter 14.5)

11.7 Power ON, Self-diagnostic and zeroing

Press the ON key at the base unit. The analyzer starts Self diagnostics without any further action from the user.



Top left: Leak proof test
 Top right: sensor test
 Bottom left: flow control
 Bottom right: Battery status

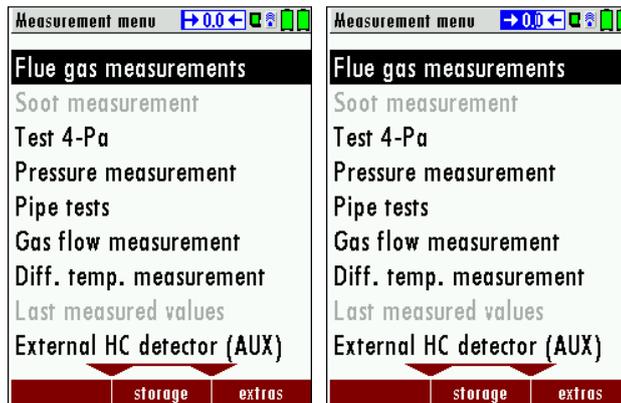
The self-diagnostics provides a quick overview of the status of the batteries and the sensors. If the option "Flow control" exists, can appear the current flow rate [l/min].

The self-diagnostics begin with **F2 start** and follow the instructions on the display. The self-diagnostics can be skipped with the **ESC key**.

After the self-diagnostic the analyzer will start zeroing without any further action from the user.

The probe shall **NOT** be installed in the stack during zeroing!

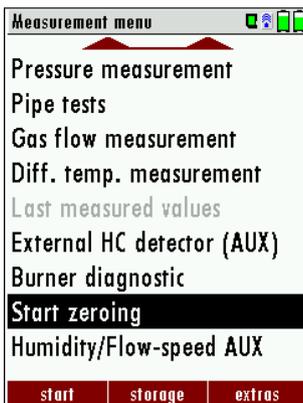
While the analyzer is zeroing you will see a blinking **0.0** symbol in the task bar indicating the progress of zeroing.



The unit will display a self-test after zeroing (Leak tight test, sensor test, internal flow monitoring and battery status). The unit will display any error (for example defect sensor) that is detected during the self-test. With the ESC button you can delete any displayed error messages and then reach the measuring menu.

11.8 Repeating the zeroing

The zeroing can be repeated at any time as long as the zeroing will proceed with fresh air. In the main menu you select "Zeroing", and after the displayed message press the OK key.



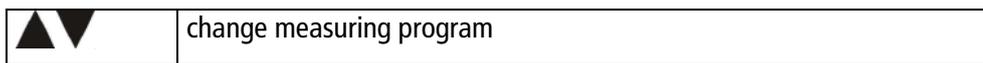
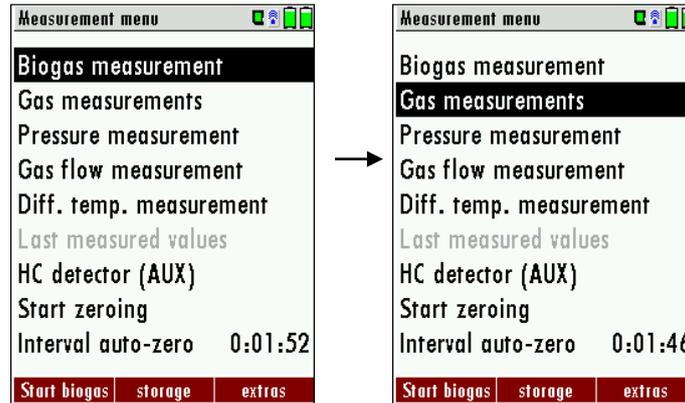
▲, ▼	Zeroing
OK	Start zeroing

12 HOW TO TAKE A MEASUREMENT

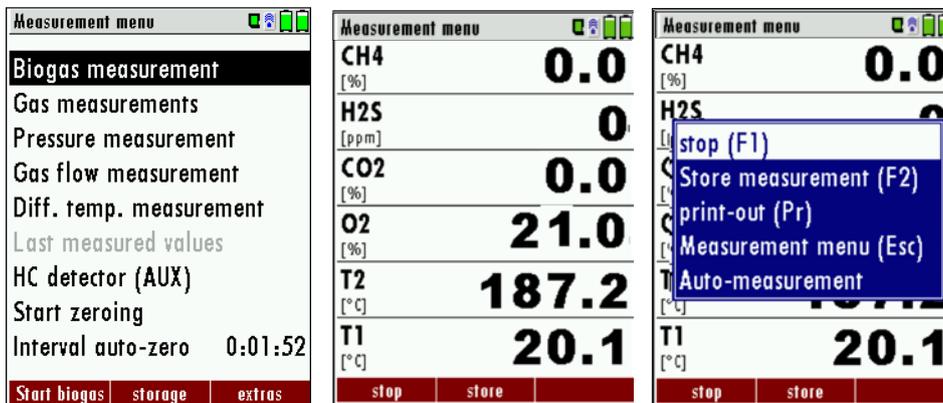
Every NOVAplus BIOGAS is capable of making a complete BIOGAS measurement. How to perform this is described below.

12.1 Selection of the measurement program

If you press the F1 key "Start" in the measurement menu, you will be directed directly into the measurement screen, using the parameters that have been selected last time the analyzer was used.



12.2 BIOGAS measurement

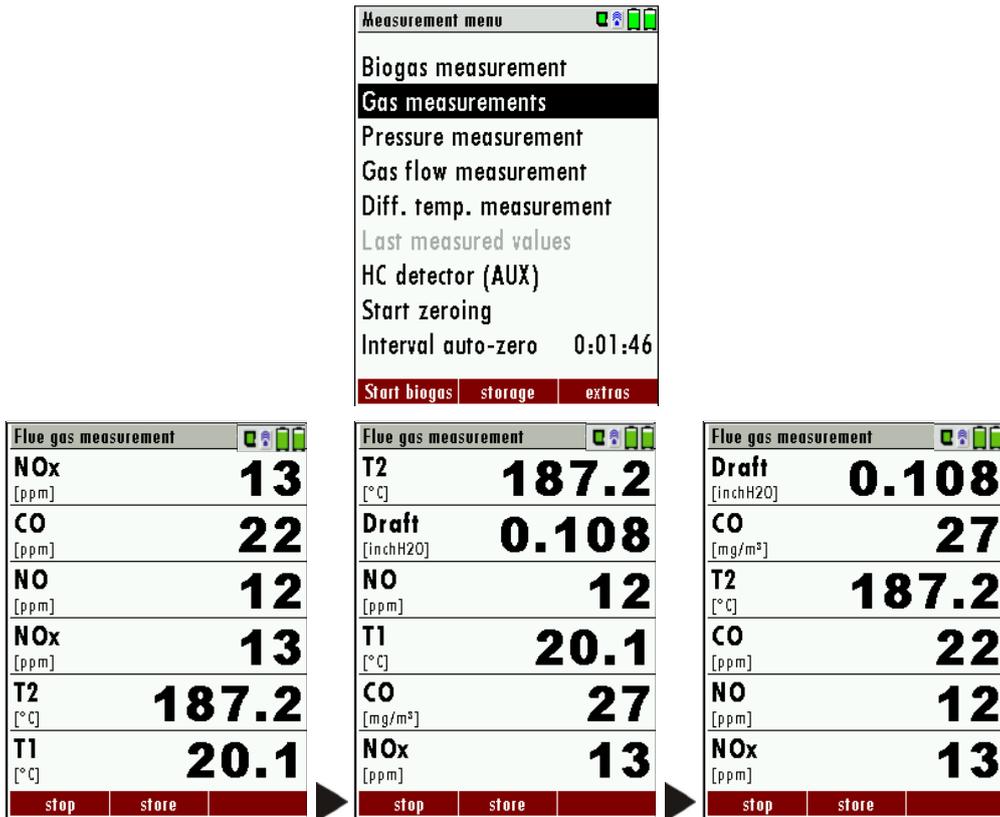


F1	Measurement: start / stop
	Menu key
F2	Store measurement
Printer	Print display content
ESC	Back to measurement menu

12.3 Flue gas measurement (option)

Measurement values can be organized on three pages, each page displaying 6 measurement values.

The order of the display is operator settable.



There are direct measured values available such as Oxygen and Temperature as well as calculated values such as dew point, efficiency and CO₂. You will also find the same measurement value in different calculated values such as CO in ppm or CO in mg/kWh.

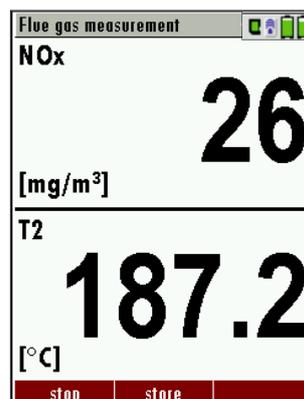
Values that cannot be displayed are indicated with dashes. Possible reasons for value not being displayed are:

- Electro chemical sensor was detected as defective during zeroing.
- External temperature sensors are not connected.

The measurement value T-Gas is usually read at the connector "T-Gas/AUX" (depending on configuration) or if not available from the connector "T1". (see chapter 6)

There are three measurement windows available, with the arrow keys left and right moving between them.

Zoom function, each with two values, is activated by moving the arrow keys up and down. Moving arrow keys left and right pages between the two zoom windows.



12.1 CO-limit (only with optional flue gas measurement)



If the CO limit value is exceeded, the color of the measured CO values changes (red).

12.2 Storage the measuring results

If in the function key bar "store" is indicated, you can store with the accompanying function key F2 or F3 the measurement in the data memory. The function of the data memory is explained in chapter 13

12.3 Printing the measurement results

Measurement results can be printed using the printer button. Printer line feed is activated when pressing the printer button outside of a measuring screen. All measurement values which are activated in the measurement screen will be printed (values which are selected more than once will only be printed once).



To change the printer paper you pull out the little plastic recessed grip (2) which is mounted on the transparent printer cover (1). Insert the new printer roll and let the end of the paper stick out of the printer (+/- half inch). Close the printer cover (marking 3) using only with light pressure. Paper feed is activated using the printer button (when not in measuring window).

