

EMISSION MONITORING SYSTEMS



We *care* about the environment

USER MANUAL



NOVAplus

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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-instruments.com

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 from this manual or any mis-use resulting from the use of this manual.

2 INTRODUCTION

2.1 The NOVAplus

The main task of the NOVAplus gas analyzer is in supporting the following applications:

Precise control- and adjustment measurements for Gas-, oil or wood fired burners

Flue gas measurement according to 1. BImSchV and KÜO

The CO sensor is protected with the automatic purging pump.

This analyzer can be equipped with additional options and/or additional accessories to full fill multiple other measuring tasks such as

Mobile Gas detector (Option HC-sniffer)

Anemometer (Option Flow velocity, using either a Pitot tube or a vane)

Hygrometer/Barometer (Option ambient humidity including temperature and barometric pressure)

Leak testing device (Option external pressure sensor)

The multiple options and multiple connections possibilities of external sensors often replaces the need of additional measuring equipment(s). Ask our sales reps. for available options and accessories or check out our MRU website.

The wireless remote unit offers the user a variety of advantages while measuring. Especially in small rooms only the base unit will sit next to the boiler while the user can operate the unit from a distance. Precise ambient air temperature measurements can be done with either the base unit or remote unit (RCU). The RCU can also be used as a stand alone measuring and data logging unit for differential temperature and differential pressure (and other optional functions). With the optional available gas cooler with automatic condensate draining pump the unit can also be used for long term measurements.

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.

2.3 Important general information (EN 50379) and VDI 4206

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.



2.5 SAFETY INFORMATION

The following safety procedures must 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.

2.6 Safety regulations

1. The NOVApplus 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**).



2.7 Safety regulations

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8. 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**).

2.8 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.



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.

2.9 Guideline for Li-Ion Batteries

- The battery pack is not accessible for end users
- Li-Ion rechargeable battery pack for NOVApplus
- Do not heat or throw the battery pack 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

2.10 RETURNED GOODS

Packing regulation of 12.07.1991

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

2.11 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.

2.12 Return of analyzer according to ElektroG

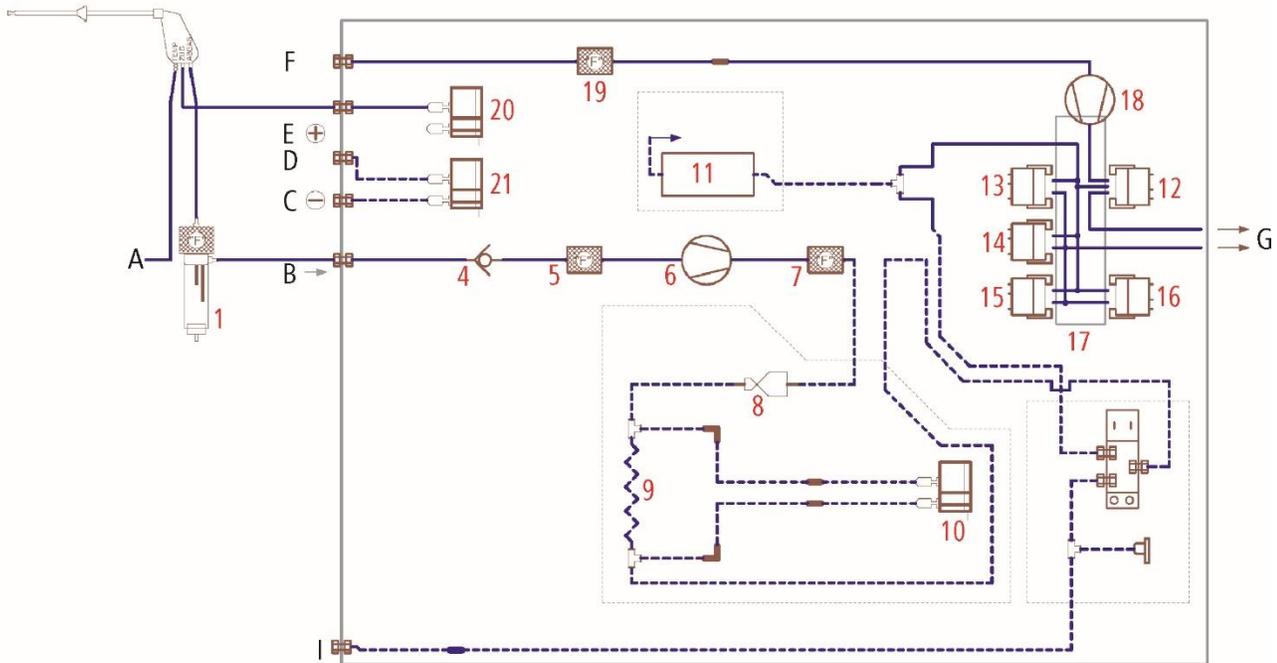
MRU GmbH is required to accept the return, for proper disposal, of all analyzers delivered after 13th of August 2005. Analyzers must be returned to MRU prepaid.

3 MEASUREMENT PRINCIPAL

The analyzer draws a sample of the flue gases from the duct using a built-in gas pump through the probe is cleaned and dried using condensate separator with built-in filter and analyzes the extracted gas with electro-chemical sensors.

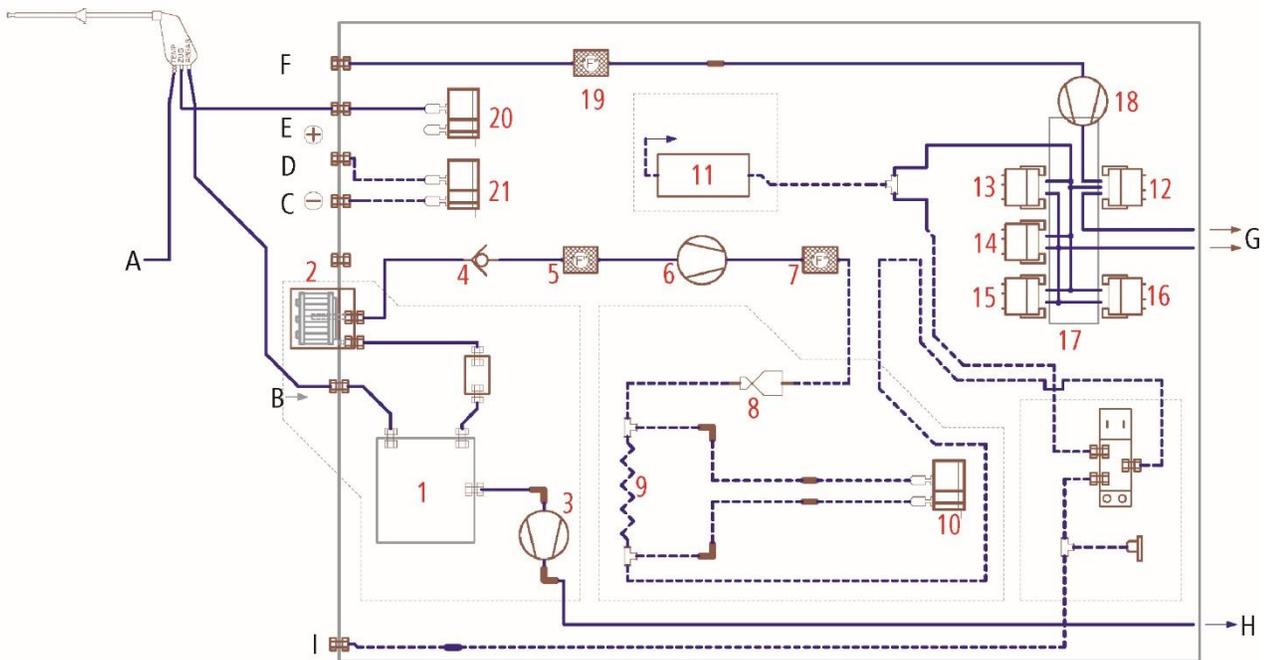
Draft and temperature are measured at the tip of the sampling probe.

3.1 Gas flow diagram with condensate separator



Position	Description	Position	Description
A	Gas temperature	6	Gas pump
B	Gas inlet	7	Filter
C	Differential pressure -	8	Nozzle
D	Differential pressure +	9	Capillary tube
E	Draft	10	Flow sensor
F	Fresh air inlet	11	NDIR bench
G	Gas outlet	12	O2 sensor
H	Not used	13	CO sensor
I	TRGI	14	NO sensor
		15	NO2 sensor
		16	SO2 sensor
1	Condensate separator	17	Sensor chamber
2	not used	18	Purge pump
3	not used	19	Filter
4	Non return valve	20	Pressure sensor
5	Filter	21	Pressure sensor

3.2 Gas flow diagram with gas cooler



Position	Description	Position	Description
A	Gas temperature	6	Gas pump
B	Gas inlet	7	Filter
C	Differential pressure -	8	Nozzle
D	Differential pressure +	9	Capillary tube
E	Draft	10	Flow sensor
F	Fresh air inlet	11	NDIR bench
G	Gas outlet	12	O2 sensor
H	Condensate outlet	13	CO sensor
I	TRGI	14	NO sensor
		15	NO2 sensor
		16	SO2 sensor
1	Gas cooler	17	Sensor chamber
2	Star filter unit	18	Purge pump
3	Hose pump	19	Filter
4	Non return valve	20	Pressure sensor
5	Filter	21	Pressure sensor

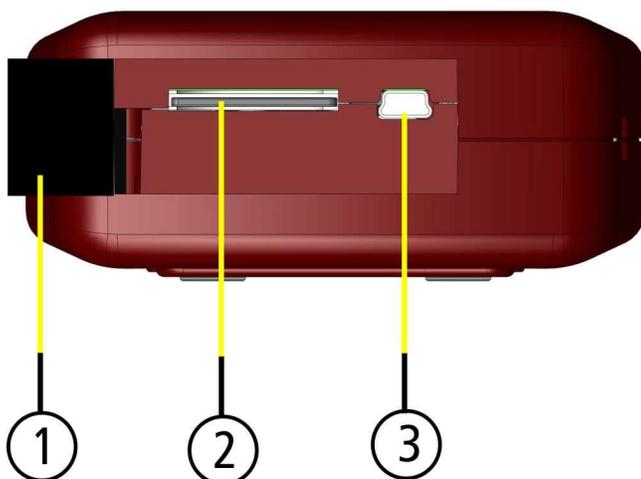
4 ANALYZER DESCRIPTION

4.1 Remote control unit (RCU) front



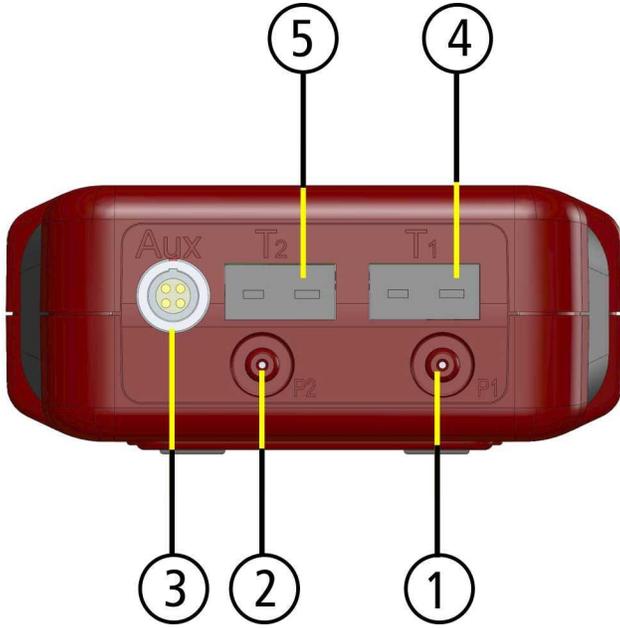
1	Display
2	Keypad

4.2 Remote control unit (RCU) Connectors - top



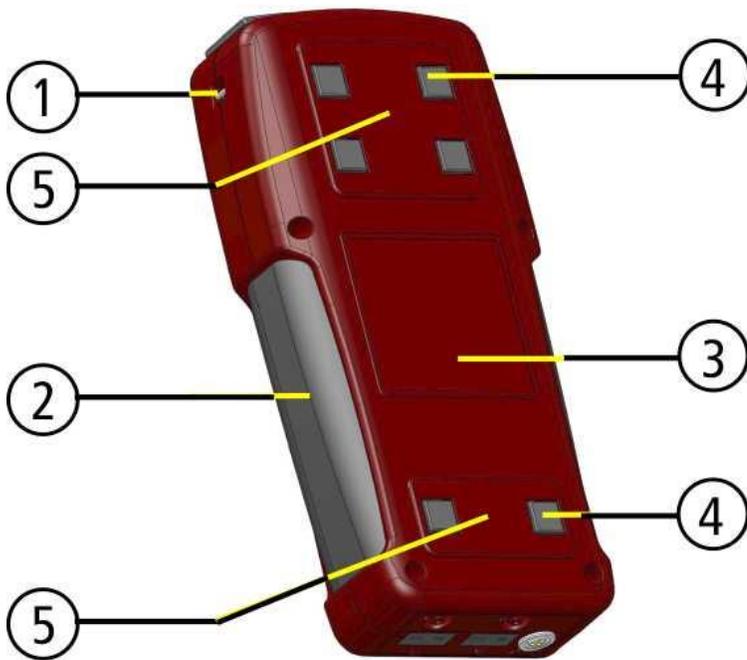
1	Cover
2	SD-card reader (only by using a MRU-SD-CARD we can assure the compatibility of all analyzer functions)
3	USB port

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



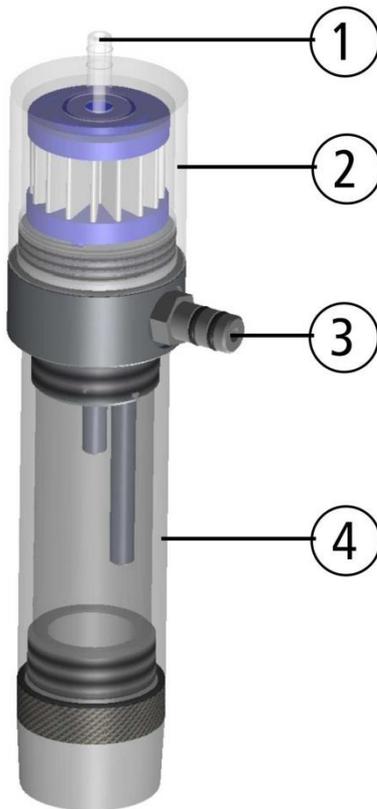
1	Pressure connection 1
2	Pressure connection 2 (Diff. pressure)
3	AUX connector
4	Temperature connection 1
5	Temperature connection 2

4.4 Remote control unit (RCU) back side



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

4.5 Base unit condensate separator



Disconnect the hoses at the gas entrance port (3) and the gas exit port (1). Lift the condensate separator upwards out of the mounting bracket next to the base unit.

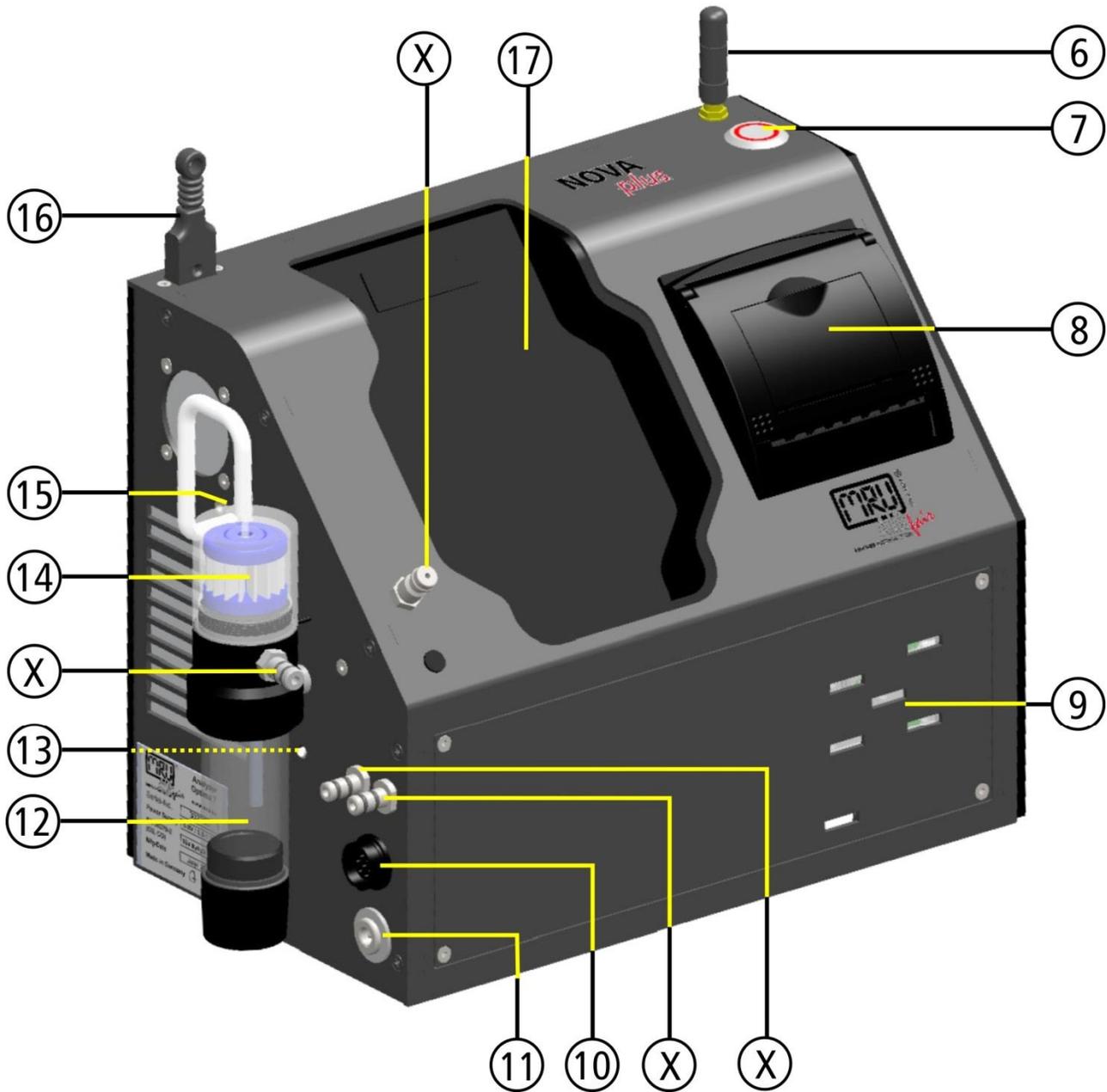
Liquid that is poured out of the condensate separator can be lightly acidic.