12.4 End of measurement

A current emission measurement can be stopped at any time with the F1 key. The display will change its colour and the measurement will be frozen. At the time you stop the measurement all measured values are still available and can be viewed at a later time (see chap. 12.11).

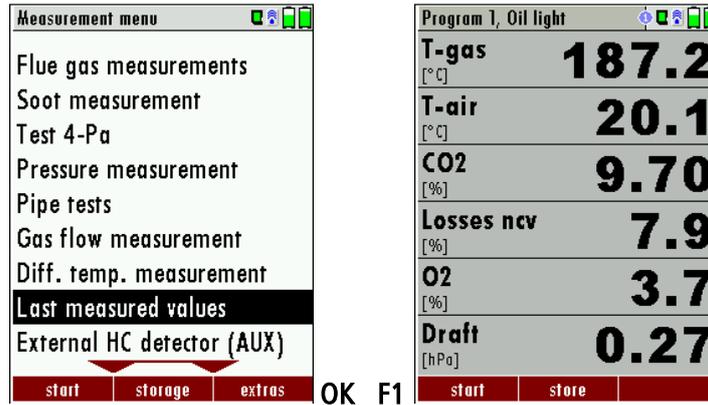
Return to the measurement menu by pressing the ESC key.

12.5 Last measurement results

The analyzer allows the viewing of the last measurement after a measurement is completed.

In the main menu "Measurement" select the point "last meas. values".

The last values can be viewed, printed and/or saved.



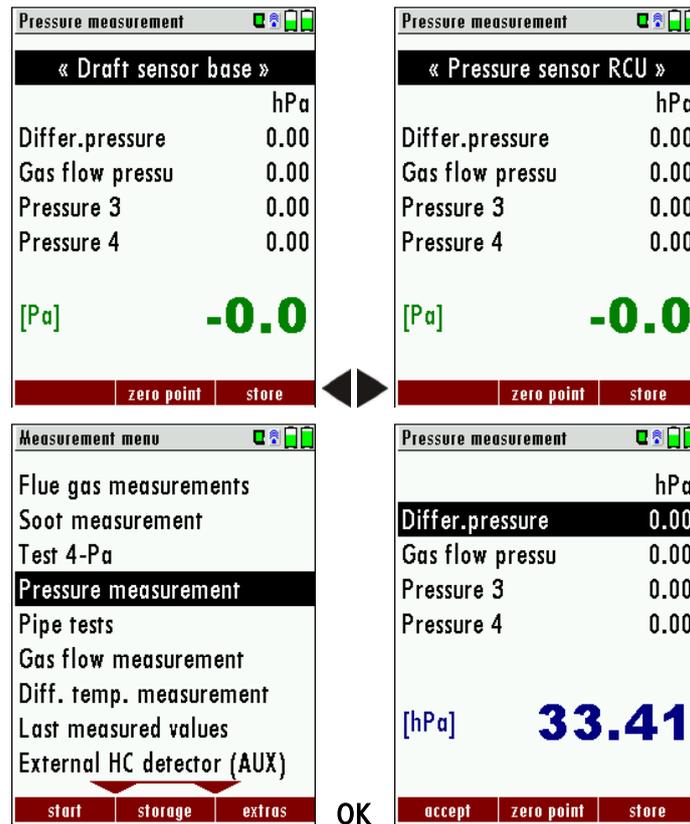
Above the F1 key "Start" instead of "Stop" is displayed. Pressing this key will continue the measurement.

12.6 Pressure measurement

Pressure (4 values) is measured and saved to the selected measurement name. The actual measured value is displayed in the middle of the display. The 4 measurement names can be changed as desired.

Rearrangement of the differential pressure sensors:

To be able to use the pressure sensors in the RCU (only Comfort Model) as well as the pressure sensors in the base unit an selection will take place using the arrow keys:



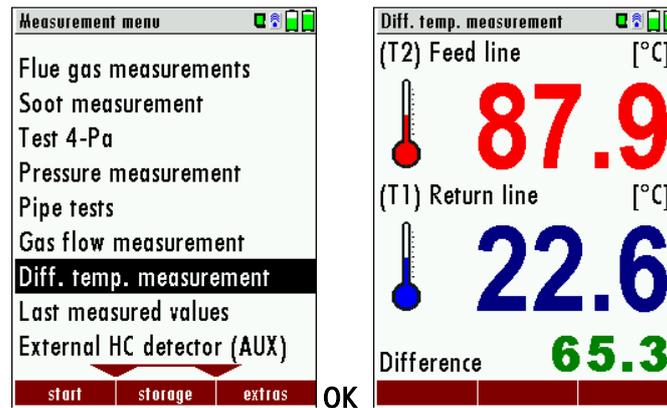
▲, ▼	Select the measurement name 1-4
F1	Save the measured value to one of the measurement name
F2	Zeroing the pressure sensor
F3	Change the name of the measurement category
ESC	Return to the measurement menu

Note:

The pressure of the remote control (RCU) can also displayed in the flue gas measurement.

12.7 Differential temperature measurement

The RCU (only comfort version) can display two temperature values in the menu Differential Temperature if two temperature sensors are connected to T1 and T2. The RCU will also calculate and display the differential temperature.



Note:

The accuracy of the difference temperature measurement is guaranteed only on use of the MRU temperature sensors.

13 DATA STORAGE

13.1 Organisation of the data memory

Basis of the data memory of the NOVAp^{plus} BIOGAS is a set of sites stored in the device. Every site exists of an unique site number and 8 freely usable text lines which can have, e.g., the address, customer name etc.

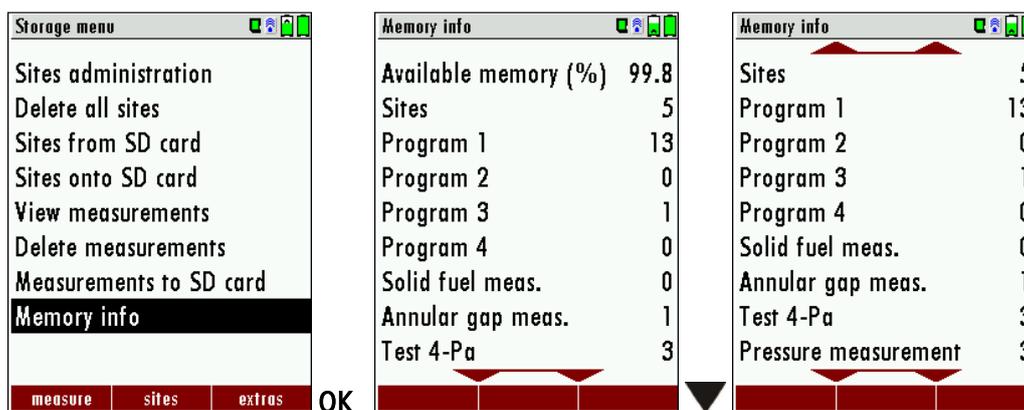
The device can store up to 4000 different sites.

Sites can be created in the device and be changed, or could be imported from a PC program. Attention: sites created in the device and site data changed in the device will not be updated towards the PC. The device does only transmit to the PC the measurement values, but no information about site data.

Measurements are stored by assigning them to a site. Measurements can be, on this occasion, singles flue gas measurements or other measuring programmes available in the device.

13.2 Information about the data memory

In the menu item "storage" you select „memory info“ to get information about the actual memory volume. The part of free memory, the total number of the stored sites and the number of the measurements stored all together, split in the kind of the measurement is listed.



13.3 Site administration

In the menu item "Sites administration" you are able

- view all data of the stored sites
- create new sites
- change date of existing sites
- delete sites



Attention:

In the device new created sites and changes in the data of a site will not transmit to the PC back

13.3.1 View and search sites

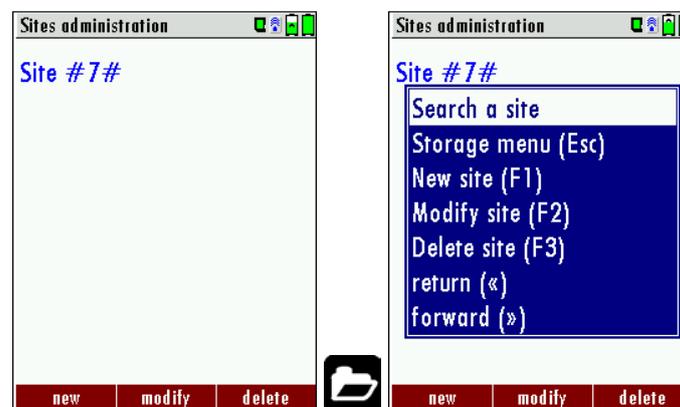
If the menu item "Site administration" will be selected for every stored site will be displayed with:

- of the unequivocal site number in the first line which is set down because of this meaning colorfully,
- the other 8 free text lines.

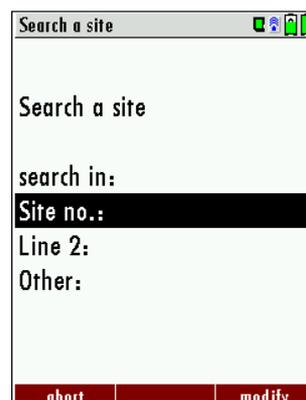
With the arrow keys on the left / on the right you scroll by all sites.

In this menu item, as well as in the menus for viewing the measurements, you can filter straight after sites by using a search mask.

- Select with the menu key "Search a site"

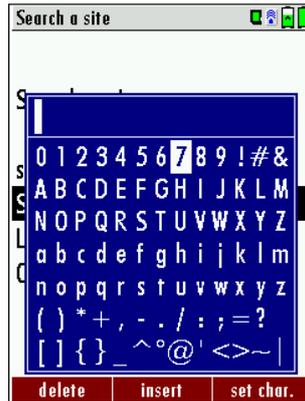


- Now you can enter the text to be searched for the first line, i.e. the site number, or for the second line, or for the rest of the text lines.