The condensate show glass and the bottom plug are screwed into each other and can easily be taken apart from each other (for cleaning and drying the condensate separator). The filter housing can also be unscrewed to replace the pleated filter. Please pay special attention when reassembling the condensate separator that all the O-Rings are in the right position and that they are not damaged. After each dismounting of the condensate separator we recommend you to perform an instruments leak proof test. (See chapter 12.5)!

There is a pleated filter mounted in the condensate separator. This filter filters rough particles out of the flue gas. This pleated filter is washable and can be reused up to five times (filter must be completely dry before being used again). The filter should be replaced or washed when it changes its color from to brown or grey. A frequently washed or replaced filter will avoid dirt getting inside the analyzer will therefore avoid damage to your analyzer.

4.6 Base unit with condensate separator



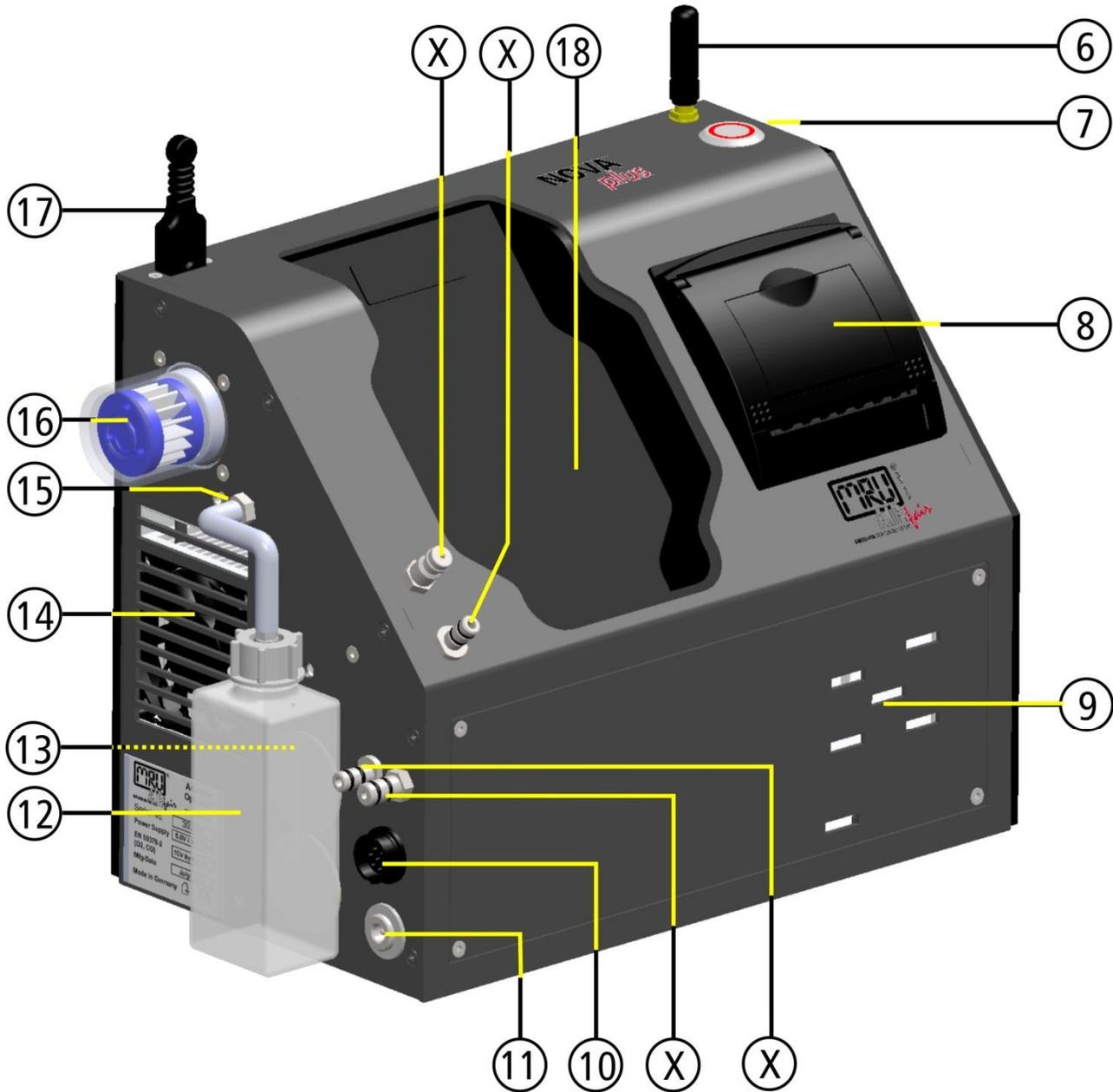
6	Aerial	12	Condensate separator
7	ON-/OFF key button	13	LED condensate separator
8	Built-in speed printer	14	Star filter
9	Gas outlet	15	Gas inlet after condensate separator
10	Connector T-gas	16	Connector T-Ambient air (combustion air)
11	Charging socket	17	Charging frame for Remote control unit
X	Connectors see chap. 4.7		

4.7 Connectors depending on the options (condensate separator)



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

4.8 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. 4.9

4.9 Connectors depending on the options (gas cooler)



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

5 ACCESSORIES

5.1 Gas sampling probes

The NOVApplus 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.

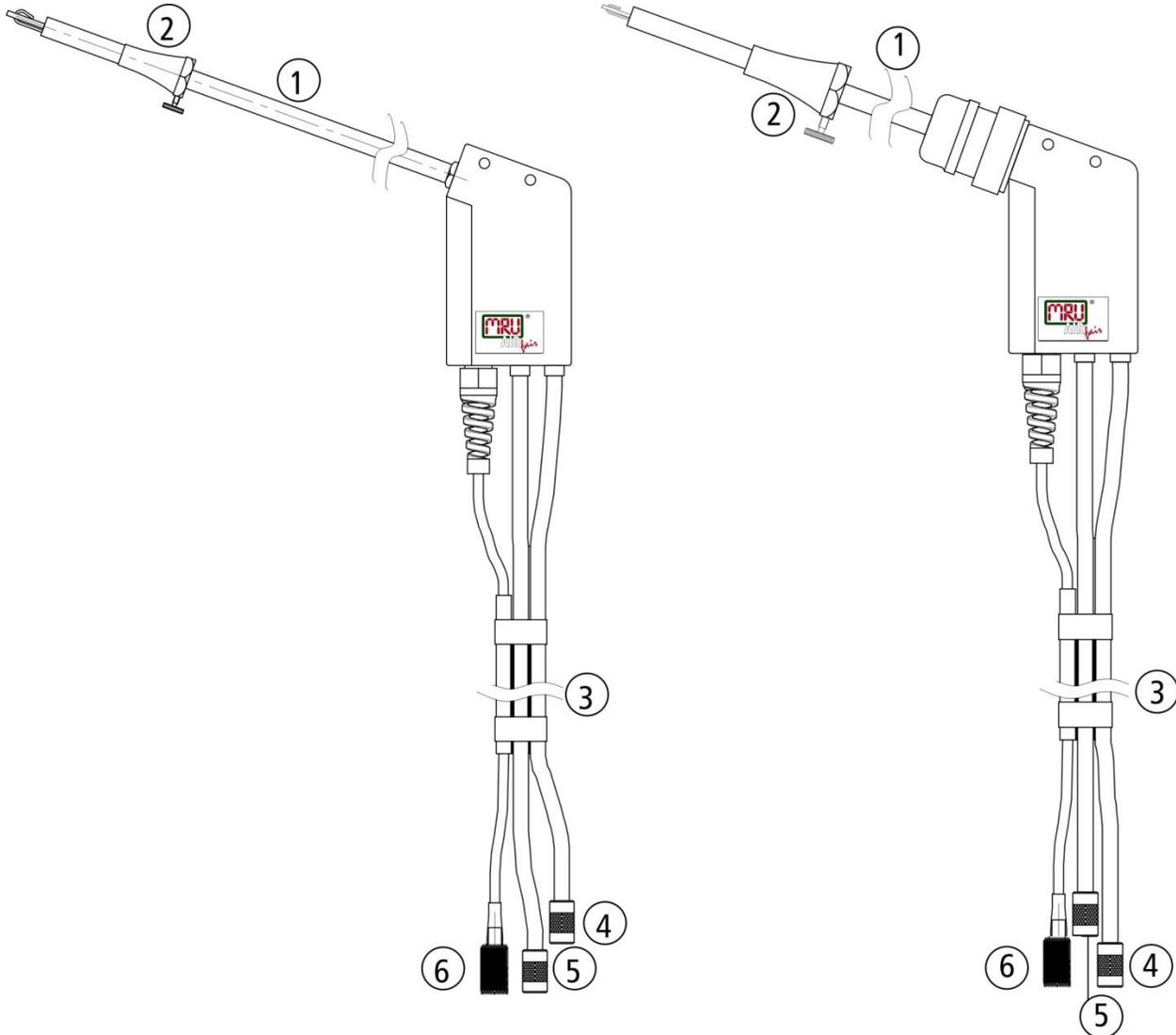
Below are two different probe types:

Probe

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

Probe

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

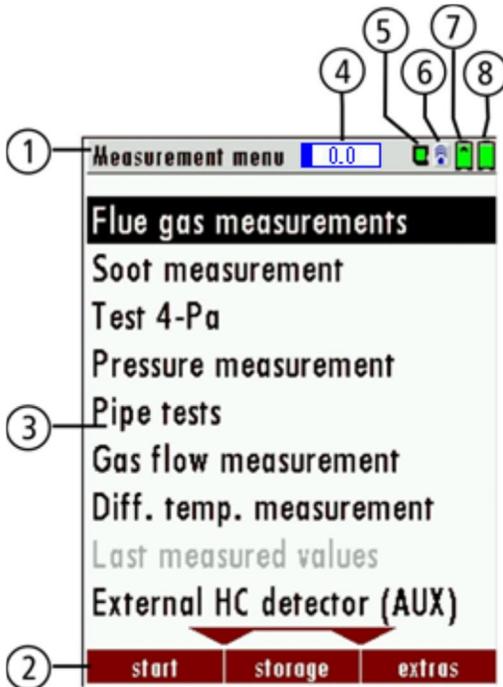


1	Probe tube
2	Probe cone (high grade steel)
3	Hose
4	Connector for sample gas measurement
5	Connector for draft measurement
6	Connector for temperature measurement

6 OPERATING THE ANALYZER

6.1 The Display

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



1	Menu bar
2	Function key bar
3	Display panel Menu Measurement value, ÷
4	Zeroing active
5	SD-Card in the slot Indication green Read- and write access Indication yellow only Read access (SD-Card write protected) Indication red SD-Card is damaged
6	Blue tooth connection Blue: connected Red: not connected
7	Battery charge condition base unit
8	Battery charge condition RCU

6.2 Keyboard

Description and function of the keys:

		<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>Activates the functions seen on the display (2 function key bar)</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>Abort or return to the menu above</p>
		<p>Jump in between lines, change values</p>
		<p>Confirmation key, select a marked menu point</p>
		<p>Activates the print out of the measuring results in the measuring screen in a pre-defined format. Linefeed when there is no printable display condition.</p>

6.3 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)

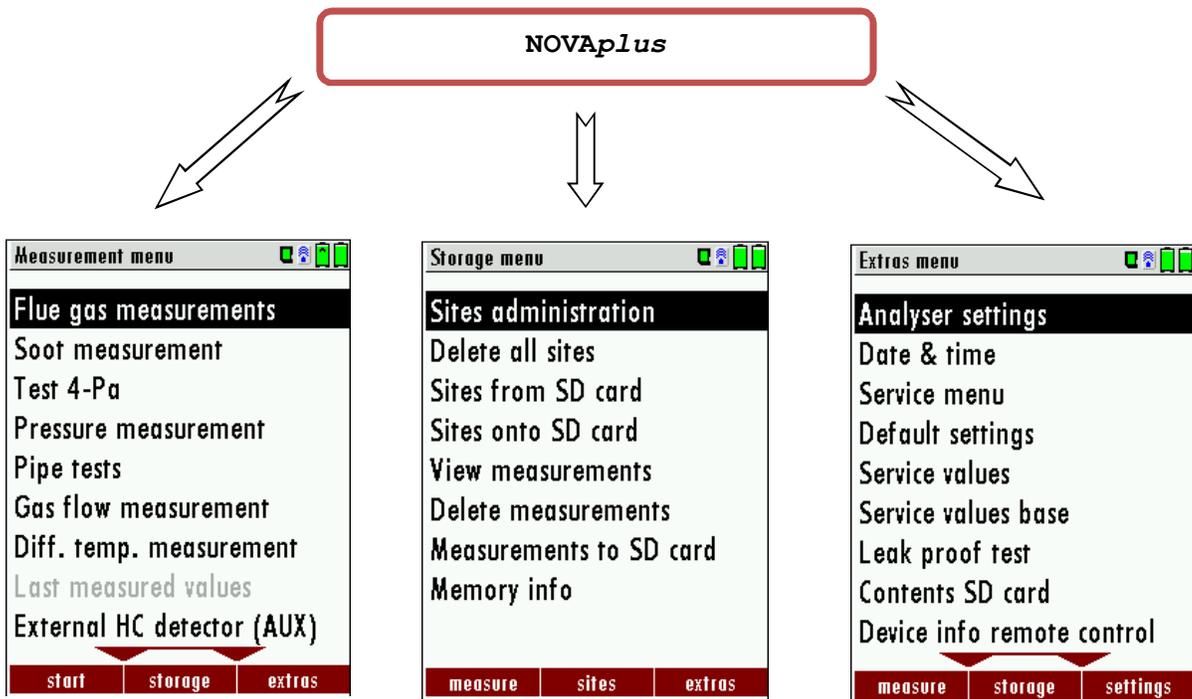
LED in ON/OFF- button in the base unit:

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

6.4 Menu configuration

The NOVApplus 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.



MEASUREMENT MENU

The topic of Flue gas measurement is a standard feature in every analyzer and is explained in chapter 0. Other menu points are optional and will be explained either in this manual or in an additional manual or flyer.

STRAGE MENU

Please read chapter 11 for details.

EXTRAS MENU

Please read chapter 12 for details.

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

7 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.