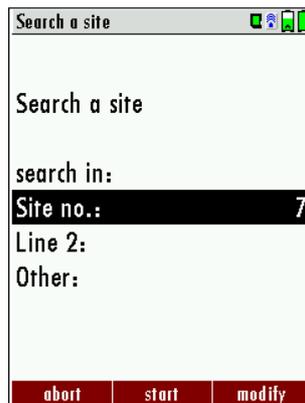


- Select the line for searching (site no. No., line 2, or rests) and select F3 "modify"

- Now in the indicated text input field you can enter a combination of letter, character and figures for whose occurrence is searched in the selected text field. Press then "OK".



- Select after input of the search text F2 = "start"



- If only one site is found as a result of the search, this is displayed. If became several sites the total number is found in the header viewed and you can scroll by this found standing with the arrow keys.

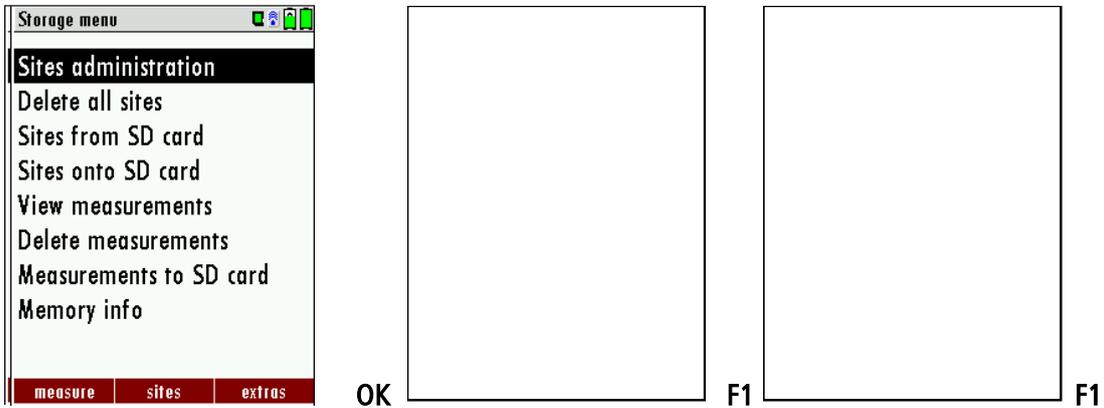
	Page through the sites
	Menu key: Search site ▲, ▼: Selection of the input field F3: Input mask, see chap. 16.1 F2: Start search ◀▶: According to the search criteria found sites page through. If no saved site with the search criteria agrees occurred the Medung: „Search unsuccessfully“
ESC	Back to storage menu

13.3.2 New entry and change of sites

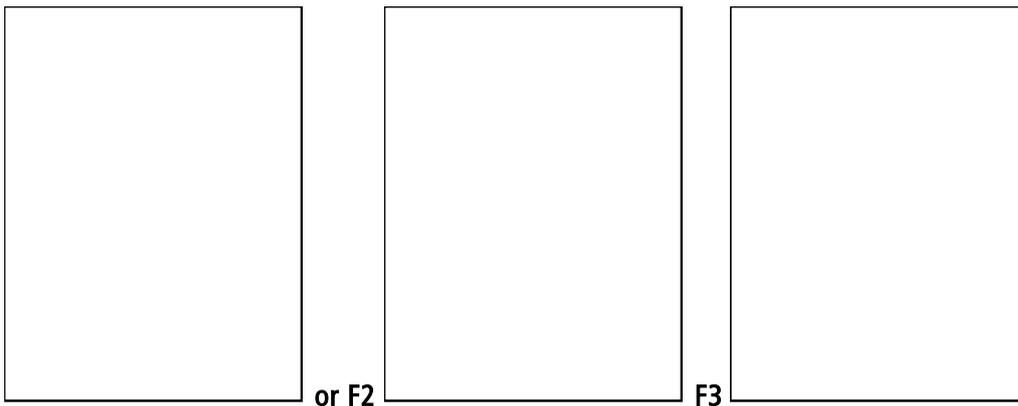
In the menu item "Sites administration" you can new entry sites and change data of existing sites.

Select F1 = "new" for a new site. Besides, it is displayed:

- The first line which must contain an unequivocal site number to the identification of the site. With the function F2 = „auto no. “ can assign the device automatically a free site number.
- All further free text lines which can contain, e.g., name and address.



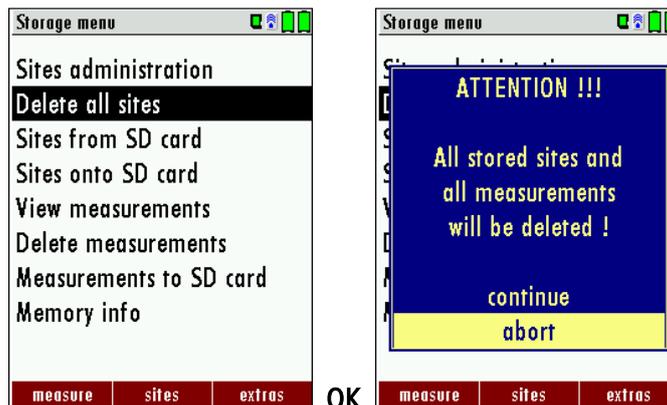
In the new site or an existing site you can change the data while you select the too change line, F1 = "modify" select and use the text input field for editing of the text. Conclude the text input field with "OK" and store the updates with F3 = "store".



13.3.3 Delete sites

You are able to

- delete the displayed sites only by selecting the menu entry "F3" = "delete"
- or delete all sites at the same time



This user's decision must be confirmed. (see chap. 16.2).

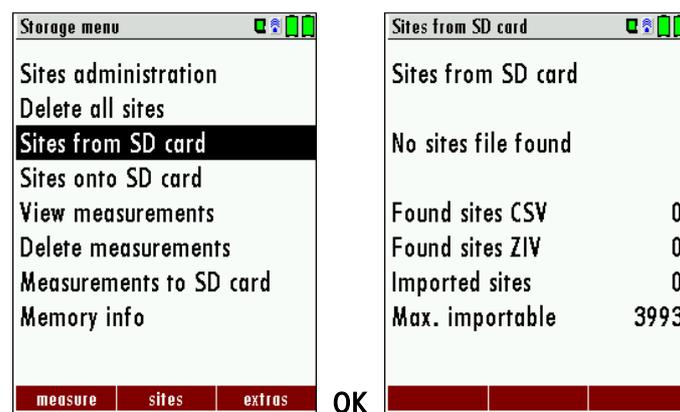
13.4 Data transfer via SD Card (Option)

The data exchange format is CSV. A character-separated values (CSV) file is a simple text format for a database table. Each record in the table is one line of the text file. Each field value of a record is separated from the next by a character. NOVAplus BIOGAS Combustion Analyzer uses a semi-colon ';' as value separator (other implementations use sometimes a comma). Implementations of CSV can often handle field values with embedded line breaks or separator characters by using quotation marks or escape sequences. 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. Also other computer programs offer this type of interface because it is widely spread and easy to use.

The following functions are available from Software Version 1.11 and higher:

1. Import of Sites
2. Export of Sites
3. Export of Flue Gas Measurements

13.4.1 Import of Sites



With this function you can Import Sites which have been created on a computer or another Analyzer.

The File name must have the name "anlagen.csv" (anlagen = german for sites) . The file has no column heading that means that the first line already has user data. Each line has a minimum of 9 columns (with 8 semi-colons) and the first field in the line will be the site number. All data will be imported as long a site number is available. Per field a maximum of 24 characters will be imported, too long words will be cut off.

Example file with 8 valid sites (4 with 9 lines and 4 with less lines):

A1-Z1;A1-Z2;A1-Z3;A1-Z4;A1-Z5;A1-Z6;A1-Z7;A1-Z8;A1-Z9

A2-Z1;A2-Z2;A2-Z3;A2-Z4;A2-Z5;A2-Z6;A2-Z7;A2-Z8;A2-Z9

A3-Z1;A3-Z2;A3-Z3;A3-Z4;A3-Z5;A3-Z6;A3-Z7;A3-Z8;A3-Z9

A4-Z1;A4-Z2;A4-Z3;A4-Z4;A4-Z5;A4-Z6;A4-Z7;A4-Z8;A4-Z9

A5-Z1;A5-Z2;A5-Z3;A5-Z4;;;;;

A6-Z1;A6-Z2;;A6-Z4;;;;;

A7-Z1;;;A7-Z4;;;;;

A8-Z1,,,,,,,,;

Example file with 2 invalid sites (1 with not enough fields and 1 with missing site number):

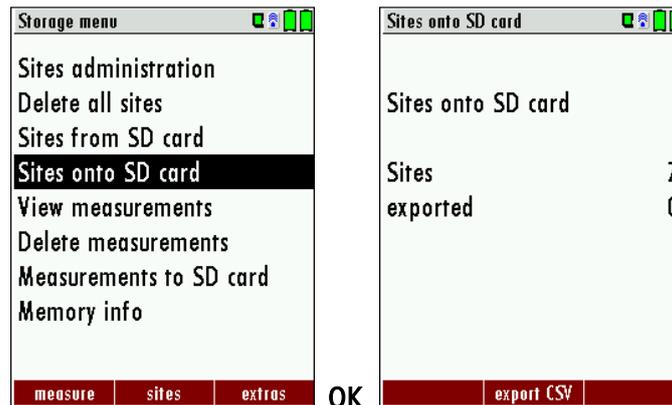
A1-Z1;A1-Z2

;A1-Z2;A1-Z3;A1-Z4;A1-Z5;A1-Z6;A1-Z7;A1-Z8;A1-Z9

Important:

Whilst importing data from the SD Card to the analyzer there is no check for double site numbers (Line 1), neither inside of the file that is imported nor between the file and the sites already inside the analyzer. The analyzer can easily handle double site numbers but you could face problems with double site numbers when exporting them again to a computer program (see also Export of Measurements).

However the analyzer marks the files that have been imported successfully. If you try to import a file with the same analyzer that is already in the analyzer you will get a red information screen.

13.4.2 Export of Sites

This function can be used for an analyzer back up or if you wish to supply the analyzer information to a computer program or another analyzer. This is very handy if you have made some modifications inside the analyzer (site) for example if you have modified the phone number of a customer and this modification needs to be updated in the computer software, or if a second analyzer needs to have the same site information.

The File format ist the same as described above „Import of Sites“.

Only the file name is different, the file name will be ‚ANLxxxx.csv‘, in which the xxxx are continuing 5 digit numbers with leading zeros. If the file must be imported into another analyzer, the file must first be renamed into „anlagen.csv“.

13.4.3 Export of Flue Gas Measurements

This function is used to export the measurements from the analyzer to a computer program.

Attention! This function is not suitable for back up or for the transfer to another analyzer because the exported file can not be imported again!

The created file has the name ‚EMlxxxx.csv‘, in which the xxxx are continuing 5 digit numbers with leading zeros.

The created file has a column header with the following information: Site number, Date/Time, Measuring program name, Fuel type, CO2max, O2reference, and all measured values that the analyzer can measure as well as the soot numbers, Derivate and T-Boiler.

Example:

	A	B	C	D	E	F	G	H	I	J	K
1	Site no.	Date & time	meas.progra	fuel type	CO2max [%]	O2ref [%]	T-gas [°F]	T-air [°F]	Dewpoint [°F]	O2 [%]	CO2 [%]
2	BOILER	THU 30.09.20	Program 1	Natural gas	11.7	3.0	--.	73.5	--.	21.0	--.
3	BOILER	THU 30.09.20	Program 1	Natural gas	11.7	3.0	--.	73.0	--.	21.0	--.
4	BOILER	THU 30.09.20	Program 1	Natural gas	11.7	3.0	--.	73.0	--.	21.0	--.
5	BOILER	THU 30.09.20	Program 1	Natural gas	11.7	3.0	--.	72.5	--.	21.0	--.
6	BOILER	FRI 01.10.20	Program 1	Natural gas	11.7	3.0	--.	72.5	--.	21.0	--.
7	A FURNACE	TUE 05.10.20	Program 1	Natural gas	11.7	3.0	81.0	--.	113.0	11.7	5.2
8	A FURNACE	TUE 05.10.20	Program 1	Natural gas	11.7	3.0	81.0	--.	113.0	11.7	5.2
9	A FURNACE	TUE 05.10.20	Program 1	Natural gas	11.7	3.0	82.5	--.	112.5	11.7	5.1
10	A FURNACE	TUE 12.10.20	Program 1	Natural gas	11.7	3.0	84.5	--.	132.5	2.7	10.2

13.4.4 Export of Differential Pressure Measurements

The same function as under 13.4.3(Export of Flue Gas Measurements) only the file name is different.

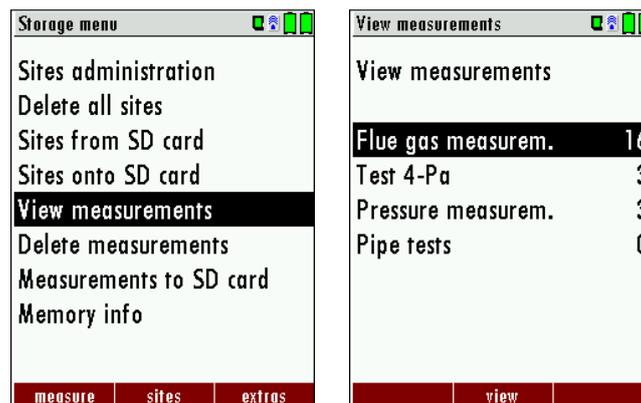
The created file has the file name "DDMxxxx.csv", in which the xxxx are continuing 5 digit numbers with leading zeros.

The created file has a column header with the following information: Site number, Date/Time, as well as 4 saved pressure measurements.

13.5 Measurements in the data memory

13.5.1 View measurements

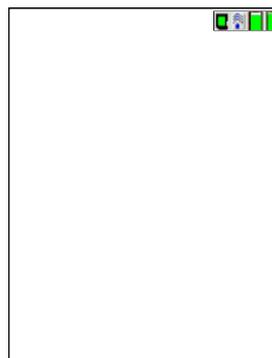
In the menu item „View measurements“ you can inspect the stored measurements. After selection of this item you receive first an overview of the number of the stored measurements according to measuring type.



- Select flue gas measurement or another measuring type.
- Then you receive first a page with context information to the stored measurement. Scroll with the arrow keys by the context information of the stored measurements.



- With F2 = "measured value" are displayed the measured data of the stored measurement in detail, available in 3 measuring value pages, as they are defined in the measuring value window.



- With ESC you return to the context information of the measurement.

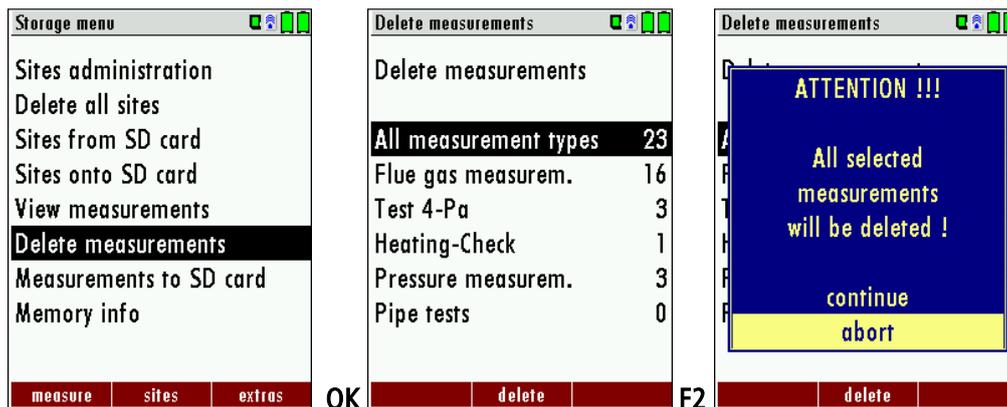
You have the possibility to display only those data that are assigned to a single site:

- either F1 = „this site“ , while a measurement of the desired site is displayed.
With F1 = „all sites“ you cancel this filter again.
- or while you select with the menu key the function "search a site" and execute, as described in the chapter site administration.

13.5.2 Delete measurements

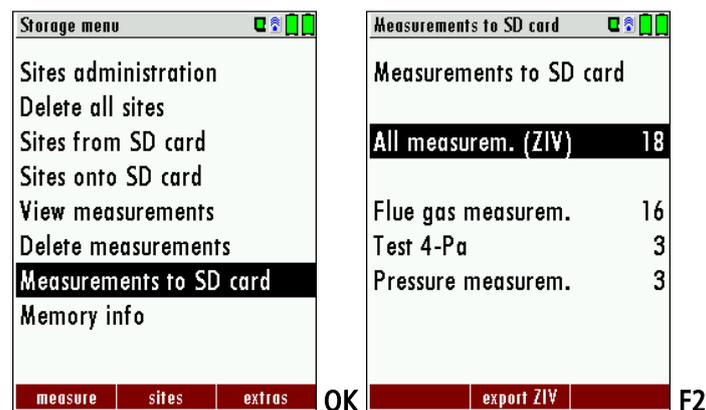
You are able to

- delete single measurements, while they are displayed – press the key F3 = "delete" .
- or delete all measurements of a measuring type.



13.5.3 Export measurements to a SD card (optional)

The NOVAplus BIOGAS offers the possibility to export all stored measurements to a SD card.



By confirming with the F2 key the data transmission / export on the SD card is started.

During the data export the display reads „please wait“. A write error to SD card is reported by the instrument. Make sure that the SD card is not write protected.

The data are stored as a csv-file (e.g., EMI01032.csv) on the SD card. The filename exists of a sequential number which fixes the device.

This file is editable on your Notebook/PC with a program like e.g. Microsoft® EXCEL or OpenOffice® Calc. With possible problems with the using of your computer programs please read your software documentations or ask your software dealer.

14 EXTRAS / ADJUSTMENTS

The NOVAp^{plus} BIOGAS is delivered in a standard software configuration which should cover most needs. However, there are many ways to tailor the settings to your individual needs if required. The possibilities are highly flexible and individual adaptable.

Use the variable possibilities to adapt your analyzer to your own needs and customize the measurement menu, the measurement window, the printer out put and many other features. Usually this is something you will do once you receive the analyzer, once you have adapted your analyzer you will most probably don't make much changes in future, but you can when ever you need and want to do so.

After you have made any changes in the configuration, you should switch off the analyzer to save all the changes that have been made. Next time that you start up the analyzer, all changes will have been made.

14.1 User definable Logo print out

Overview:

The Logo file can be created out of a Bitmap using the program "NOVAp^{plus} BIOGASPrnLogoCreator.exe" which comes with the analyzer CD. The generated file will be transferred from your computer to the analyzer using the SD card (only once). Once transferred the Logo can either be printed above or below the customer address or you can choose not to print the logo at all.

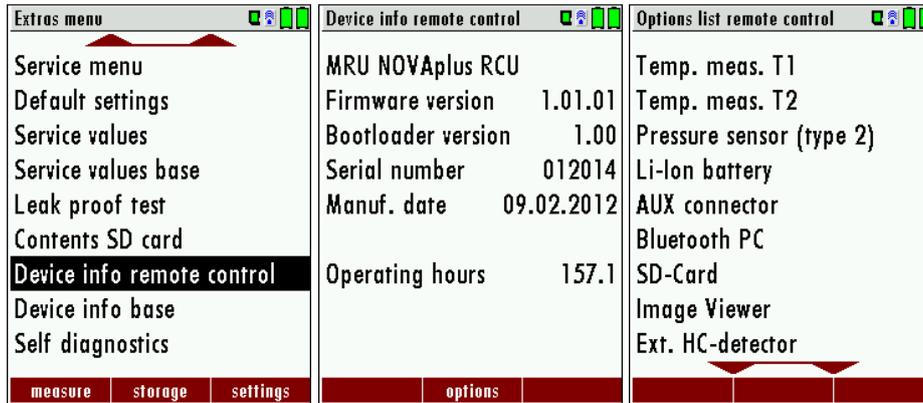
Converting a Bitmap into a Logo file:



Use the enclosed Windows-Program "NOVAp^{plus} BIOGASPrnLogoCreator.exe" (MRU Product CD / Software / NOVAp^{plus} BIOGASPrnLogoCreator).

The Bitmap can have any color depth bit ideal is a color depth of 1-bit black-white. The horizontal resolution must have 384 pixels. If necessary the Bitmap can be adjusted using a picture editing program (not included on the CD).