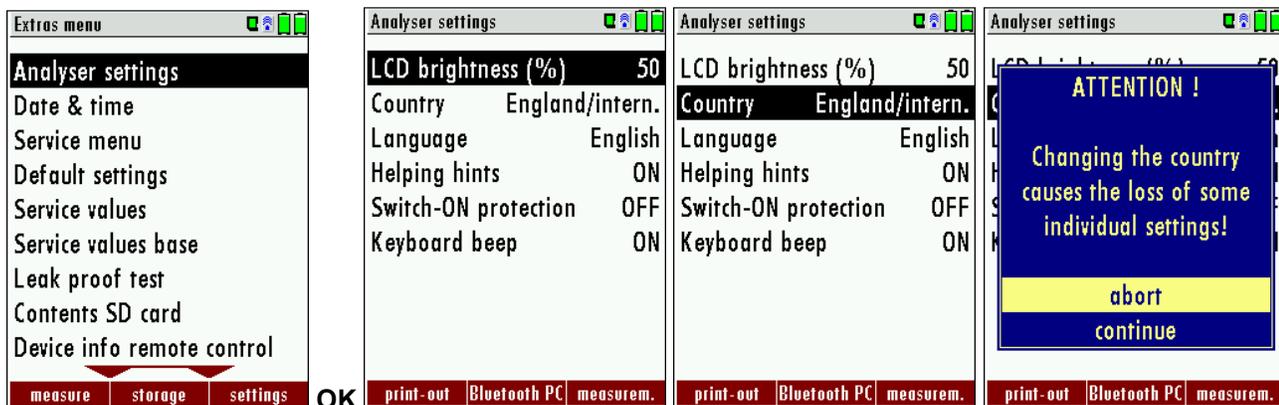
7.1 Analyzer ready for operation

- 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

7.2 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 s3 seconds OK key press %displays
Keyboard beep	ON / OFF	Keyboard beeper activated or deactivated

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:

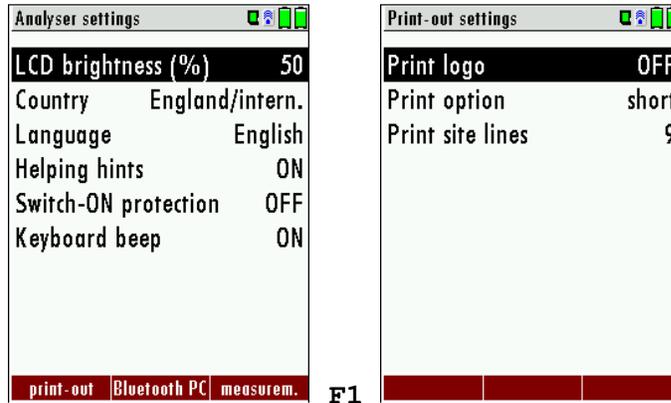
- %Zeroing finished, Sensors are ready. Analyzer ready for measurement.+
- %Reminder! Charge batteries at regular intervals!+
- %Measurement stopped/started.+

7.2.1 Switch-ON protection

If activated and if ON key is pressed (possibly inadvertently), then the message: s3 seconds OK key press % displays

7.2.2 Print-out settings

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



Print logo ON/OFF:

Print logo see chap. 12.1

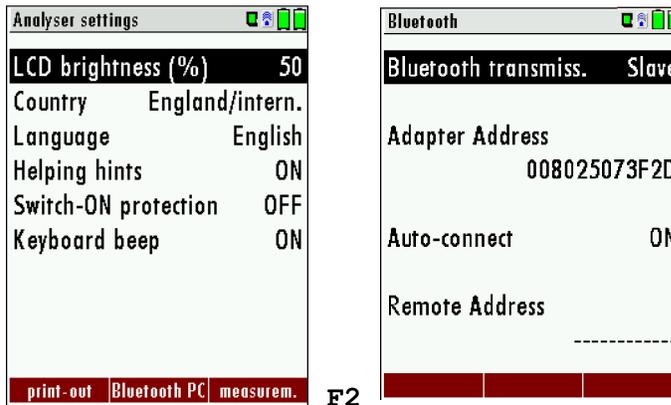
Print option SHORT/LONG:

SHORT: Print-out without area for signature and site information

Print site lines 1 ÷ 9:

Line 1 (Site no.) is necessary, further lines (freetext) printable if necessary see chap. 11.2

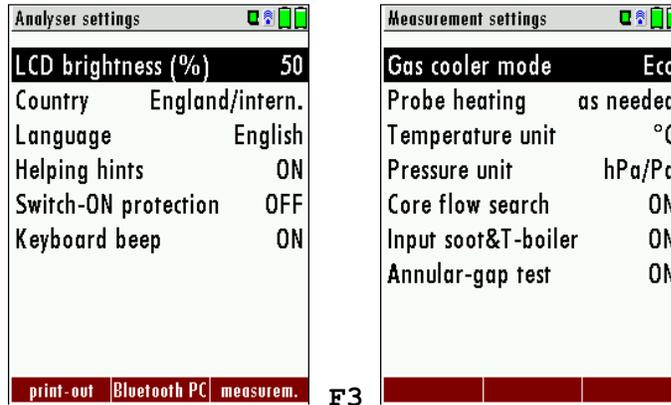
7.2.3 Bluetooth settings



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 2 OPTIONS)

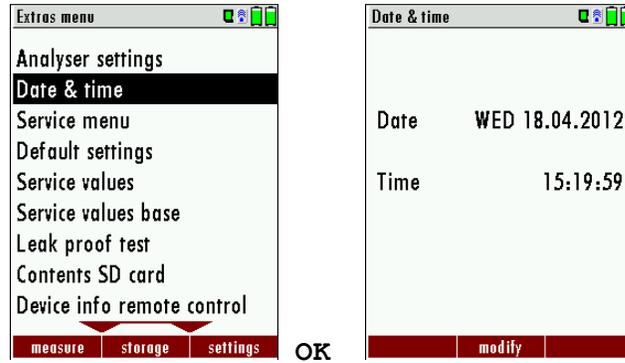
7.2.4 Measurement settings



F3

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!)
Probe heating	as needed / with mains	Probe heating is always switched on with mains, if the NOVApplus is connected to mains and is switched ON.
Temperature heating	°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.
Core flow search	ON / OFF	Core flow search before start of each flue gas measurement: activated or deactivated
Input soot & T-Boiler	ON / OFF	Input soot and T-boiler values for print-outs and/or storage: activated or deactivated
Annular-gap test	ON / OFF	Annular-gap measurement: activated or deactivated

7.3 Setting time and date



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

7.4 Configuration of measurement program

(Flue gas measurements) Select one of the 6 configurable measurement programs.

For each of the programs the following parameters can be configured:

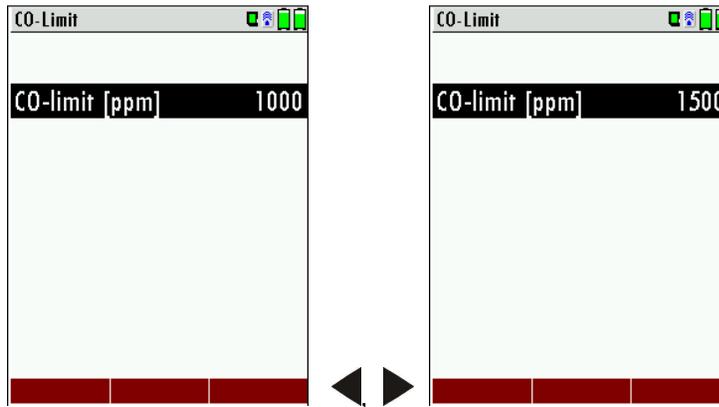
- CO ppm limit: adjustable value for the CO sensor protection. If the CO value in the flue gas is higher than the adjusted value in the analyzer, the purge pump will be activated and the sensor will be protected against high CO concentrations. (Optional)
- Selectable fuel types: choose and select from the available fuel type list
- Measurement windows: configuration of what and where will be displayed in the 3 measurement value windows.
- Zoom . window: select what will be displayed in the zoom - window
- Program name

The following programs have a pre configured:

- sFlue gas measurement%with CO . limit of 2000 ppm
- sCO measurement%with CO limit of 2000 ppm
- sAnnular-gap test%for pure O2 and CO . display
- sTest program%indented for use at instrument maintenance and calibration, without fuel selection

7.4.1 Setting the CO ppm limit values

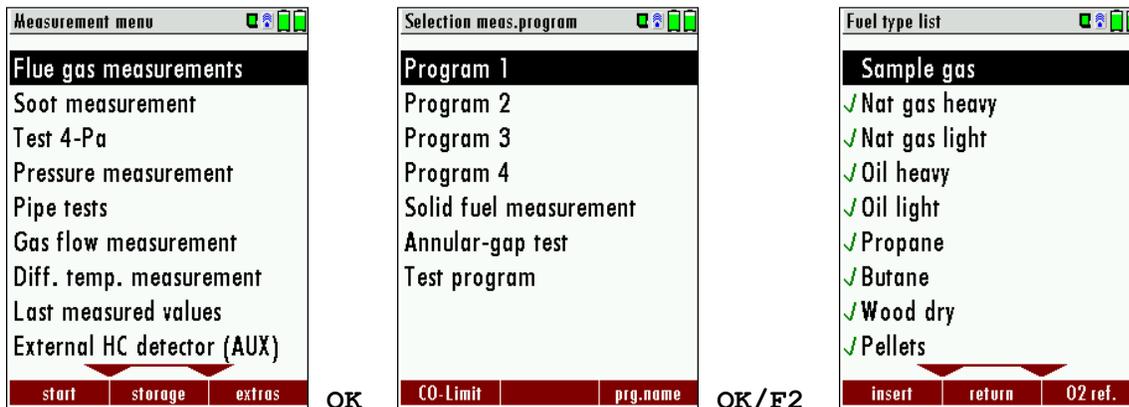
The CO ppm limit can be adjusted in the window sMeasuring program selection%oo
 Select one of the available programs (arrow up/down) then press the F1 key.



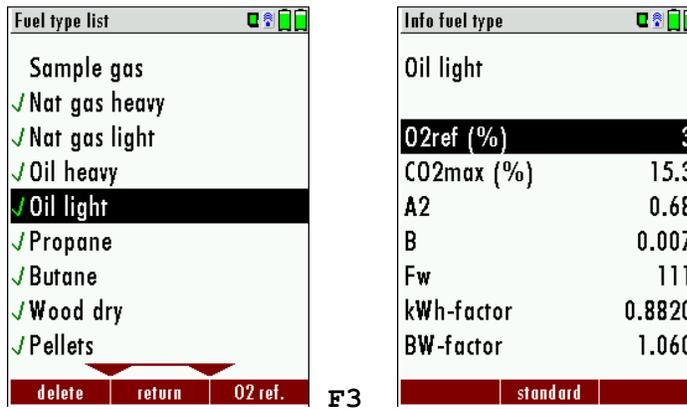
▲, ▼, ◀▶	The CO-ppm limit value can be adjusted in 100 ppm steps between 300 ppm and 4.000 ppm / 10.000 ppm
OK or ESC	Return to the measurement window

7.4.2 Fuel type selection and O2 reference

Each time you start a measurement program you can select a fuel type from the fuel type short list. This short list is linked to the measurement program and can be configured as a sub set of fuel types from the total fuel type list.



▲, ▼, ,	Select a program
OK	Show a pre selected fuel type
OK and F2	Show the list of all fuel types



F1	Add / remove a fuel type
F2	Exit the fuel type list
F3	Change O2-ref with the keys ◀▶

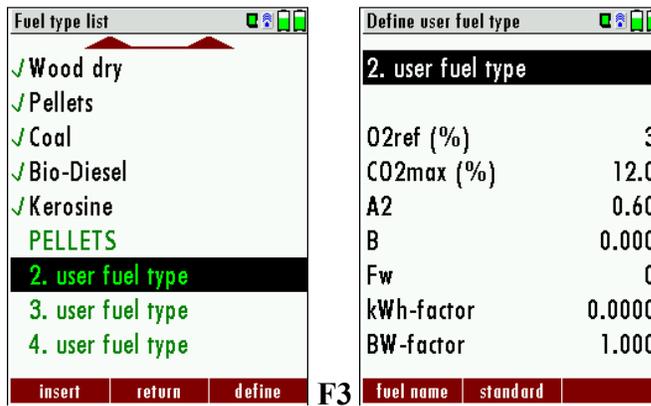
First select a program then press OK . then press the F2 key in the window %fuel type selection+. All available fuel types are displayed: they can be added to or removed from the short list by using the F1 key. Added fuel types have a check mark in front of the fuel type.

7.4.3 User definable fuel types

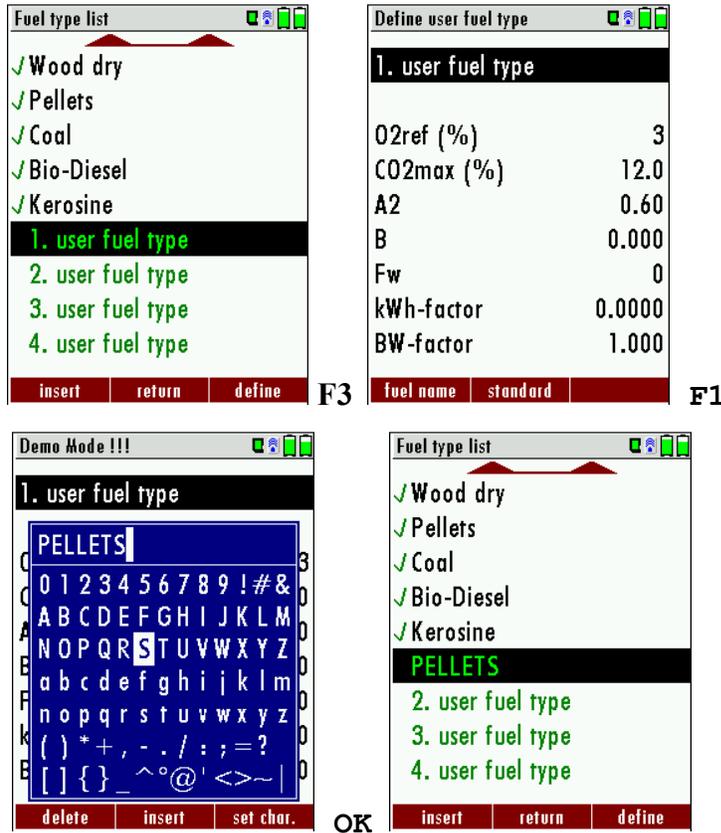
Here, four fuels are adjusted individually. The names as well as the parameters are adjustable. As the other fuel types, they can be pre-selected or left out.

Note:

The last 4 fuel types at the list are the user fuel types.
The user fuel types are coloured green.



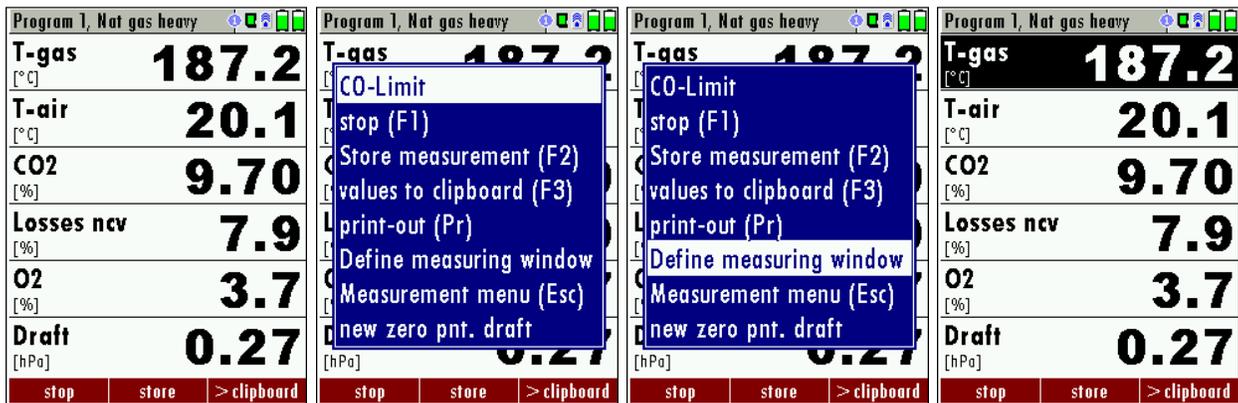
F1	Add or remove selected fuel to the pre-selected fuel types
F2	Back to the window %fuel type selection+
F3	Modify fuel type parameters



F3	Modify fuel type parameters
F2	Modify fuel type name Text input see chapter 14.1
OK	Save the new fuel type name

7.4.4 Configuration of the measurement window (display content)

Start the measuring program . once you are inside the measuring window press the  key.



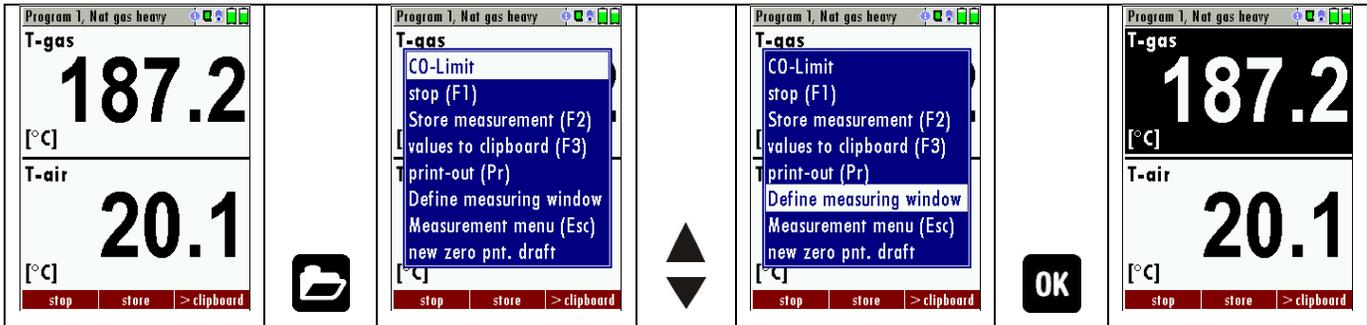
Now you select **Define measuring window** and press the **OK** key. The top value will now be marked black . this black bar can be moved up and down. Move it to the position that you would like to change or to the position where you want to add a measuring value. Once you have reached the position you can use the arrow left and right keys to change the measuring value.

When all your changes have been made, you press again the **menu** key. Now you select **Save measuring window**. All your changes will be saved and all saved values will be printed when using the printer function.

Start the measuring program . once you are inside the measuring window press the **menu** key.

7.4.5 Configuration of the zoom function

For each measurement program you have 3 zoom windows with two selectable values for each window.



	Change Zoom window 1..3
	Change measuring values
F1	Save measuring window and save configuration

7.4.6 Change measurement program names

In the %fuel type selection+window you can edit the marked program name with the F3 key and then change the program name.

(See chapter 14.1)

7.5 Select core flow search

You can choose if you want a core flow search before every measurement or not. This function is only possible in the programs 1 -4. Enabling the core flow search is a global instrument setting valid for all programs and therefore described in chapter 7.2

8 Maintenance and Cleaning

8.1 Cleaning

The NOVApplus 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 NOVApplus, so that the hose can dry
- after longer disuse load battery first and afterwards approx. all 4 weeks

8.2 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.

8.3 Service-Maintenance Plan

A check of NOVApplus 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.

9 PREPARATION FOR EACH MEASUREMENT

9.1 Power supply

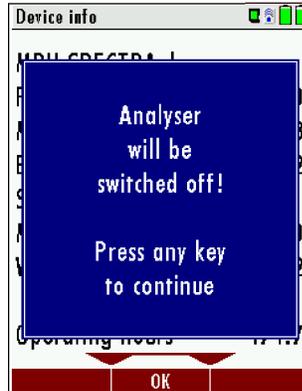
The analyzer can be used with:

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!

9.2 Auto Off

The instrument is automatically switched off after 60 minutes.

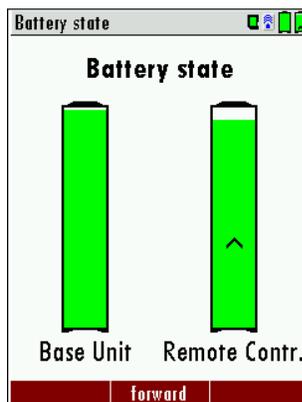


During a measurement or a battery charging cycle the auto off is deactivated.

9.3 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.

9.4 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.

9.5 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. 13), 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 does not start until it has reached the specified operation temperature.

9.6 Condensate separator / Condensate container

The condensate separator must be checked before and after each measurement!

Please check if the condensate separator must be **emptied** and if the star filter is still **white**.

White = good for measurement **dark = replace**



Base units with optional gas cooler require a frequent check of the pleated filter as well as the emptying of the condensate separator.

9.7 Connectors and leak tightness

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

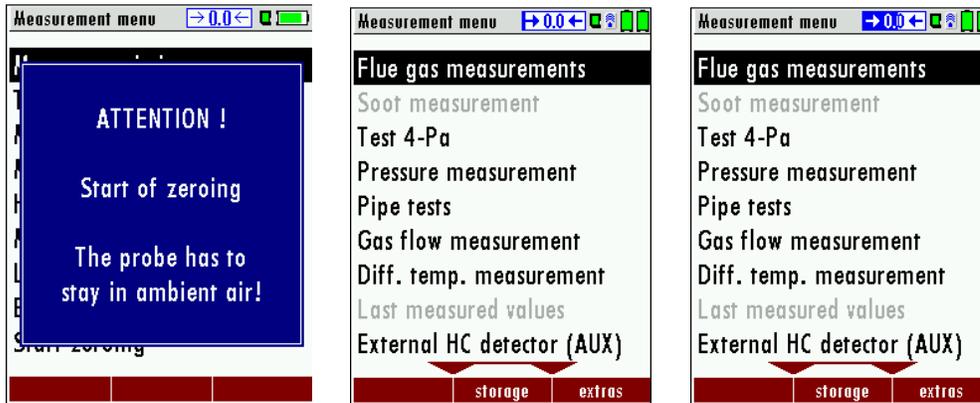
The NOVApplus provides an automatic test to check the probe and internal system for leaks (see chapter 14.5)

9.8 Power ON and zeroing

Press the ON key at the base unit. The analyzer will start zeroing without any further action from the user.

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

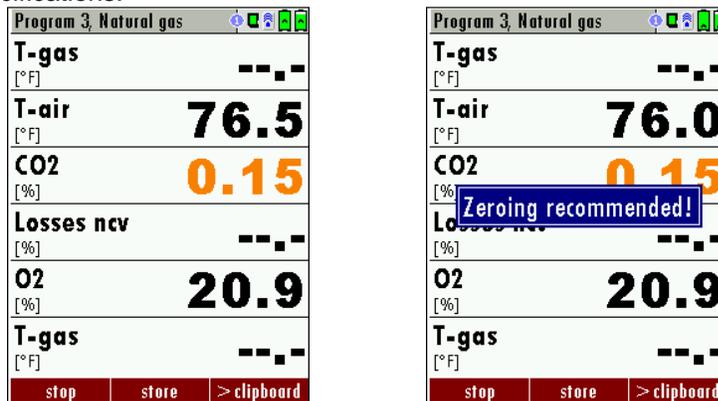
While the analyzer is zeroing you will see a blinking  symbol in the task bar indicating the progress of zeroing.



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.

9.9 Zeroing with the 3-gas-NDIR bench

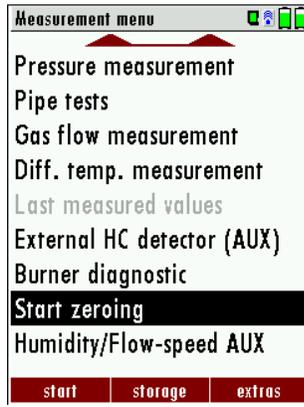
The zeroing of the 3-gas NDIR bench takes typically 7 to 10 minutes and maximal 18 minutes. After this zeroing the measuring values are not stable for a longer time yet and will be displayed at first orange colored. Nevertheless a short time measurement is possible, but only the other (not orange colored) values are correct according the specifications.



Aprox. 30 minutes after the first zeroing the analyzer will display every 8 seconds %Zeroing recommended%. After the accomplishment of this second zeroing the color of the displayed measuring values will be switch from orange to black and the measuring precision of the 3-gas NDIR bench is now correct.

9.10 Repeating the zeroing

The zeroing can be repeated at any time as long as the probe is not inside the stack. In the main menu you select %Zeroing+, and after the displayed message press the OK key.



OK

▲, ▼	Zeroing
OK	Start zeroing

10 HOW TO TAKE A MEASUREMENT

Every NOVApplus is capable of making a complete flue gas measurement. How to perform this is described below.

The description of other optional available measurement programs can be read in the appendix or in additional flyers.

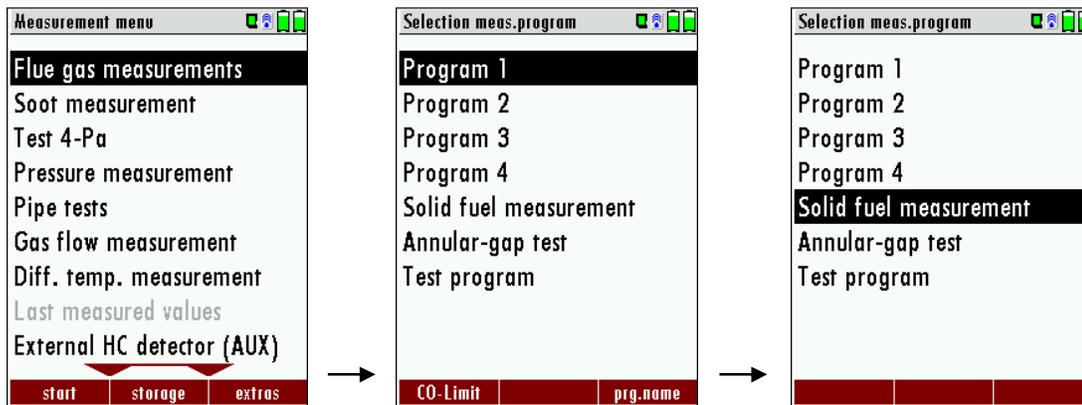
When using the optional soot probe make sure that no soot test paper is inserted in your probe handle when performing a flue gas measurement.

10.1 Selection of the measurement program



In the measurement menu select %Flue gas measurements+then select one of the available programs.

If you press the F1 key %Start+in the measurement menu, you will be directed directly into the measurement screen, using the parameters (program and fuel type) that have been selected last time the analyzer was used.

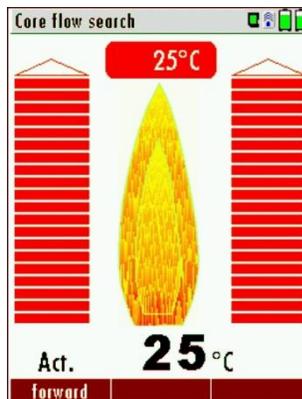


change between the lines

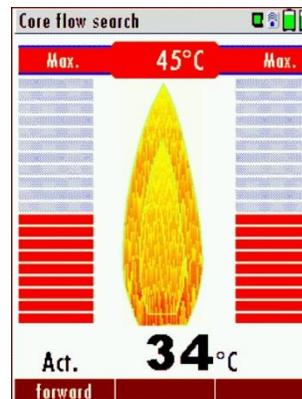
10.2 Core flow search

The core flow search will help you to find the optimal measurement point in the stack. The core flow can be identified by the maximum flue gas temperature.

In high reaction time the analyzer displays the trend of the flue gas temperature. Insert the probe pipe slowly into the stack and position your probe tube when you have reached the maximum flue gas temperature that is displayed.



Temperature rising



Approaching the maximal flue gas temperature

Positioning the probe in the core flow:

Insert the probe pipe slowly into the stack and position your probe pipe when you have reached the maximum flue gas temperature that is displayed (see temperature maximum value on the display . in this case 45°C).

Maximum temperature has been reached when the arrows (left picture) disappear, max. (right picture) appears in place of the arrow, and the beeper signal stops. Moving away from the max. temperature will result in the bars moving away from the max. temperature (1 bar is equivalent to 1°C). Once the right core flow has been achieved, the probe is fixed with the probe cone screw.

10.3 Measured Value Display

After the core flow search you will see the measurement values on the display.

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

The order of the display is operator settable. (See chap. 7.4.4).

Program 1, Nat gas heavy	
T-gas [°C]	187.2
T-air [°C]	20.1
CO2 [%]	9.70
Losses ncv [%]	7.9
O2 [%]	3.7
Draft [hPa]	0.27
stop store > clipboard	

Program 1, Nat gas heavy	
CO [ppm/ref0%O2]	2
CO [ppm]	0
CO [mg/kWh]	2
Air ratio	-- --
Eff. ncv [%]	-- --
stop store > clipboard	

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.

Program 1, Nat gas heavy	
T-gas	187.2
[°C]	
T-air	20.1
[°C]	
stop store > clipboard	

10.4 CO purging (optional)

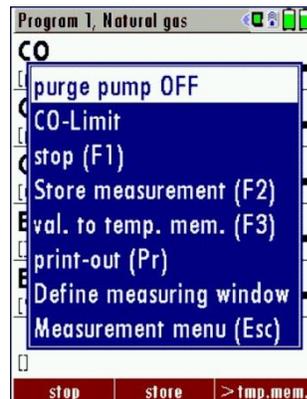
If the CO ppm limit is reached the analyzer will start the CO purging pump to protect the CO sensor from getting saturated with CO. Other values will not be affected while the CO sensor is being purged.

While the CO sensor is being purged the CO value is not displayed and dashes will appear on the display. The dashes will remain red as long as the CO value is higher than the CO ppm limit, and they will turn black once a level below the selected ppm value has been reached.

CO Messung, Erdgas	
T-Gas [°C]	70.0
T-Luft [°C]	23.0
O2 [%]	5.26
CO [ppm]	---
NO [ppm]	4
Zug [hPa]	---
Stop	

The purging does not stop automatically: it must be turned off by the user.

Press the  key and select %purge pump off+ to cancel the CO purging function.



The actual CO value will then be displayed again.

10.5 CO/H2 and CO high (optional)

If that exceeds CO the CO threshold, then to CO high, the measured value is red indicated - also the calculated values - is switched.

The CO value exceeds 10.000 ppm to % is in such a way switched (example 1.00%).

If the CO value sinks below the CO threshold, then the red CO value becomes again black. Starting from this moment the purge pump can be switched off over the menu key.

10.6 Specific measurement applications

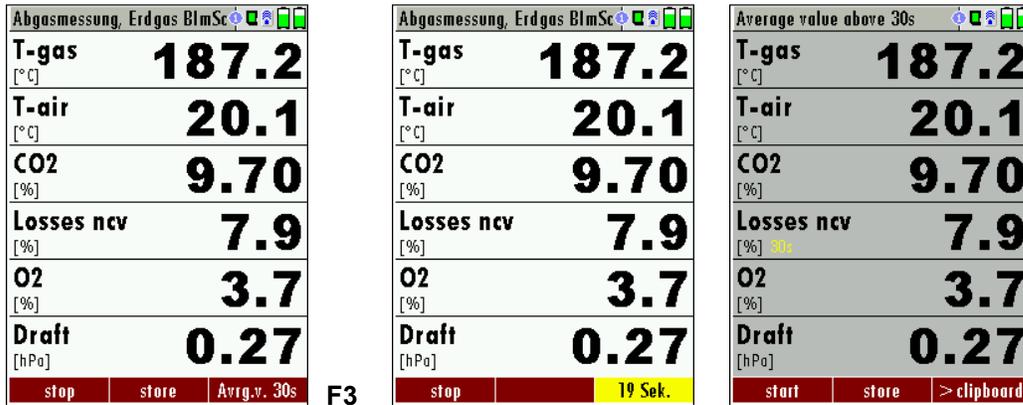
10.6.1 30 second average value calculation according to 1. BImSchV_2010

This function is available if you have received your unit with German configuration.

This option is started with the F3 button in the measuring window.

In the right bottom corner of the display the countdown from 30 to 0 will be displayed. Once the countdown is completed the measurement will stop automatically.

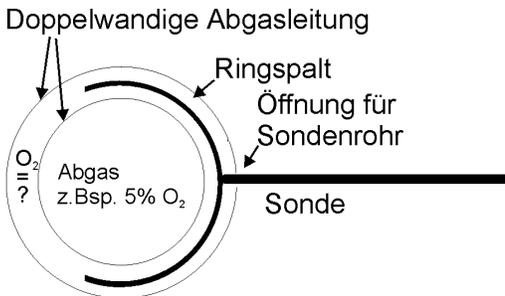
The per 30 seconds determined Loss Values will be market in the measurement print out.



The countdown can be stopped at any time using the F1 button (the measurement will be stopped as well).

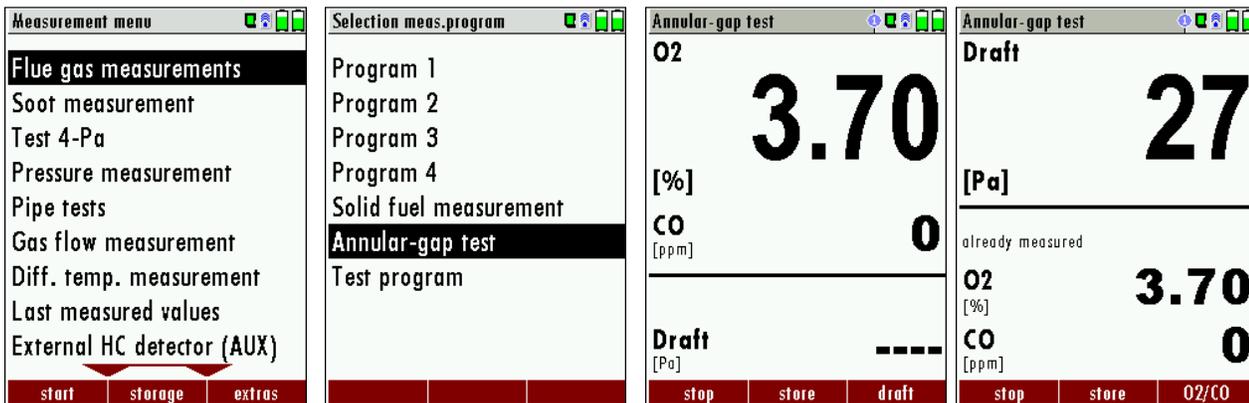
10.6.2 Annular-gap measurement program

This program is used to find leaks in the double walled exhaust duct of condensing boilers. It is done by measuring the O₂ value in the combustion air.