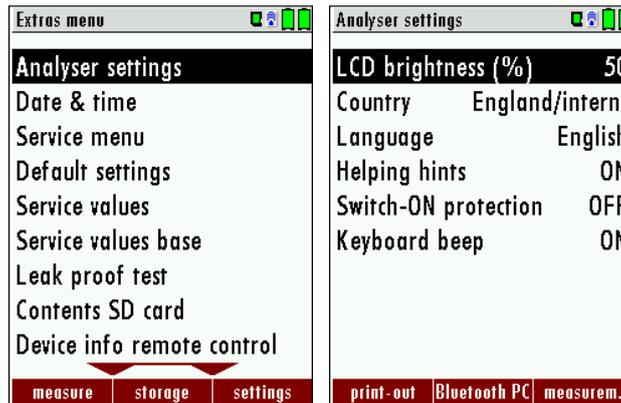
The vertical resolution of the Bitmap must be a multiple of 24, where 24 is the minimum and the maximum is 480 pixels. If necessary the Bitmap can be adjusted using a picture editing program (not included on the CD).



Transferring the Logo file per SD card to the analyzer:

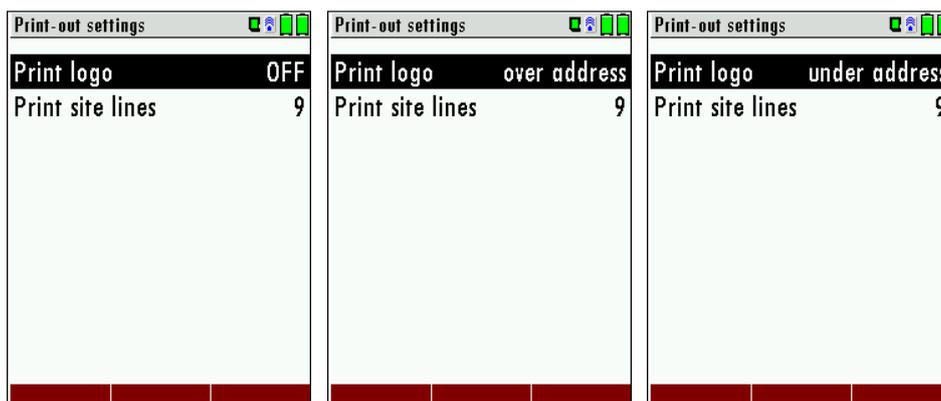
Copy the created file "lg_print.mru" onto the SD card (root).

Switch on the analyzer then navigate to – Extras (F3) Analyzer info RCU / options. Now insert the SD card into the SD card slot, the unit will conform the upload with a short beep and on the screen you will see a short message – Logo installed.



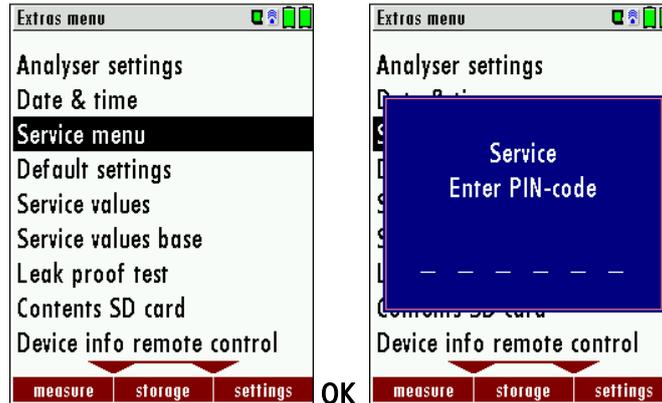
Printer Logo setting:

As soon as the Logo has been installed and the printer type is set on MRU, the Logo print will be available in the menu "extras / settings (print Logo).



14.2 Maintenance adjustment menu

The Maintenance adjustment menu is secured with a Pin Code to protect it against unauthorized users.

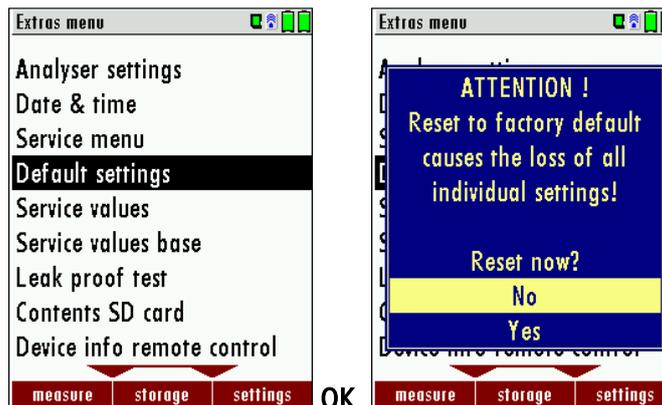


If you enter a wrong pin code you will be exited into the "Extra Menu" again.

Please contact MRU GmbH if you need the Pin Code for your analyzer.

Press the Enter key if you should have landed in this menu by accident and you will be exited into the "Extra Menu" again.

14.3 Manufacturer default settings



The analyzer will be reset to original delivery settings.

Be aware that your configurations will be deleted, such as:

- CO-ppm limits
- Fuel type list activation
- Measurement window selection
- and others

14.4 Service values (RCU)/ Service values (Base unit)

Should your analyzer display an error message after zeroing (for example: „O2-Sensor not OK"), then you can use the Service value menu to get detailed information about possible defects. In this menu you will see all service values of the sensors and also other parameters.

In case of a defect contact the MRU service department. The MRU service technician will ask you about these values or he will ask you to send them by fax or email.

Service values RCU:

<table border="1"> <tr><td>Extras menu</td></tr> <tr><td>Analyser settings</td></tr> <tr><td>Date & time</td></tr> <tr><td>Service menu</td></tr> <tr><td>Default settings</td></tr> <tr><td>Service values</td></tr> <tr><td>Service values base</td></tr> <tr><td>Leak proof test</td></tr> <tr><td>Contents SD card</td></tr> <tr><td>Device info remote control</td></tr> <tr><td>measure storage settings OK</td></tr> </table>	Extras menu	Analyser settings	Date & time	Service menu	Default settings	Service values	Service values base	Leak proof test	Contents SD card	Device info remote control	measure storage settings OK	<table border="1"> <tr><td>Service values base</td></tr> <tr><td>TC-Air [mV] -0.013</td></tr> <tr><td>PT-Air [kR] 1.097</td></tr> <tr><td>U-Battery [V] 7.878</td></tr> <tr><td>I-Battery [A] -0.665</td></tr> <tr><td>T-Battery [V] 1.634</td></tr> <tr><td>U-mains [V] 0.967</td></tr> <tr><td>U - WL-Charge [V] 11.228</td></tr> <tr><td>I - WL-Charge [A] 0.001</td></tr> <tr><td>U-Pneumatic [V] 11.831</td></tr> <tr><td>Gas pump Purge pump</td></tr> </table>	Service values base	TC-Air [mV] -0.013	PT-Air [kR] 1.097	U-Battery [V] 7.878	I-Battery [A] -0.665	T-Battery [V] 1.634	U-mains [V] 0.967	U - WL-Charge [V] 11.228	I - WL-Charge [A] 0.001	U-Pneumatic [V] 11.831	Gas pump Purge pump	<table border="1"> <tr><td>Service values</td></tr> <tr><td>TC-1 [mV] 585.000</td></tr> <tr><td>TC-2 [mV] 585.000</td></tr> <tr><td>U-Batt [V] 3.834</td></tr> <tr><td>I-Batt [A] -0.175</td></tr> <tr><td>T-Batt [V] 1.531</td></tr> <tr><td>VDD [V] 3.271</td></tr> <tr><td>T-ADC [°C] 23.028</td></tr> <tr><td>AD-U-VBUS [V] 0.000</td></tr> <tr><td>U-WL-Charge [V] 0.000</td></tr> <tr><td>Events> SD</td></tr> </table>	Service values	TC-1 [mV] 585.000	TC-2 [mV] 585.000	U-Batt [V] 3.834	I-Batt [A] -0.175	T-Batt [V] 1.531	VDD [V] 3.271	T-ADC [°C] 23.028	AD-U-VBUS [V] 0.000	U-WL-Charge [V] 0.000	Events> SD
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▲, ▼	Jump between the lines
F2	Export of service values to SD card
ESC	return

Service values base unit:

<table border="1"> <tr><td>Extras menu</td></tr> <tr><td>Analyser settings</td></tr> <tr><td>Date & time</td></tr> <tr><td>Service menu</td></tr> <tr><td>Default settings</td></tr> <tr><td>Service values</td></tr> <tr><td>Service values base</td></tr> <tr><td>Leak proof test</td></tr> <tr><td>Contents SD card</td></tr> <tr><td>Device info remote control</td></tr> <tr><td>measure storage settings OK</td></tr> </table>	Extras menu	Analyser settings	Date & time	Service menu	Default settings	Service values	Service values base	Leak proof test	Contents SD card	Device info remote control	measure storage settings OK	<table border="1"> <tr><td>Service values base</td></tr> <tr><td>O2 (type 1) [mV] 11.459</td></tr> <tr><td>CO (type 1) [mV] 0.003</td></tr> <tr><td>H2 (type 1) [mV] 0.002</td></tr> <tr><td>T-ECS Sensor [V] 0.890</td></tr> <tr><td>Draft (type 3) [mV] 0.011</td></tr> <tr><td>Pressure (type 6) [mV] 23.685</td></tr> <tr><td>P-Flow (type 3) [mV] 2.637</td></tr> <tr><td>T-Press. sensor [V] 0.883</td></tr> <tr><td>NDIR_CO2 [mV] 3294.982</td></tr> <tr><td>Gas pump Purge pump</td></tr> </table>	Service values base	O2 (type 1) [mV] 11.459	CO (type 1) [mV] 0.003	H2 (type 1) [mV] 0.002	T-ECS Sensor [V] 0.890	Draft (type 3) [mV] 0.011	Pressure (type 6) [mV] 23.685	P-Flow (type 3) [mV] 2.637	T-Press. sensor [V] 0.883	NDIR_CO2 [mV] 3294.982	Gas pump Purge pump	<table border="1"> <tr><td>Service values base</td></tr> <tr><td>TC-Air [mV] -0.013</td></tr> <tr><td>PT-Air [kR] 1.097</td></tr> <tr><td>U-Battery [V] 7.878</td></tr> <tr><td>I-Battery [A] -0.665</td></tr> <tr><td>T-Battery [V] 1.634</td></tr> <tr><td>U-mains [V] 0.967</td></tr> <tr><td>U - WL-Charge [V] 11.228</td></tr> <tr><td>I - WL-Charge [A] 0.001</td></tr> <tr><td>U-Pneumatic [V] 11.831</td></tr> <tr><td>Gas pump Purge pump</td></tr> </table>	Service values base	TC-Air [mV] -0.013	PT-Air [kR] 1.097	U-Battery [V] 7.878	I-Battery [A] -0.665	T-Battery [V] 1.634	U-mains [V] 0.967	U - WL-Charge [V] 11.228	I - WL-Charge [A] 0.001	U-Pneumatic [V] 11.831	Gas pump Purge pump
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Gas pump Purge pump																																			