This program is used to find leaks in the double walled exhaust duct of condensing boilers. It is done by measuring the O₂ value in the combustion air.

Umgebungsluft 20,96% O₂



▲, ▼	Select Annular gap measurement
OK	Start Annular gap measurement In case a new zeroing is necessary then this will be done automatically
F3	Draft measurement

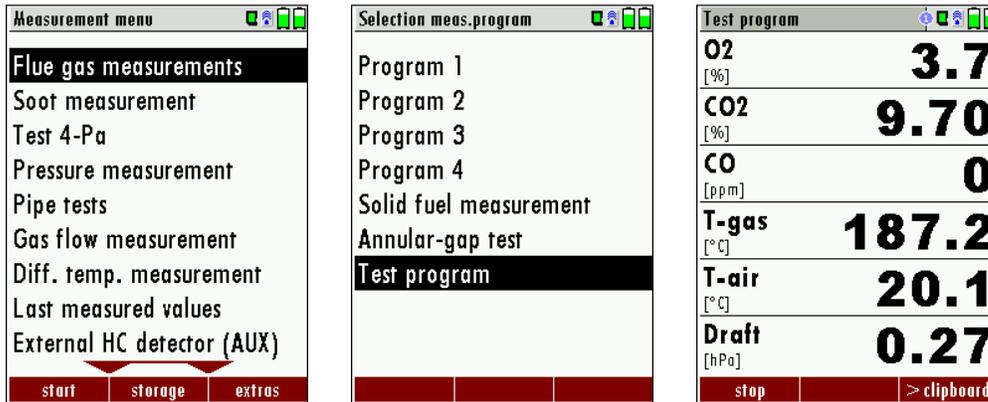
ESC	Back to the measurement menu without saving
------------	---

For this measurement MRU offers an annular gap probe (Part no. 56352) which can be connected to the condensate separator of the analyzer.

Optional you can connect the annular gap probe with an adaptor (Part No. 11652) to the tip of the probe pipe.

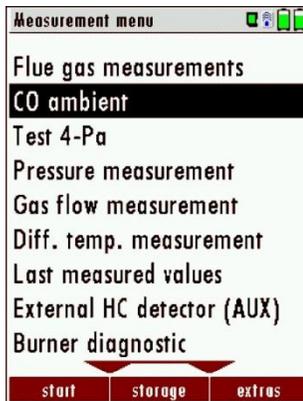
10.6.3 Test program

This test program is made for testing facilities that will test these analyzers with test gases and don't need to make any modifications. In this program you will only see measured values and no calculated values at all.



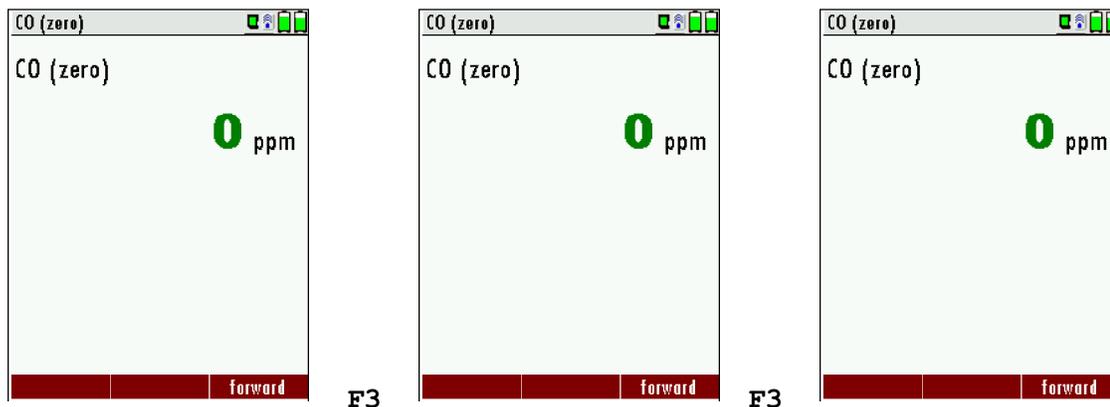
10.6.4 CO ambient

In some countries the measuring program CO environment is demanded. The objective of this measuring program is the proof of CO concentration in the environment of the measuring point. In the case of the country setting in the main menu the menu option is indicated sCO ambient%.



Before that CO ambient measurement a zeroing at fresh air (outside of the environment of the measuring point) must be taken.

Start thereafter the function sCO ambient % at fresh air with the **OK** key.



The current CO value (zeroing) as a check is indicated. (This value must be approx. 0 ppm!)
 The CO ambient measurement starts through pressing the key **F3** at the measuring point.
 The current CO (ambient) and CO (peak) values will be indicated.
 The measuring result will be indicated by pressing the **F3** key. This can be printed out by the **printer**-key.
 With the **ESC** key one reaches back in the main menu.

10.7 Clipboard

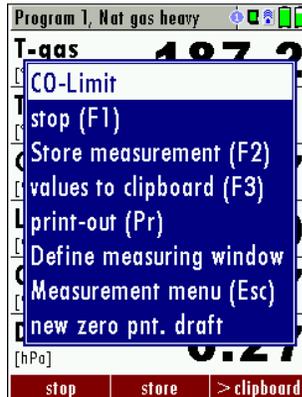
The NOVApplus gives the possibility to set the momentary values into a clipboard during effecting and continuing the measurement. Later on, the values can be brought back from the clipboard to the measuring window in order to print them out or / and to save them.

10.7.1 Set values into clipboard

During an actual measurement you can set the actual values into the clipboard

Operation:

- the function sval. to clipboard% of the menu (accessible about the menu button)



- or, provided that offered, the function key F3 with the text **> clipboard**

10.7.2 To bring values back from the clipboard

With stopped measurement you are able to change the indicated values with the clipboard content.

Operation:

- the function s>clpbrd>% of the menu (accessible about the menu button), or
- the function key F3 with the text **> clipbrd >**

Now you can change the current values and the values of the clipboard with the key F3. This change of the actual values with the values of the clipboard memory can be executed several times one after the other

⇒ clipboardq	current values to the empty clipboard
⇒ clipbrd >q	replace (overwrite) clipboard values with current values
⇒ ./clipboardq	after stopping the measurement via F1 key (stop): swap indicated values with those in the clipboard

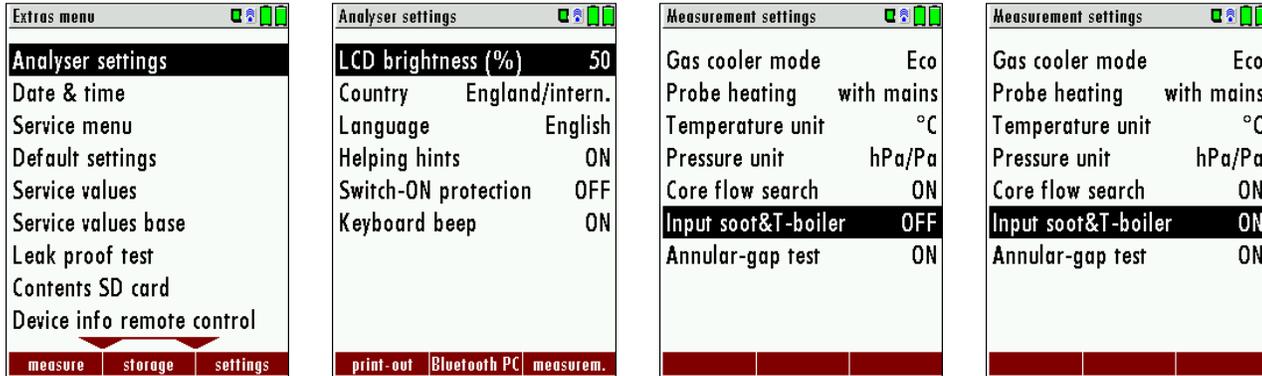
Now it is possible to print and save as usual one of both measurements.

10.8 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 11.

10.8.1 Input of soot and T-boiler

In fact, the NOVApplus has no soot measurement, but you can nevertheless insert, save and print soot data. Before using this function it must be switched-ON:

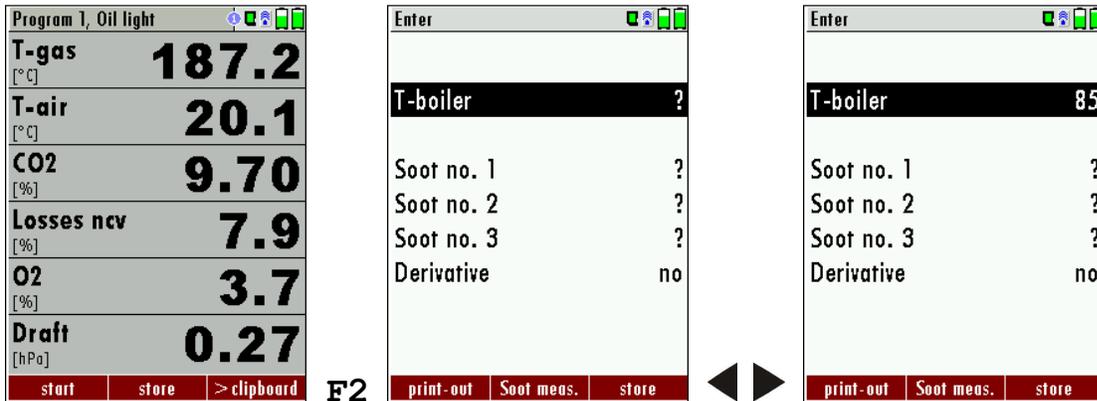


Press F1 or enter

Press F3

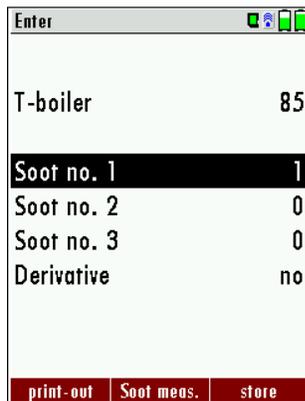


After a flue gas measurement is finalized, the externally determined soot data can be entered. The input possibility of soot values and derivate is given only with the fuel oil.



The input of the boiler temperature occurs with the arrow keys . Afterwards the determined soot values and the derivate can be set - with the fuel oil.

Change of the line with the arrow keys: .



Save the entered data with the F3. key.

10.9 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).

10.10 End of measurement

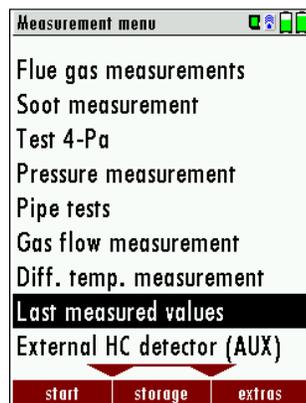
A current emission measurement can be stopped at any time with the F1 key. The display will change its colour and the measurement will be frozen. At the time you stop the measurement all measured values are still available and can be viewed at a later time (see chap. 10.11).

Return to the measurement menu by pressing the ESC key.

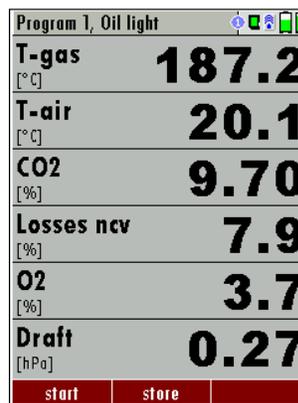
10.11 Last measurement results

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.



OK F1



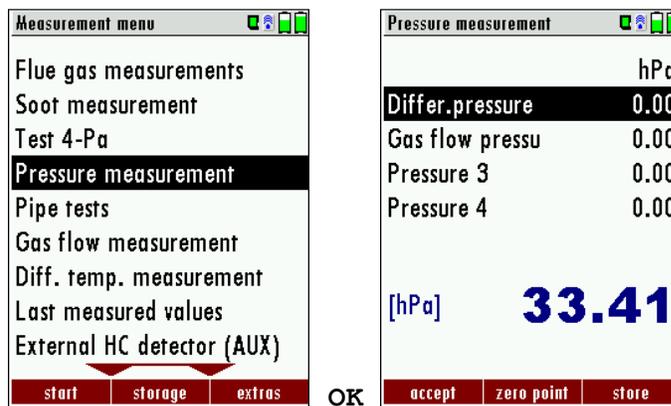
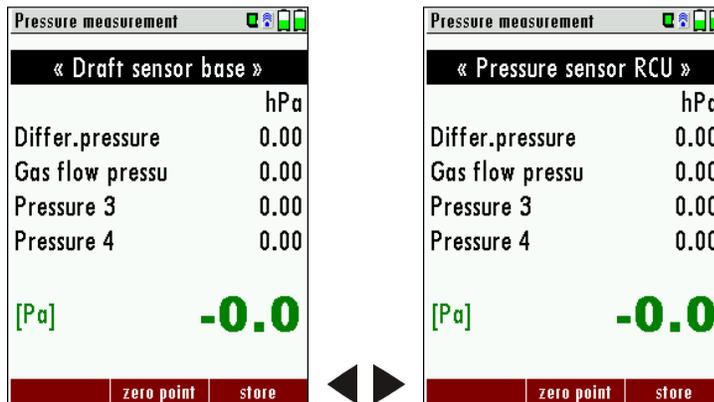
Above the F1 key **Start** instead of **Stop** is displayed. Pressing this key will continue the measurement.

10.12 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:

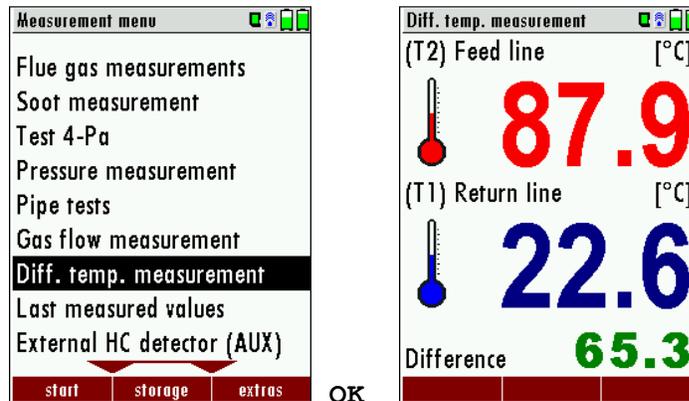
To be able to use the pressure sensors in the RCU (only Comfort Model) as well as the pressure sensors in the base unit an selection will take place using the arrow keys:



▲, ▼	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

10.13 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.

11 DATA STORAGE

11.1 Organisation of the data memory

Basis of the data memory of the NOVApplus 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.

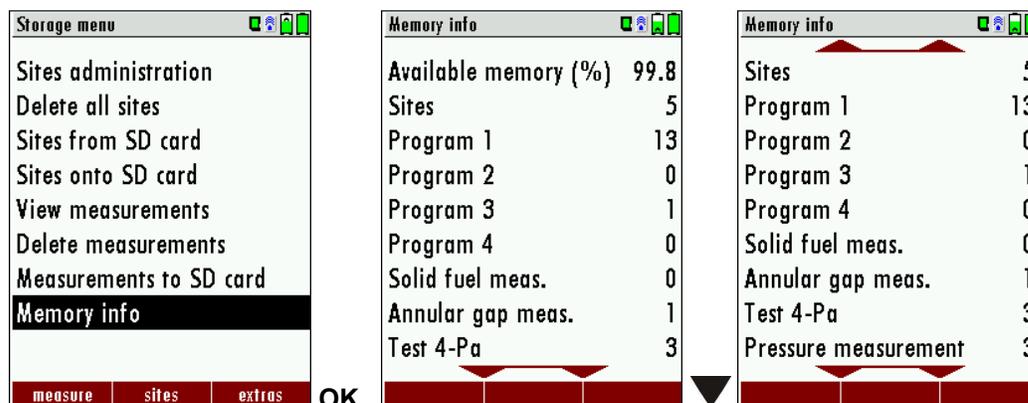
The device can store up to 4000 different sites.

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.

11.2 Information about the data memory

In the menu item "storage" you select smemory 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.



11.3 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

11.3.1 View and search sites

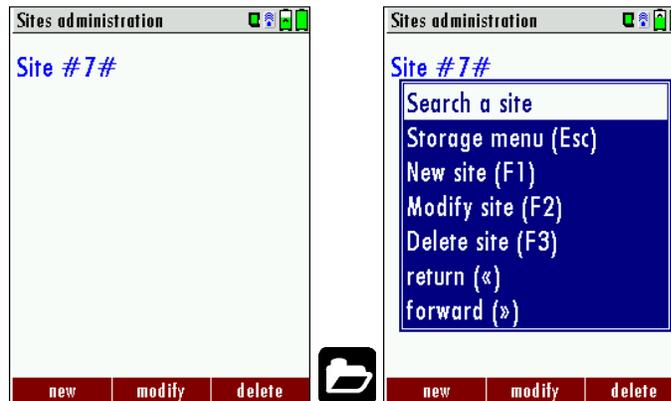
If the menu item "Site administration" will be selected for every stored site will be displayed with:

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

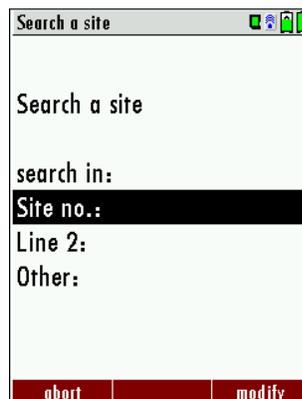
With the arrow keys on the left / on the right you scroll by all sites.