▲, ▼	Jump between the lines
F1	Function test gas pump (on / off -> only with service PIN code!)
F2	Function test purge pump (on / off -> only with service PIN code!)
ESC	return

14.5 Leak proof test

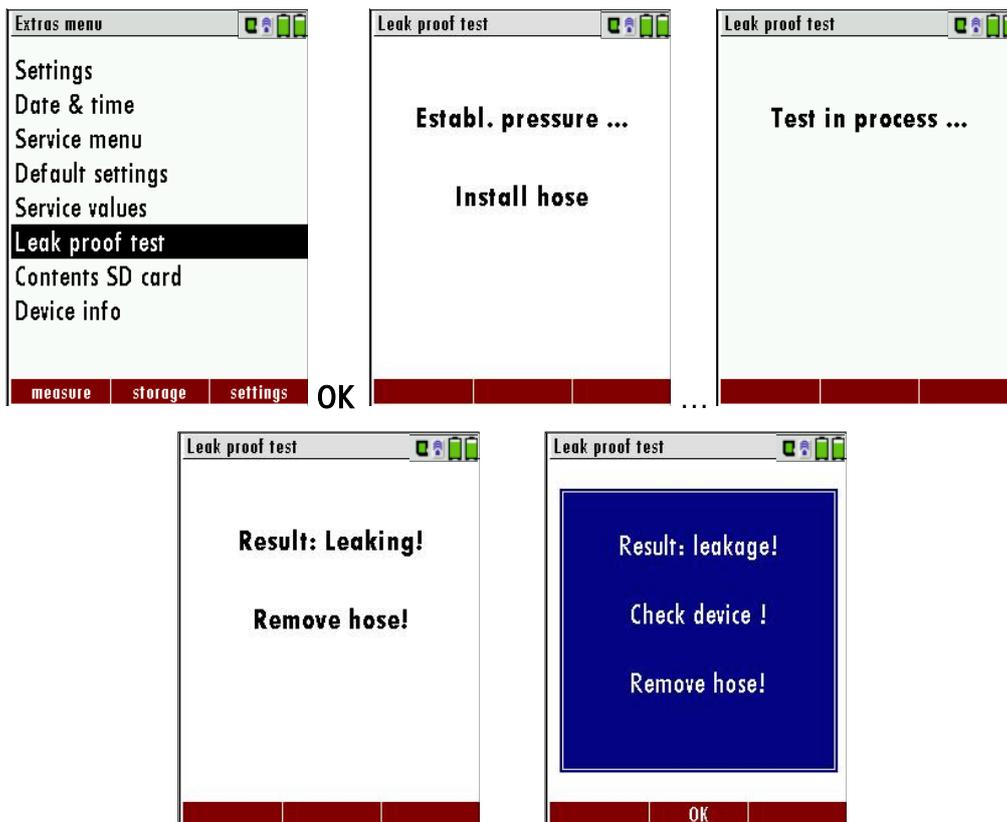
With the leak proof test the system is checked by the device on undensity. The internal gas pump generates in addition a subpressure which is measured over the built-in draft sensor and is observed for a period of 10 seconds. Based on the decrease of pressure the leakiness of the system will be determined.

Operation:

- The hose must plug on the device as shown in the figure below.

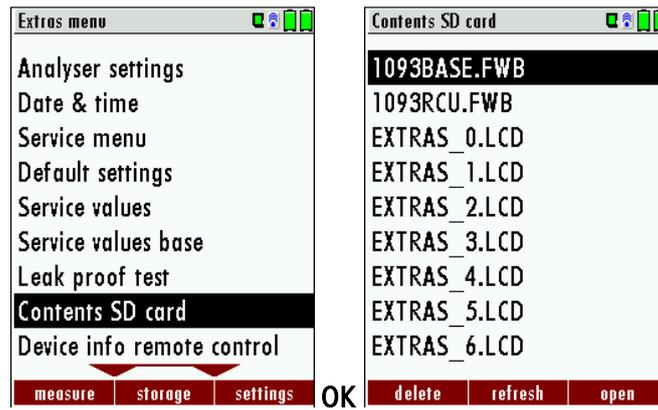


- Launch under "extras" the leak proof test on which the following window will pop up:



If no undensity is ascertained the NOVAplus BIOGAS has to be checked in a service department (worldwide service departments see www.mru.eu).

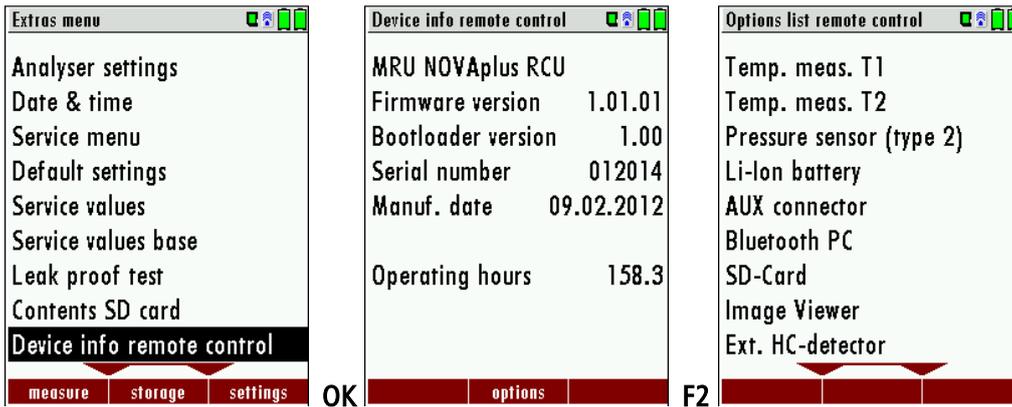
14.6 Contents SD card



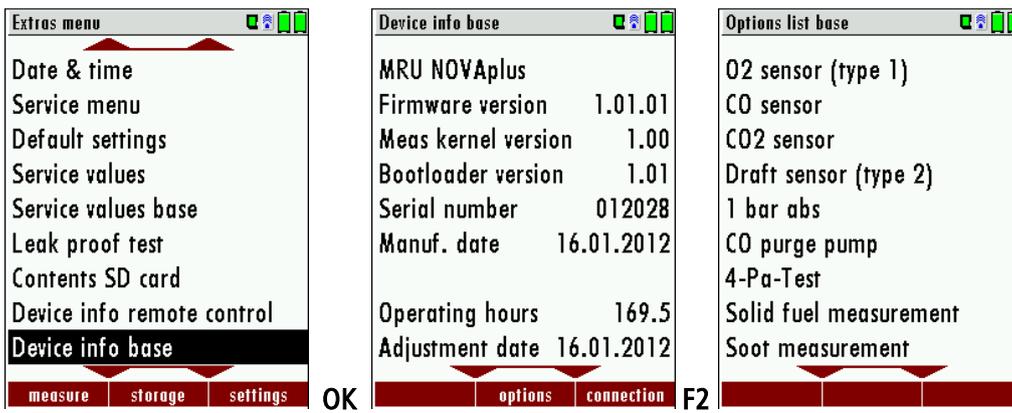
The contents of the SD card will be displayed. With F3 the selected file can be opened.

14.7 Analyzer info

Here you will find information about the analyzer and the installed options.



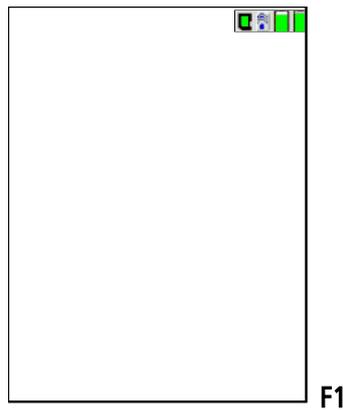
Use the F2 button to see the installed options of the RCU.



Use the F2 button to see the installed options of the base unit.

Use the F3 button to get the information about the name respectively the MAC address of the connected base unit.

Use the F1 button to get information about the last 7 service dates



and the F2 button to see the warranty status of the unit.

15 TECHNICAL SPECIFICATIONS

15.1 General specifications

Deutsch	Angabe	English
Betriebstemperatur	+5°C ... +45 °C / 41 °F ... 113 °F	Operating temperature
Rel. Luftfeuchtigkeit bei Betrieb, nicht-kondensierend	95%	Rel. Humidity, non-condensing
Lagertemperatur	-20°C ... +50°C / -4°F ... 122°F	Storage Temperature
Fernbedieneinheit : Akku intern, Betriebszeit	NiMH: 15h Li-Ion: 25h	Remote Control Unit: Internal Battery Pack, operating hours
Grundgerät: Akku intern, Betriebszeit (ohne Gaskühler und Rußsonde)	Li-Ion, 20h	Base unit: internal Battery Pack, operating hours (w/o gas cooler and soot probe)
Stromversorgung Grundgerät	100 - 240 V / 1,4A 12V DC / 5A	Power supply base unit
Stromversorgung Fernbedieneinheit: - kontaktlos in der Ladeschale - oder ext. USB Netzteil	• USB 5V 1A	Power Supply Remote Control Unit RCU - wireless charging via base unit, - or USB power supply externally
Gewicht mit 2 Sensoren, Koffer, Sonde, Netzteil	7,4 kg	Weight w/ 2 sensors, case, probe, power supply
Maße inkl. Koffer (BxHxT)	470 x 314 x 235 mm ³	Size incl Case (WxHxD)
Gehäusematerial Fernbedienung	PA6 GF 30	Housing Material RCU
Schutzart Fernbedienung	IP30	IP degree of protection of remote control
Gehäusematerial Grundgerät	Aluminium	Housing Material Base Unit
Schutzart Grundgerät	IP30	IP degree of protection of Base Unit
Schutzart (Grundgerät geöffnet)	IP20	IP degree of protection (Base Unit open)
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.