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.

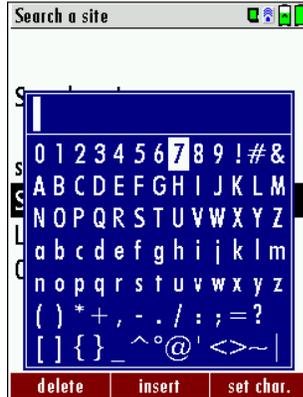
- Select with the menu key "Search a site"



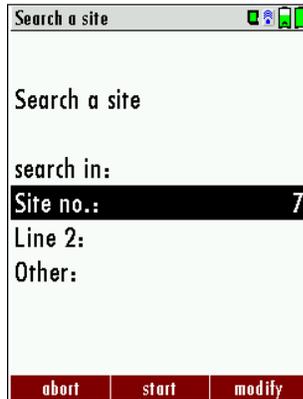
- Now you can enter the text to be searched for the first line, i.e. the site number, or for the second line, or for the rest of the text lines.



- 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.

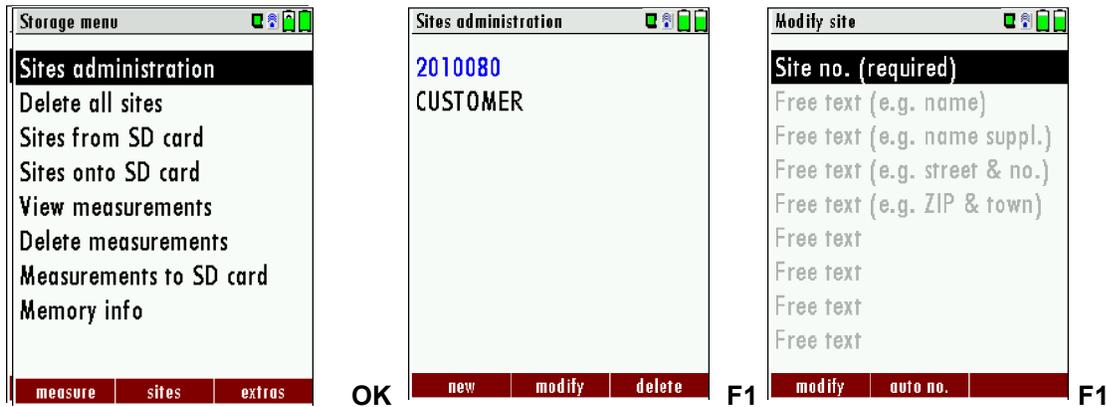
	Page through the sites
	Menu key: Search site ▲, ▼: Selection of the input field F3: Input mask, see chap. 14.1 F2: Start search ◀▶: According to the search criteria found sites page through. If no saved site with the search criteria agrees occurred the Meldung: sSearch unsuccessfully%o
ESC	Back to storage menu

11.3.2 New entry and change of sites

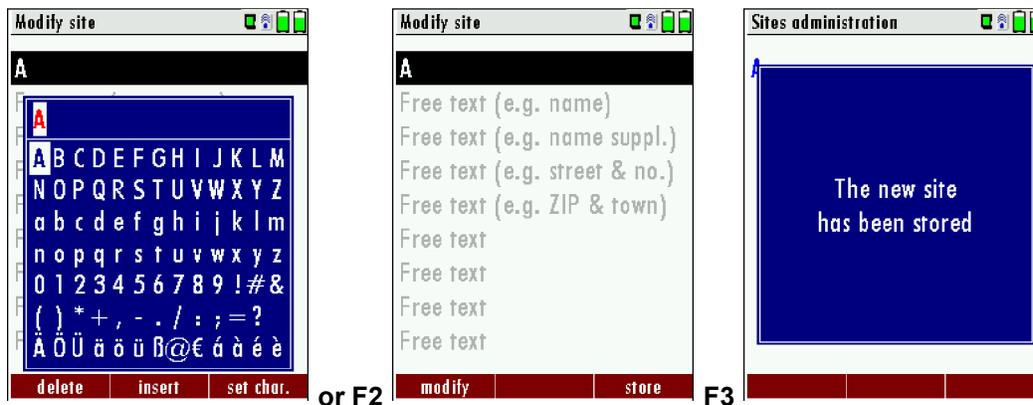
In the menu item "Sites administration" you can new entry sites and change data of existing sites.

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 = ~~s~~auto no. %o can assign the device automatically a free site number.
- All further free text lines which can contain, e.g., name and address.



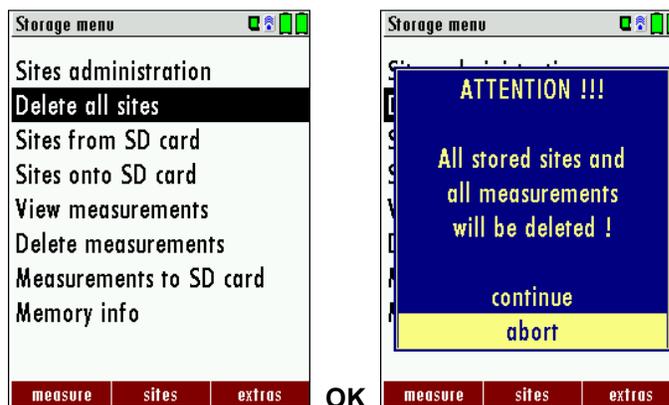
In the new site or an existing site you can change the data while you select the too change line, F1 = "modify" select and use the text input field for editing of the text. Conclude the text input field with "OK" and store the updates with F3 = "store".



11.3.3 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. 14.2).

11.4 Data transfer via SD Card (Option)

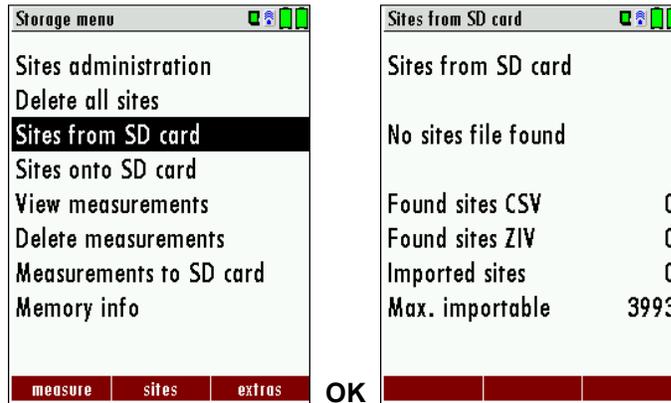
The data exchange format is CSV. A character-separated values (CSV) file is a simple text format for a database table. Each record in the table is one line of the text file. Each field value of a record is separated from the next by a character. NOVApplus Combustion Analyzer uses a semi-colon ; as a 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

11.4.1 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):

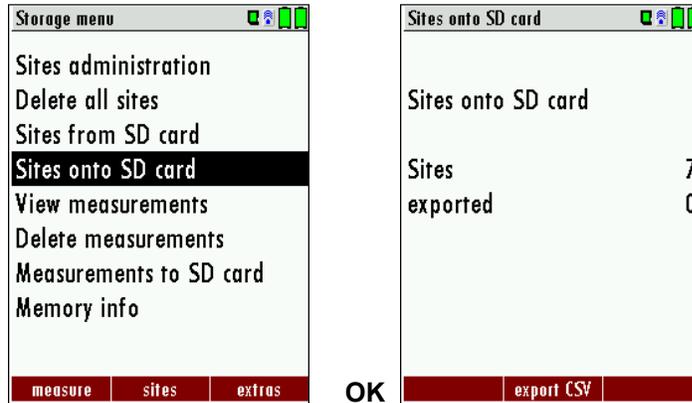
```
A1-Z1;A1-Z2
;A1-Z2;A1-Z3;A1-Z4;A1-Z5;A1-Z6;A1-Z7;A1-Z8;A1-Z9
```

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.

11.4.2 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.csvq in which the xxxxx are continuing 5 digit numbers with leading zeros. If the file must be imported into another analyzer, the file must first be renamed into %an-lagen.csv+

11.4.3 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.csvq in which the xxxxx 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

11.4.4 Export of Differential Pressure Measurements

The same function as under 11.4.3(Export of Flue Gas Measurements) only the file name is different.

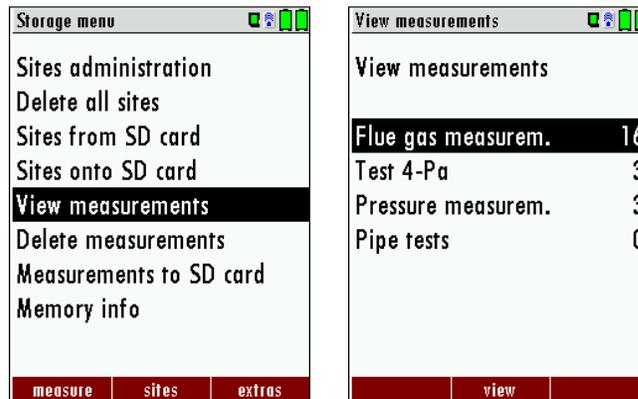
The created file has the file name %DMxxxx.csv%in which the xxxxx are continuing 5 digit numbers with leading zeros.

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

11.5 Measurements in the data memory

11.5.1 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.

Program 1, Pellets	
T-gas [°C]	187.2
T-air [°C]	20.1
CO2 [%]	16.8
Losses ncv [%]	7.4
O2 [%]	3.6
Draft [hPa]	0.27
overview	

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

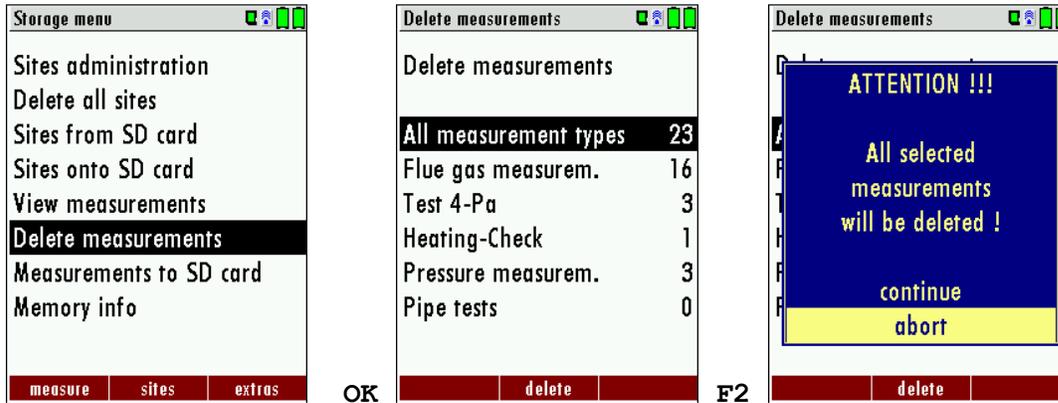
You have the possibility to display only those data that are assigned to a single site:

- 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.

11.5.2 Delete measurements

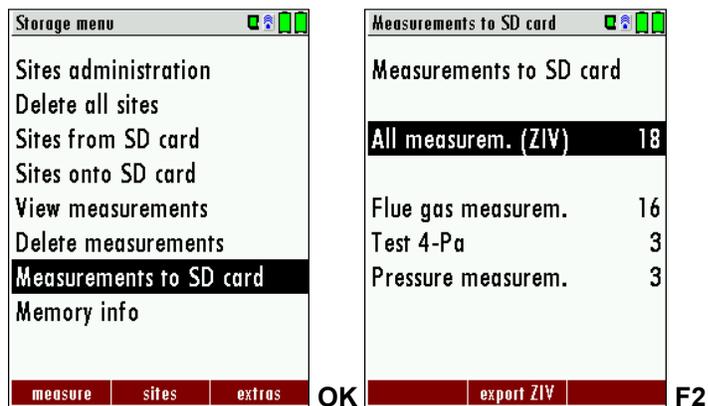
You are able to

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



11.5.3 Export measurements to a SD card (optional)

The NOVApplus 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.

12 EXTRAS / ADJUSTMENTS

The NOVApplus 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.

12.1 User definable Logo print out

Overview:

The Logo file can be created out of a Bitmap using the program "NOVAPlusPrnLogoCreator.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.

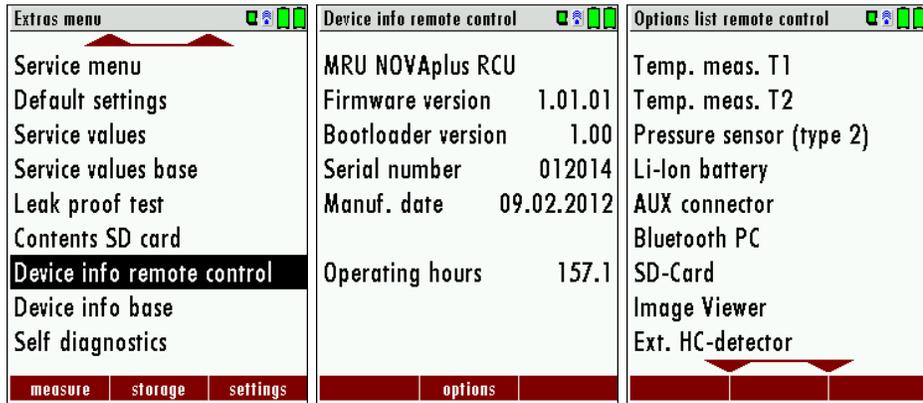
Converting a Bitmap into a Logo file:



Use the enclosed Windows-Program "NOVAPlusPrnLogoCreator.exe" (MRU Product CD / Software / NOVAPlusPrnLogoCreator).

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).

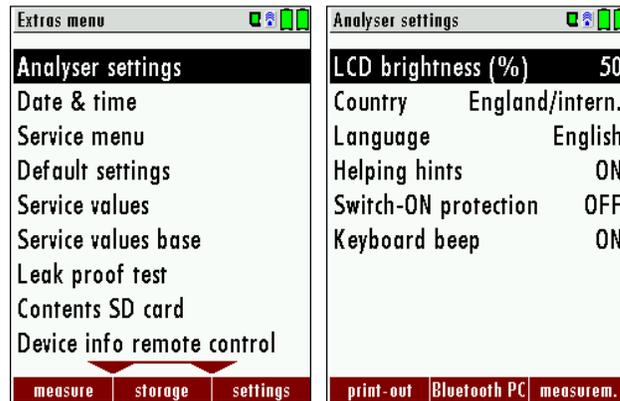
The vertical resolution of the Bitmap must be a multiple of 24, where 24 is the minimum and the maximum is 480 pixels. If necessary the Bitmap can be adjusted using a picture editing program (not included on the CD).



Transferring the Logo file per SD card to the analyzer:

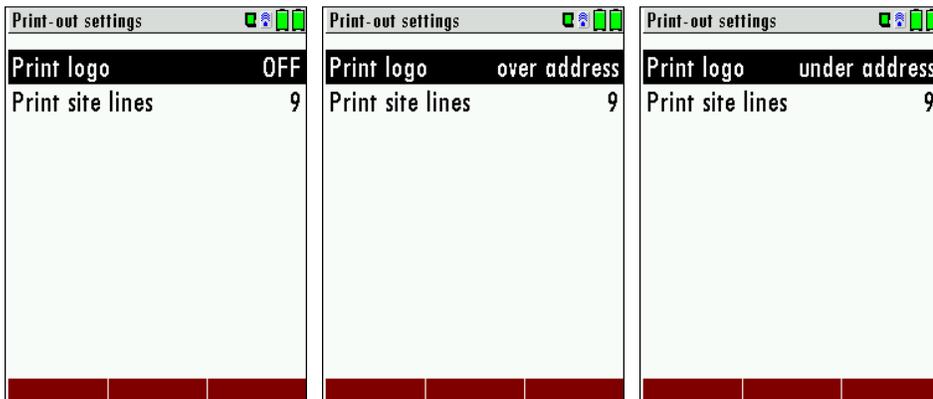
Copy the created file "lg_print.mru" onto the SD card (root).

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.