15.2 Gas conditioning

Deutsch	Angabe	English
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.
Kondenstafalle (nicht-gekühlt)	Standard	Condensate trap (non-cooled)
Gaskühler	Option	Gas cooler
Temperatur Peltierkühler (an Netz und Akku)	5 °C	Temperature Peltier cooler (during grid and battery operation)

Akkubetriebszeit mit Gaskühler	2,5h (5°C) / 6h (ECO T-Gerät - 10°C)	Batt operating hours with gas cooler
Kondensatentsorgung aus dem Gaskühler	•	Condensate removal from gas cooler
Automat. Feuchtealarm	•	Humidity supervision and alarm
Interne Durchflussmessung	•	internal gas flow measurement

15.3 Measured values

Deutsch	Angaben zur Messgenauigkeit	English
Elektrochemischer Sensor	O2 Long Life	Electrochemical Sensor
Messbereich	0 - 21 Vol%	Measuring Range
Auflösung		Resolution
Genauigkeit abs.	± 0,2 Vol%	Abs. Accuracy
Ansprechzeit T90	< 20s	Response Time T90
Jahre erwartete Lebensdauer an Luft	5	Years expected lifetime (@air)
Elektrochemischer Sensor	CO	Electrochemical Sensor
H2 - kompensiert		H2 compensated
Nominaler Messbereich	0 - 4000 ppm	Nom. Measuring Range
Überlastbereich	< 10000 ppm	Overload Range
Auflösung		Resolution
	± 10 ppm/	
Genauigkeit absolut / vom Messwert	5% (0 .. 4000 ppm) 10% (> 4000 ppm)	Accuracy abs. / reading
Ansprechzeit T90	< 40s	Response Time T90
Option	CO low	Option
Messbereich	300 ppm	Measuring Range
Auflösung	0,1 ppm	Resolution
Genauigkeit absolut / vom Messwert	2,0 ppm 5%	Accuracy abs. / reading
Elektrochemischer Sensor	CO high	Electrochemical Sensor
Nominaler Messbereich	0 - 4000 ppm	Nom. Measuring Range
Überlastbereich	< 20000 ppm	Overload Range
Auflösung		Resolution
	± 100 ppm /	
Genauigkeit absolut / vom Messwert	5% (0 ... 4000 ppm) 10 % (> 4000 ppm)	Accuracy abs. / reading
Ansprechzeit T90	< 40s	Response Time T90
Elektrochemischer Sensor	NO	Electrochemical Sensor

Nominaler Messbereich	0 - 1000 ppm	Nom. Measuring Range
Überlastbereich	< 5000 ppm	Overload Range
Auflösung		Resolution

± 5ppm /

Genauigkeit abs. /vom Messwert	5% (0 ... 1000 ppm) 10% (> 1000 ppm)	Accuracy abs./reading
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Ansprechzeit T90	< 30s	Response Time T90
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Option	NO low	Option
Messbereich	300 ppm	Measuring Range
Auflösung	0,1 ppm 2,0 ppm	Resolution
Genauigkeit abs / vom Messwert	5%	Accuracy abs. / reading

Elektrochemischer Sensor	NO₂	Electrochemical Sensor
Nominaler Messbereich	0 - 200 ppm	Nom. Measuring Range
Überlastbereich	< 1000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 5ppm / 5% (0 ... 200 ppm) 10% (> 200 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 40s	Response Time T90

Elektrochemischer Sensor	SO₂	Electrochemical Sensor
Nominaler Messbereich	0 - 2000 ppm	Nom. Measuring Range
Überlastbereich	< 5000 ppm	Overload Range
Auflösung		Resolution
	± 10ppm /	
Genauigkeit abs. /vom Messwert	5% (0 ... 2000 ppm) 10% (> 2000 ppm)	Accuracy abs./reading

Ansprechzeit T90	< 40s	Response Time T90
------------------	-------	-------------------

Elektrochemischer Sensor	H₂S	Electrochemical Sensor
Nominaler Messbereich	0 - 500 ppm	Nom. Measuring Range
Überlastbereich	< 2000 ppm	Overload Range
Auflösung		Resolution
	± 5 ppm /	
Genauigkeit abs. /vom Messwert	5% (0 ... 500 ppm) 10% (> 500 ppm)	Accuracy abs./reading

Ansprechzeit T90	< 40s	Response Time T90
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Nicht-dispersive Infrarotmessung (NDIR)	CO₂	Non-dispersive Infrared Measurement (NDIR)
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Nominaler Messbereich	0 - 100 Vol%	Nom. Measuring Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	$\pm 0,3 \text{ Vol\%} /$ 3%	Accuracy abs./reading
Ansprechzeit T90	< 35 s	Response Time T90

Nicht-dispersive Infrarotmessung (NDIR)	CH₄	Non-dispersive Infrared Measurement (NDIR)
Nominaler Messbereich	0 - 100 Vol%	Nom. Measuring Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	$\pm 0,3 \text{ Vol\%} /$ 3%	Accuracy abs./reading
Ansprechzeit T90	< 35 s	Response Time T90

Abgastemperatur	T_A	Flue gas temperature
Messbereich mit Gasentnahmerohr aus Edelstahl	0 - 650°C	Measuring Range with high grade steel probe pipe
Messbereich mit Gasentnahmerohr aus Inconel	0 - 1100°C	Measuring range with Inconel probe pipe
Genauigkeit abs. / vom Messwert	$\pm 2^\circ\text{C} /$ 1%	Accuracy abs. / reading
Anschluss an Basisgerät		To be connected to base unit

Verbrennungslufttemperatur	T_i	Air temperature
Messbereich	0 - 100°C	Measuring Range
Genauigkeit abs.	1 °C	Accuracy
Anschluss an Grundgerät oder optional an Fernbedieneinheit		To be connected to base unit or optional to remote control unit

Kaminzug		Draft
Messbereich	$\pm 120 \text{ hPa}$	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading

Differenzdruck Basis		Differential Pressure Base Unit
Messbereich	$\pm 120 \text{ hPa}$	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading

Anschluss an Grundgerät To be connected to base unit

Differenzdruck RCU		Differential Pressure RCU
Messbereich	$\pm 120 \text{ hPa}$	Measuring Range

Genauigkeit abs. / vom Messwert 0,02 hPa / Accuracy abs. / reading
1%

Anschluss an Fernbedieneinheit To be connected to Remote Control Unit

Differenzdruck RCU		Differential Pressure RCU
--------------------	--	---------------------------

Messbereich	± 300 hPa	Measuring Range
-------------	-----------	-----------------

Genauigkeit abs. / vom Messwert 0,1 hPa / Accuracy abs. / reading
2%

Anschluss an Fernbedieneinheit To be connected to Remote Control Unit

Temperaturmessung RCU		Temperature Measurement RCU
-----------------------	--	-----------------------------

Messbereich	-50 ... 1100 °C	Measuring Range
-------------	-----------------	-----------------

Thermoelement	Typ K Mini	Thermocouple
---------------	------------	--------------

Barometrischer Druck	P_{abs}	Barometric Pressure
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Messbereich	300 1200 hPa	Measuring Range
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Genauigkeit	± 3 hPa	Accuracy
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15.4 Calculated values

Deutsch	Angabe	English
	CO₂	
Messbereich (brennstoffabhängig)	0 - CO ₂ max	Measuring range (fuel type dependant)
Genauigkeit abs.	± 0,3 Vol%	Accuracy abs.
Taupunkt	°C	Dew point
Abgasverlust qA	0 - 99,9%	Losses qA
Wirkungsgrad	0 - 120%	Efficiency
	mg/Nm ³	
	O ₂ Ref	
Messwerte darstellbar als	mg/kWh	Measurement values available as
	NOx: mg/Nm ₃ NO ₂	
Strömungsgeschwindigkeit	v	Velocity
<i>basierend auf Differenzdruckmessung mit Prandtlrohr</i>		<i>based on differential pressure measurement with Pitot tube</i>
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

basierend auf Flügelradmessung		based on vane anemometer
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Messbereich (abhängig von Flügelrad-Typ)	0,25 - 35 m/s	measuring range (depending on actual vane type)
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Feuchte- & Temperatursonde	RH	Humidity & Temperature Probe
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Messbereich Feuchte	3 - 98 %	Measuring Range Humidity
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Genauigkeit Feuchtemessung abs.	± 3% RH	Accuracy Humidity Measurement
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Messbereich Umgebungstemperatur	-20 °C ... +80°C	Measuring Range Ambient Temperature
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Genauigkeit Umgebungstemperaturmessung	± 1°C	Accuracy Ambient Temperature Measurement
--	-------	--

Gasleitungsprüfung - Belastungsprüfung		
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Messbereich	0 - 1500 mbar	
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Genauigkeit (abs. / vom Messwert)	±4 mbar / 2%	
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Gasleitungsprüfung - Dichtheitsprüfung		
---	--	--

Messbereich	0 - 200 mbar	
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Genauigkeit (abs. / vom Messwert)	±0,5 mbar / 3%	
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Gasleitungsprüfung - Gasleckmenge		
--	--	--

Messbereich	0 - 8 l/h	
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Genauigkeit (abs. / vom Messwert)	±0,2 l/h / 5%	
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Gaslecksuche		Gas Sniffer
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Messbereich CH ₄	5 - 20000 ppm	Measuring Range CH ₄
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Überlast	100000 ppm	Overload
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Auflösung	1 ppm	Resolution
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Ansprechzeit	T ₉₀ < 5s	Response Time
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15.5 Data communication

Deutsch	Angabe	English
USB Anschluss	via RCU	USB interface
SD Karte		SD card
für SW update, Datenaustausch, erweiterter Datenspeicher	>= 2GB, via RCU	for SW update, data exchange or extended data memory

Reichweite Funkverbindung RCU - Grundgerät		Range of link RCU to base unit
freie Sicht	100 m	free air
typisch in Gebäuden (situationsabhängig)	20 m	typical inside buildings (depending on actual situation)

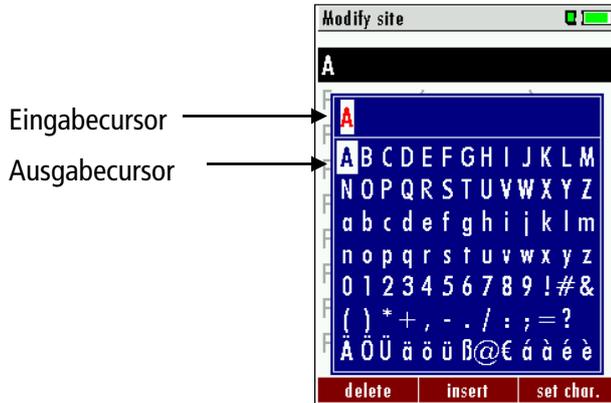
16 APPENDIX

16.1 Text input

A numbers of texts and names can be changed to your own needs.

(for example: the names of the user defined fuel types, site names, the names of the measurement programs)

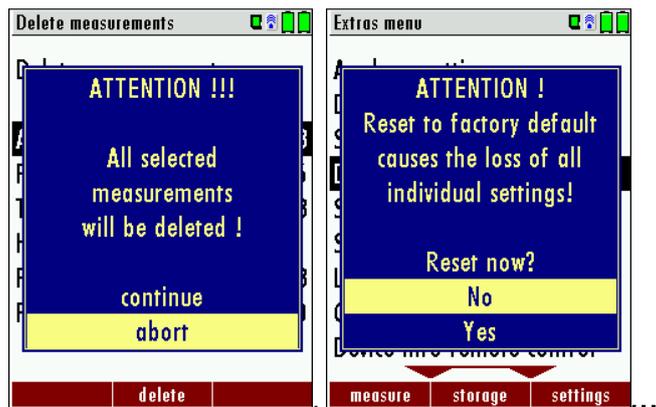
When you select the text input, the following window will pop up:



▲, ▼, ◀, ▶	Select a letter, number or sign
F1 – delete	The letter left of the cursor will be deleted
F2 – insert	Selected letter or number will be inserted
F3 – over write	Selected letter or number will over write the current letter or number
ESC	Abort the window, changes will NOT be saved

16.2 Asking the user for a decision (pop up window)

The NOVAp^{plus} BIOGAS will ask you now and then to confirm the action that will be taken.

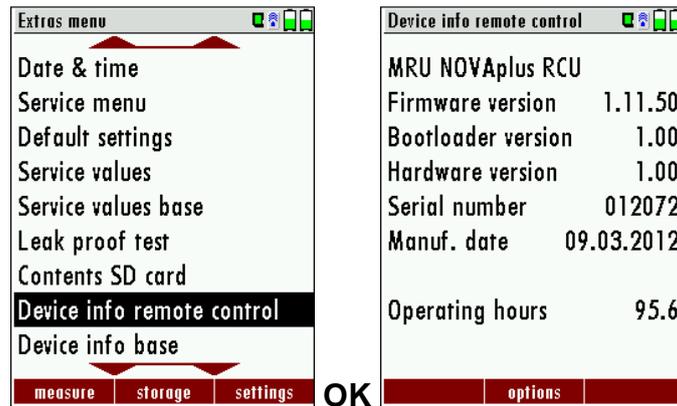


▲, ▼	Select a line
OK	Confirm the action
ESC	Abort the window, changes will NOT be saved

16.3 Firmwareupdate NOVAp^{plus} BIOGAS

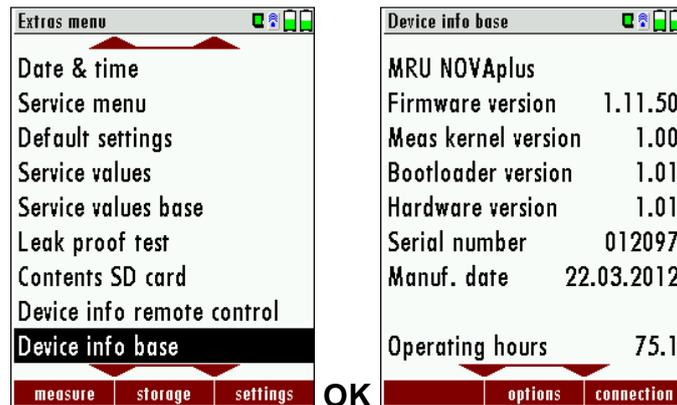
Switch OFF the device.

Select F3 settings/Device info remote control



The first line shows e.g.: Firmware-Version 1.11.50

Following select Device info base



For the case that there should be problems by the update we need some information of you.

RCU:

Please write down your Firmware-Version (e.g. 1.11.50)

Please write down your serial number (e.g. 012072)

Base unit:

Please write down your Firmware-Version (e.g. 1.09.01)

Please write down your serial number (e.g. 012039)

Do the following steps in order to update the firmware:

- copy the files '1093Base.fwb' and '1093RCU.fwb' to a SD card in the root directory (that means in no directory), in case you received the files in a zip archive you'll have to decompress it first
- switch on the analyser (Base and remote control) and verify whether the connection is OK (blue symbol)
- insert the SD card into the remote control
- you will be asked: 'Firmware for base found. Install now?'
- acknowledge with 'install'
- the base update will be started and will take about 1 minute, while you will here several beeps
- then you will be asked: 'Firmware for remote control found. Install now?'
- acknowledge again with 'install'
- the remote control update will be started and will take about half a minute, while the display remains empty
- finished

Note:

During the Firmware update the LED of the ON-OFF switch (Base unit) is flashing and the Bluetooth connection symbol changes the color from blue to yellow.

**Attention:**

Don't press during the update any key and remove the SD card first after a restart of the base unit from the device!

16.4 Analysis and calculations

Measured values	Unit
O ₂	[%]
Temp. Ambient air (Thermo-Element)	[°C]
Temp. Flue gas (Thermo-Element)	[°C]
CO	[ppm]
Draft	[hPa]

Available conversions of CO	CO
[ppm] related to. on 0% rest O ₂ (undiluted)	X
[ppm] related to. on fuel type dependent O ₂ reference value	X
[mg/m ³]	X
[mg/kWh]	X
[mg/MJ]	X
[mg/m ³] on fuel type dependent O ₂ reference value	X

Continuously caculated values	Unit
CO ₂	[%]
Efficiency ETA	[%]
Efficiency condensed	[%]
Losses	[%]
Losses condensed	[%]
Lambda	-
Dew point	[°C]

Losses and efficiency are calculated by means of net calorific value.

These values are than referenced for the gross calorific value for condensing boilers only. (efficiency > 100)

The calculations of efficiency and exhaust losses are performed using Siegert's formula.

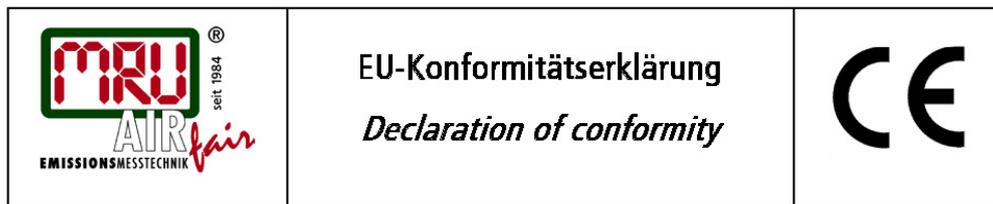
For further information please contact MRU GmbH. (www.mru.eu)

16.5 Errors

16.5.1 Error diagnosis regarding the measuring device

1. Effect	2. Error indication	3. Cause	4. Solution
Device cannot be switched off by pressing the OFF key.	LED behind the condensate separator is on and the LCD display is dark	Device does not react on any key.	Press ESC and ON simultaneously! EMERGENCY OFF After this, the date and time have to set new.
Inside of the device is too cold, device not ready for operation.	Display indication: "Device too cold" or audible sound every 5 sec..	e.g. device was stored in a cold place during winter.	Put the device to a warm room and wait
Measuring values are not correct		Sensors already get in touch with the gas during calibration.	Vent device with fresh air and re-start!
No measurement possible		Device cannot be switched on or does not react after being switched on. Battery discharge	Connect the device to the line power in order to charge the battery.
Measurement without exact temperature values.	Temperature indication: ---, - °C	Thermo element defective, balancing network interrupted or not connected.	Call our after-sales service. Remove probe from the gas duct and condensate from the probe tube.
Wrong measuring values	Measuring range exceeded: Value O ₂ too high Values CO and CO ₂ to low	Connection probe – device not correct. Leakage at probe / tube / condensate separator, pump does not suck correctly	Effect tightness test! By visual control of probes, tubes condensate separator, leaking parts could be found.
Wrong measuring values	Gas temperature is too hot or alternates	Probe is not plugged in correctly, defective cable in the probe line, formation of condensate at the probe tip.	Check probe plug respectively probe line regarding damages (loose connection), remove condensate from the probe tip.

16.6 Declaration of conformity



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

Name / name: Dierk Ahrends
 Funktion / function: QM-Beauftragter / QM- Representative
 Firmenname / company: Messgeräte für Rauchgase und Umweltschutz GmbH
 Straße / street: Fuchshalde 8 + 12
 Ort / city: 74172 Neckarsulm
 Land / country: Deutschland / Germany

Produkt/Product

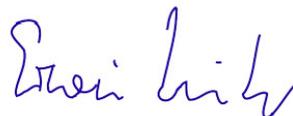
Bezeichnung / designation: Gasanalysator
 Gas analyser
 Produktname / name: NOVApplus BIOGAS
 Funktion / function: Gasanalyse / gas analysis

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

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

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

Neckarsulm, 01.07.2016



Erwin Hintz, Geschäftsführer / *Managing Director*



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Technical data change w/o notice

Date of issue: 20150817
Date of issue: 20190225