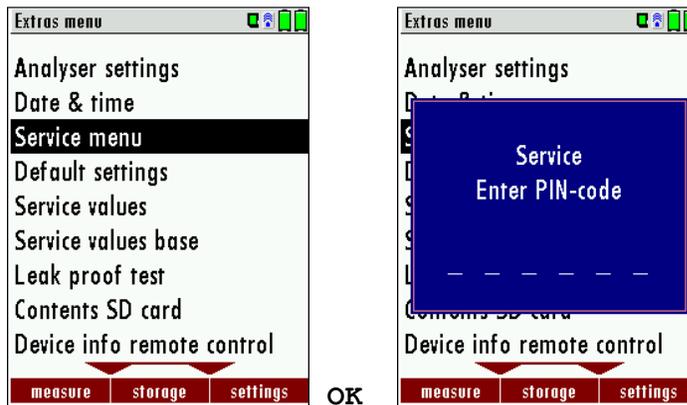
Printer Logo setting:

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).



12.2 Maintenance adjustment menu

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

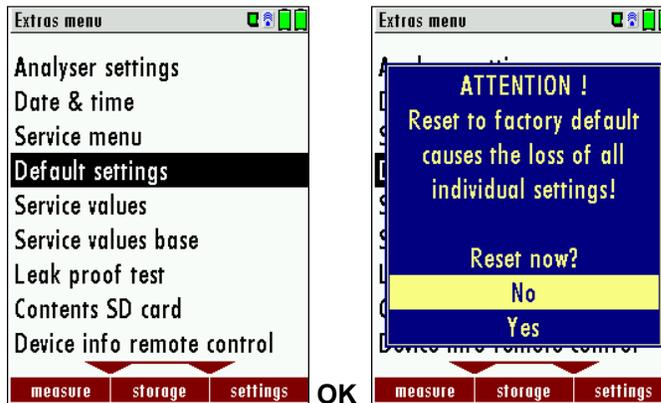


If you enter a wrong pin code you will be exited into the %Extra Menu+again.

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.

12.3 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

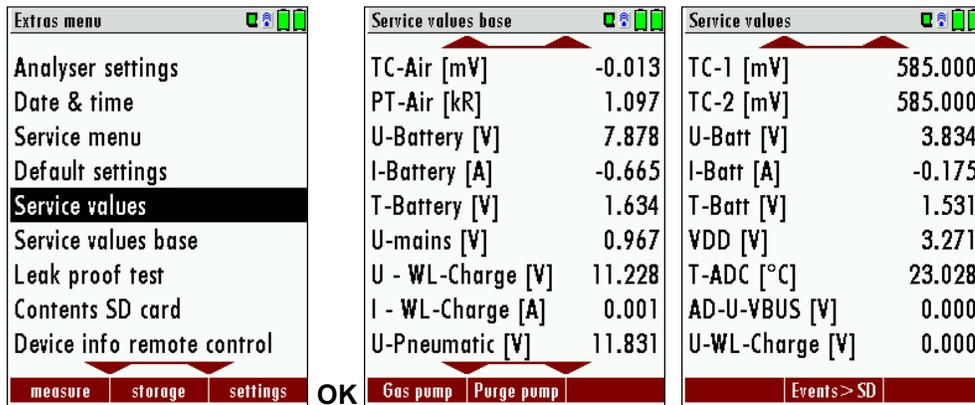
and others

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

Should your analyzer display an error message after zeroing (for example: SO_2 -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.

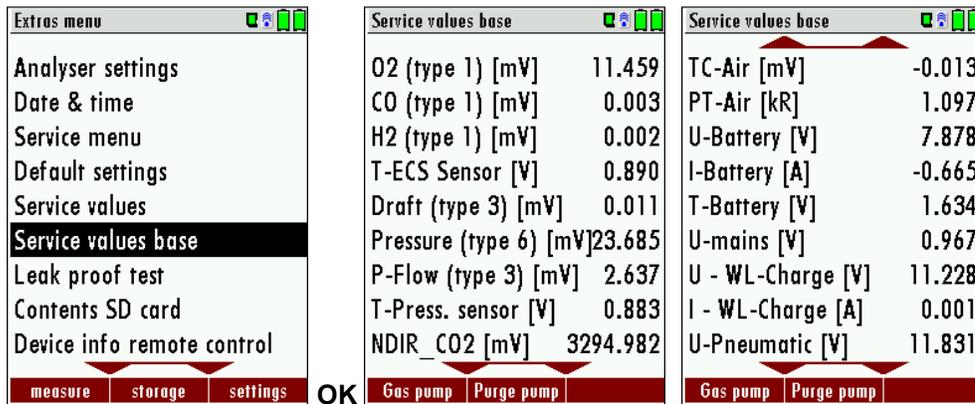
In case of a defect contact the MRU service department. The MRU service technician will ask you about these values or he will ask you to send them by fax or email.

Service values RCU:



▲, ▼	Jump between the lines
F2	Export of service values to SD card
ESC	return

Service values base unit:



▲, ▼	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

12.5 Leak proof test

With the leak proof test the system is checked by the device (incl. the condensate separator) up to the probe spike 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.

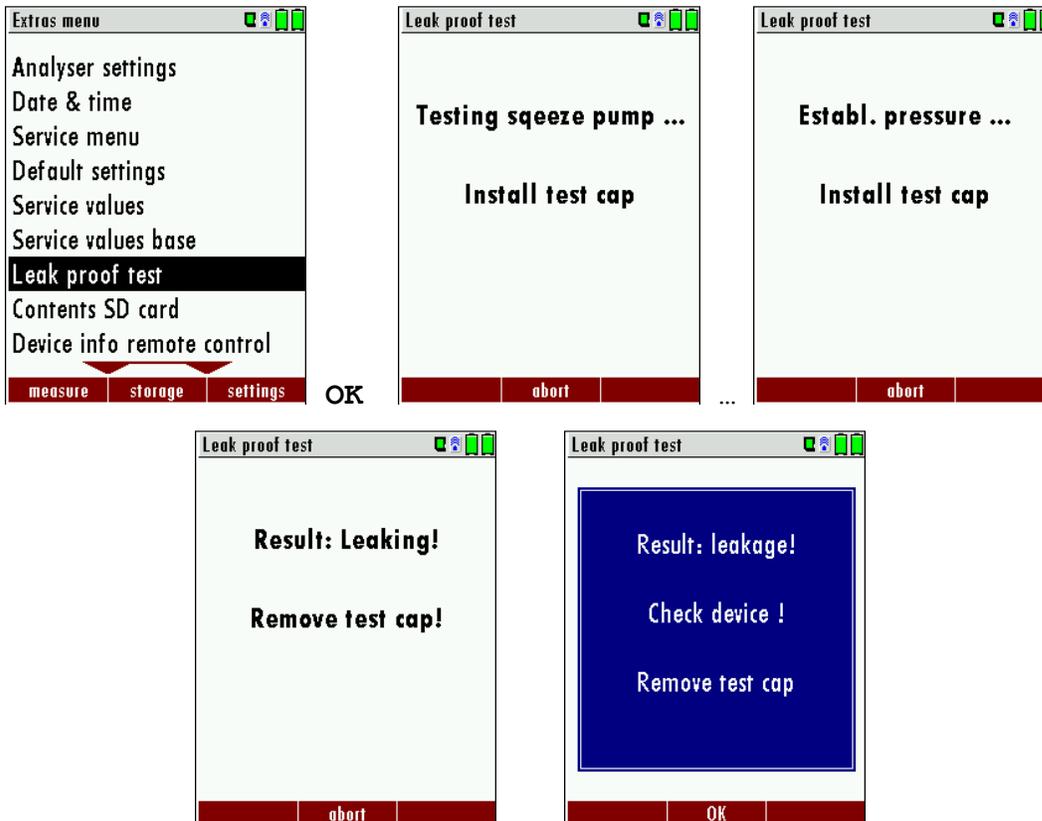
Operation:

- The leak proof test cap # 61382 (for probe tubes Ø 8 mm) must be put on on the probe spike.

**ATTENTION:**

The probe spike before the density test clean!
(With depositions on the tube the cap does not seal.)

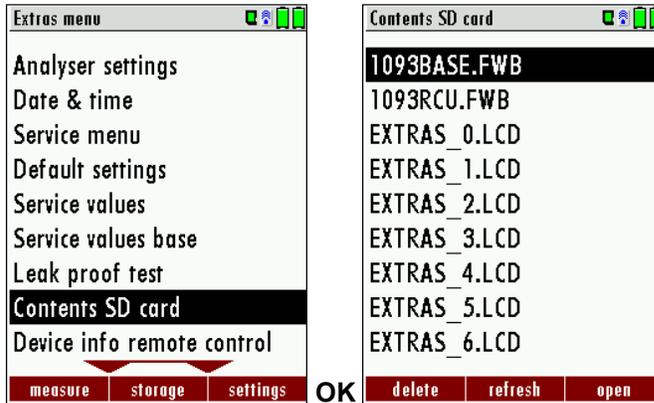
- Launch under %extras+the leak proof test on which the following window will pop up:



If of the leak proof test is not passed the probe must be checked including the hosing as well as the condensate separator.

If no undensity is ascertained in these external parts the NOVAp^{plus} has to be checked in a service department (worldwide service departments see www.mru.eu).

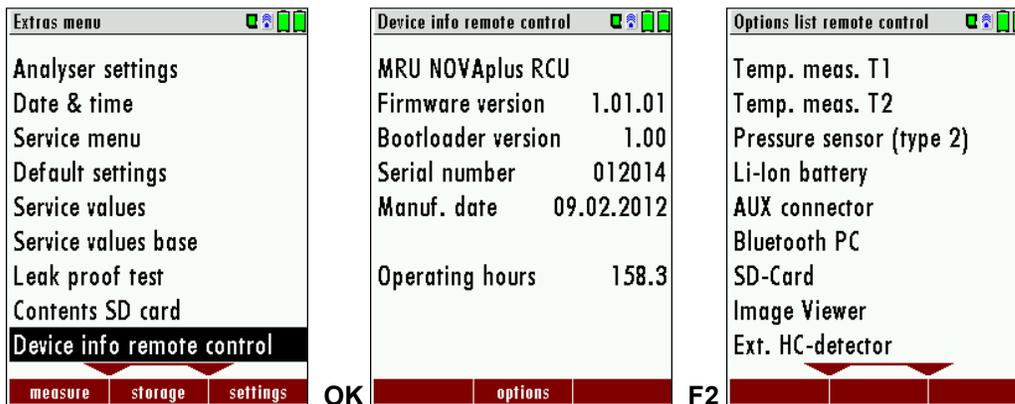
12.6 Contents SD card



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

12.7 Analyzer info

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



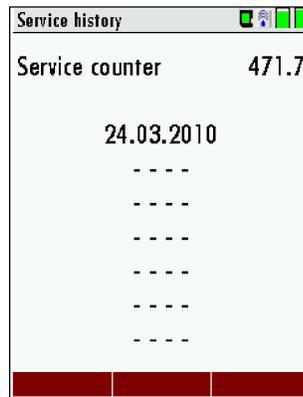
Use the F2 button to see the installed options of the RCU.



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.

13 TECHNICAL SPECIFICATIONS

13.1 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
Fernsteuerung : Akku intern, Betriebszeit	Li-Ion: 30h	Remote Control Unit: Internal Battery Pack, operating hours
Grundgerät: Akku intern, Betriebszeit	Li-Ion, 20h	Base unit: internal Battery Pack, operating hours
Stromversorgung Grundgerät	100 - 240 V 12V DC / 2A oder 5 A	Power supply base unit
Stromversorgung Fernsteuerung: - 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 Fernsteuerung	PA6 GF 30	Housing Material RCU
Gehäusematerial Grundgerät	Aluminium	Housing Material Base Unit
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.

13.2 Gas sampling and conditioning

Deutsch	Angabe	English
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.

Kondensatabscheider (nicht-gekühlt)	Standard	Condensate separator (non-cooled)
Gaskühler	Option	Gas cooler
Temperatur Peltierkühler (an Netz und Akku)	5 °C /ECO	Temperature Peltier cooler (during grid and battery operation)
Akkubetriebszeit mit Gaskühler	10h	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

13.3 Measuring values

Deutsch	Angaben zur Messgenauigkeit	English
Elektrochemischer Sensor	O2	Electrochemical Sensor
Messbereich	0 - 21 Vol%	Measuring Range
Auflösung		Resolution
Genauigkeit abs.	± 0,2 Vol%	Abs. Accuracy
Ansprechzeit T90	< 20s	Response Time T90
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
Genauigkeit absolut / vom Messwert	± 10 ppm/ 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
Genauigkeit absolut / vom Messwert	± 100 ppm / 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
Genauigkeit abs. /vom Messwert	± 5ppm / 5% (0 ... 1000 ppm) 10% (> 1000 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 30s	Response Time T90
Option	NO low	Option
Messbereich	300 ppm	Measuring Range
Auflösung	0,1 ppm	Resolution
Genauigkeit abs / vom Messwert	2,0 ppm 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
Genauigkeit abs. /vom Messwert	± 10ppm / 5% (0 ... 2000 ppm) 10% (> 2000 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 40s	Response Time T90
Elektrochemischer Sensor	H₂S	Electrochemical Sensor
Nominaler Messbereich	0 - 200 ppm	Nom. Measuring Range
Überlastbereich	< 2000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 5 ppm / 5% (0 ... 200 ppm) 10% (> 200 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 40s	Response Time T90
Nicht-dispersive Infrarotmessung (NDIR)	CO₂	Non-dispersive Infrared Measurement (NDIR)
Nominaler Messbereich	0 - 40 Vol%	Nom. Measuring Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 0,3 Vol% 5%	Accuracy abs./reading
Ansprechzeit T90	< 35 s	Response Time T90

Nicht-dispersive Infrarotmes- sung (NDIR)			CH4 / CO / CO2		Non-dispersive Infrared Measurement (NDIR)	
ArtNr.	Type	Length mm	Gas	Range	Resolution	Accuracy
64011	3	65	CH4	3 %	1 ppm	± 0,03 % / 3 %
			CO	10 %	0,001 %	± 0,03% / 3 %
			CO2	30 %	0,01 %	± 0,5% / 3 %

Nicht-dispersive Infrarotmes- sung (NDIR)			C3H8 / CO / CO2		Non-dispersive Infrared Measurement (NDIR)	
ArtNr.	Type	Length mm	Gas	Range	Resolution	Accuracy
64012	3	65	C3H8	5000 ppm	1 ppm	± 30 ppm / 3 %
			CO	10 %	0,001 %	± 0,03 % / 3 %
			CO2	30 %	0,01 %	± 0,5 % / 3 %

Abgastemperatur	T_A	Flue gas temperature
Messbereich mit Gasentnah- merohr aus Edelstahl	0 - 650 °C	Measuring Range with high grade steel probe pipe
Messbereich mit Gasentnah- merohr aus Inconel	0 - 1100 °C	Measuring range with In- conel probe pipe
Genauigkeit abs. / vom Messwert	±2 °C / 1%	Accuracy abs. / reading
Anschluss an Basisgerät		To be connected to base unit
Verbrennungslufttemperatur	T₁	Air temperature
Messbereich	0 - 100 °C	Measuring Range
Genauigkeit abs.	1 °C	Accuracy
Anschluss an Grundgerät oder optional an Fernsteu- erung		To be connected to base unit or optional to remote control unit
Kaminzug		Draft
Messbereich	± 125 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Differenzdruck Basis		Differential Pressure Base Unit

Messbereich	± 125 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Anschluss an Grundgerät		To be connected to base unit
Differenzdruck Fernsteuerung		Differential Pressure RCU
Messbereich	± 125 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Anschluss an Fernbedieneinheit		To be connected to Remote Control Unit
Temperaturmessung Fernsteuerung		Temperature Measurement RCU
Messbereich	-50 ... 1100 °C	Measuring Range
Thermoelement	Typ K Mini	Thermocouple
Barometrischer Druck	P_{abs}	Barometric Pressure
Messbereich	300 1200 hPa	Measuring Range
Genauigkeit	± 3 hPa	Accuracy

13.4 Calculated values

Deutsch	Angabe	English
	CO₂	
Messbereich (brennstoffabhängig)	0 - CO ₂ max	Measuring range (fuel type dependent)
Genauigkeit abs.	$\pm 0,3$ Vol%	Accuracy abs.
Taupunkt	°C	Dew point
Abgasverlust qA	0 - 99,9%	Losses qA
Wirkungsgrad	0 - 120%	Efficiency
Messwerte darstellbar als	mg/Nm ³ O ₂ Ref mg/kWh NOx: mg/Nm ₃ NO ₂	Measurement values available as
Strömungsgeschwindigkeit	v	Velocity
<i>basierend auf Differenzdruckmessung in Fernsteuerung</i>		<i>based on differential pressure measurement by RCU</i>
Messbereich typisch	1 m/s ... 40 m/s	typical measuring range

Absolutdruckmessung in der Fernsteuerung	•	absolute pressure measured by RCU
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13.5 Data communication

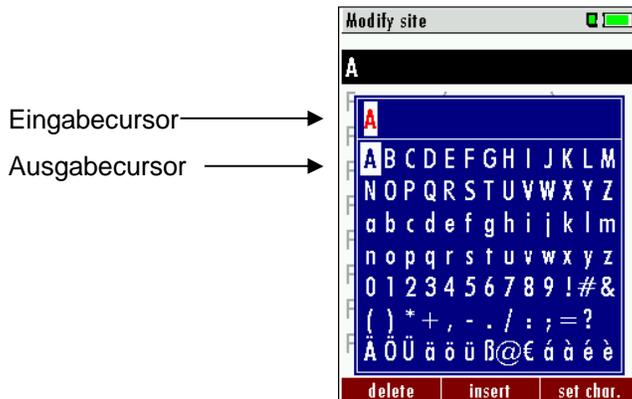
Deutsch	Angabe	English
USB Anschluss	via Fernsteuerung	USB interface
SD Karte für SW update, Datenaustausch, erweiterter Datenspeicher	>= 2GB, via Fernsteuerung	SD card for SW update, data exchange or extended data memory
Reichweite Funkverbindung Fernsteuerung - Basis freie Sicht typisch in Gebäuden (situationsabhängig)	100 m 20 m	Range of link RCU to base unit free air typical inside buildings (depending on actual situation)
Bluetooth - Verbindung Fernsteuerung für Datenaustausch mit PC	Class 1	Bluetooth Adapter RCU e.g. for data exchange with PC

14 APPENDIX

14.1 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:

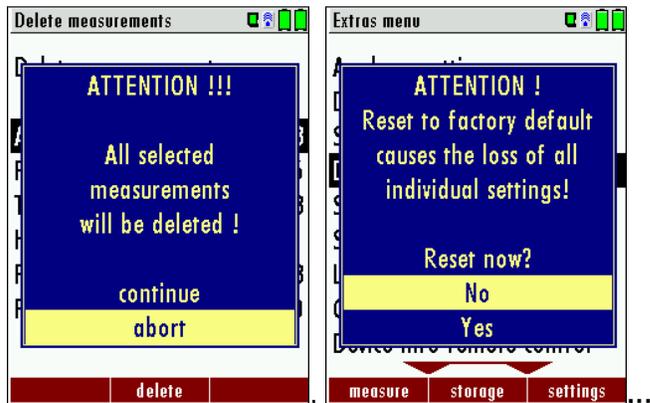


▲, ▼, ◀, ▶	Select a letter, number or sign
F1 - delete	The letter left of the cursor will be deleted

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

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

The NOVApplus 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

14.3 Using the USB-Port

This port is used for data transfer from your analyzer to your PC / Laptop using the MRU Online View (Version 2.XX). The first time you want to use your analyzer for data transfer to your PC or laptop, you have to mate the NOVApplus and your PC / Laptop. (Requires operating system Windows XP or Windows 7).

Your PC / Laptop will recognize the NOVApplus as USB- HID (Human Interface Device).

Check list:

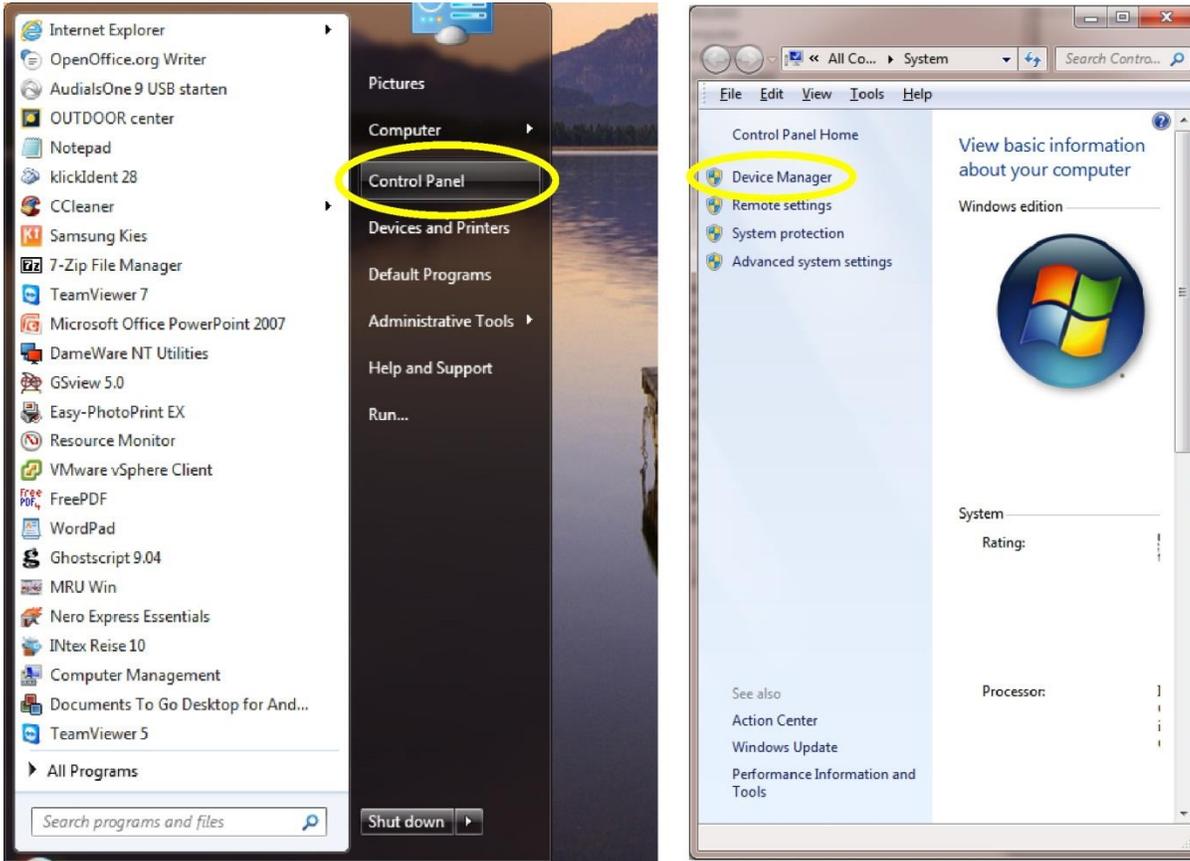
1. Switch on the NOVApplus
2. Connect the USB cable to the NOVApplus
3. Connect the USB cable into a free USB port at your PC/Laptop
4. The PC/Laptop must be powered on
5. The above seen information *New hardware found* will be displayed above the USB-Icon of your PC/Laptop

If this is not the case, then you have a problem with your USB-Connection of your PC/Laptop.

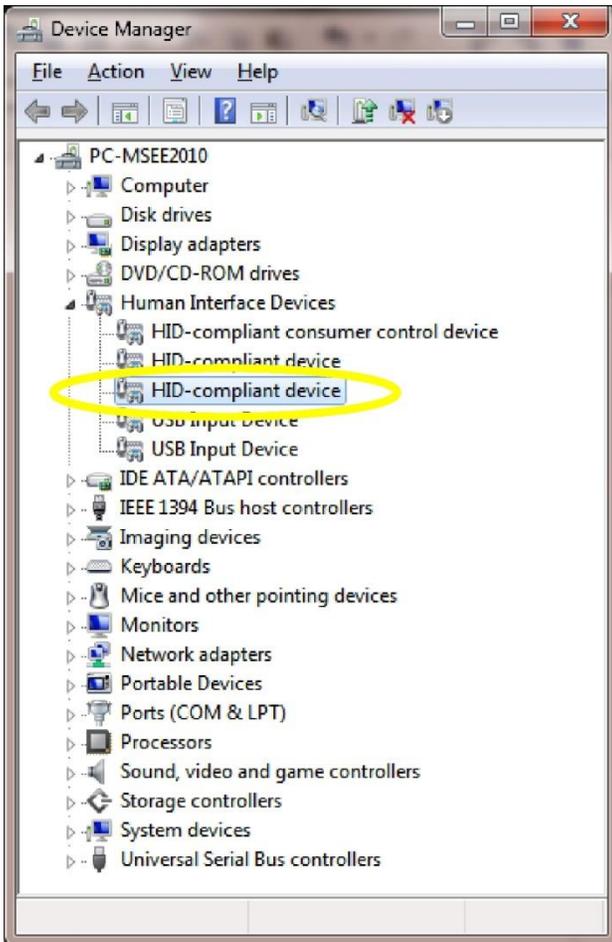
Check in your Device Manager if the analyzer is ready for operation.
The NOVApplus is as HID-conform unit registered.

Windows XP: Press the START button . then select the CONTROL PANEL . select SYSTEM . select HARDWARE . select DEVICE MANAGER

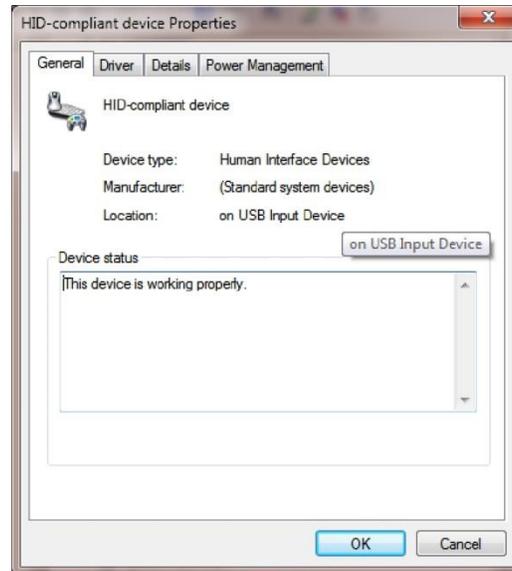
Windows 7: for Windows 7 there are several possibilities, please read your Windows 7 manual for details.



(The graphics may look different on your PC/Laptop as shown in this manual!)

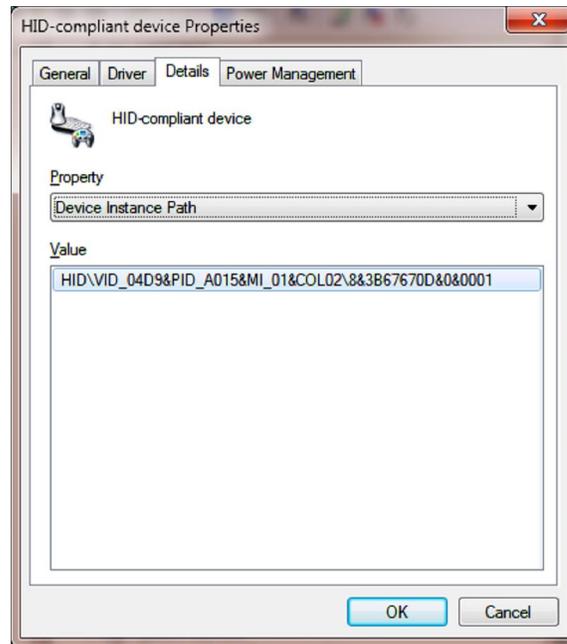


The NOVApplus is registered as HID-conform unit.
for



In the General folder you can see if the unit is ready
operation.

In case the analyzer is not ready for operation, choose a different USB instrument to check the USB port on your computer, and/or connect the NOVApplus to a different computer to locate the error.



14.4 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 then 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).

14.5 Fuel types

14.5.1 General information

$O_2 \max = 20.9\%$ O_2 content

$O_2 =$ measured O_2 value [%]

$O_2bez =$ O_2 -reference value [%] (fuel specific)

$CO_2 \max =$ CO_2 max-value [%] (fuel specific)

$V_{AGmin/tr} =$ Flue gas volume, dry and O_2 -free (fuel specific)

14.5.2 CO_2 , Lambda, losses, efficiency

$$CO_2 = CO_2 \max \cdot \left(1 - \frac{O_2}{O_2 \max} \right)$$

$$\lambda = \frac{CO_2 \max}{CO_2} = \frac{O_2 \max}{O_2 \max - O_2} \quad (\text{prefer the 2nd } O_2 \text{ formula!})$$

$$losses = (T_{fluegas} - T_{air}) \cdot \left(\frac{A_2}{O_2 \max - O_2} + B \right) \quad (\text{temp. in } ^\circ\text{C, } A_2 \text{ and } B \text{ fuel specific})$$

$$efficiency = 100\% - losses$$

14.5.3 Dew point

(DIN 4705, part 1, page 17)

$$t_p = \frac{4077,9}{23,6448 - \ln(p_D)} - 236,67 \quad \text{with} \quad p_D = \frac{H_2O}{100} * p_L \quad \text{with} \quad H_2O = 1,1 + \frac{100}{1 + \frac{f_w}{CO_2}}$$

t_p : dew point temp. in $^\circ\text{C}$ H_2O : water vapour content [%]

p_D : steam part. pressure f_w : humidity value of fuel [%]

p_L : atmospheric pressure CO_2 : carbon dioxide content [%]

At standard pressure (1013 hPa) the dew point is calculated:

$$t_p = \frac{4077,9}{23,6448 - \ln \left(1,1 + \frac{100}{1 + \frac{f_w}{CO_2}} \right) - \ln(1013)} - 236,67 = \frac{4077,9}{16,7241 - \ln \left(1,1 + \frac{100}{1 + \frac{f_w}{CO_2}} \right)} - 236,67$$

14.5.4 CO- conversion of CO [ppm]

$$CO_{unv} [ppm] = CO \left[\frac{ppm}{0\% O_2} \right] = CO [ppm] \cdot \lambda$$

$$CO \left[\frac{ppm}{O_2 bez} \right] = CO [ppm] \cdot \frac{O_2 \max - O_2 bez}{O_2 \max - O_2}$$

$$CO \left[\frac{mg}{m^3} \right] = CO [ppm] \cdot 1,249$$

$$CO \left[\frac{mg / m^3}{O_2 ref} \right] = CO \left[\frac{mg}{m^3} \right] \cdot \frac{O_2 \max - O_2 ref}{O_2 \max - O_2}$$

$$CO \left[\frac{mg}{kWh} \right] = CO \left[\frac{mg / m^3}{0\% O_2} \right] \cdot \frac{V_{AG \min, tr}}{H_{u, n}} = CO \left[\frac{mg}{m^3} \right] \cdot \lambda \cdot \frac{V_{AG \min, tr}}{H_{u, n}}$$

$$CO \left[\frac{mg}{MJ} \right] = \frac{CO \left[\frac{mg}{kWh} \right]}{3,6} \quad CO \left[\frac{mg}{MJ} \right] = \frac{CO \left[\frac{mg}{kWh} \right]}{3,6}$$

14.5.5 NO-conversion of NO [ppm]

$$NO_{undel} [ppm] = NO \left[\frac{ppm}{0\% O_2} \right] = NO [ppm] \cdot \lambda$$

$$NO \left[\frac{ppm}{O_2 ref} \right] = NO [ppm] \cdot \frac{O_2 \max - O_2 ref}{O_2 \max - O_2}$$

$$NO \left[\frac{mg}{m^3} \right] = NO [ppm] \cdot 1,339$$

$$NO \left[\frac{mg / m^3}{O_2 ref} \right] = NO \left[\frac{mg}{m^3} \right] \cdot \frac{O_2 \max - O_2 ref}{O_2 \max - O_2}$$

$$NO \left[\frac{mg}{kWh} \right] = NO \left[\frac{mg / m^3}{0\% O_2} \right] \cdot \frac{V_{AG \min, tr}}{H_{u, n}} = NO \left[\frac{mg}{m^3} \right] \cdot \lambda \cdot \frac{V_{AG \min, tr}}{H_{u, n}}$$

$$NO \left[\frac{mg}{MJ} \right] = \frac{NO \left[\frac{mg}{kWh} \right]}{3,6}$$

$$NO \left[\frac{ppm}{14\% CO_2} \right] = NO [ppm] \cdot \frac{O_2 \max - 1,8\%}{O_2 \max - O_2}$$

14.5.6 NO2-conversion of NO2 [ppm]

No conversions of NO2! All the values of interest are in the NOx conversion.

14.5.7 NO_x-conversion of NO [ppm] (possible also of NO₂ [ppm])

$$NO_x [ppm] = NO [ppm] \cdot 1,05 \quad (\text{if no NO}_2\text{-sensor exists})$$

$$NO_x [ppm] = NO [ppm] + NO_2 [ppm] \quad (\text{if a NO}_2\text{-sensor exists})$$

$$NOx_{unv} [ppm] = NOx \left[\frac{ppm}{0\% O_2} \right] = NOx [ppm] \cdot \lambda$$

$$NOx \left[\frac{ppm}{O_2bez} \right] = NOx [ppm] \cdot \frac{O_2 \max - O_2bez}{O_2 \max - O_2}$$

If NOx is specified in mg, it has to be considered, that all the NO in the atmosphere will become NO₂. Therefore the conversion factor ppm => mg is factor of NO₂.

$$NOx \left[\frac{mg}{m^3} \right] = NOx [ppm] \cdot 2,053$$

$$NOx \left[\frac{mg / m^3}{O_2bez} \right] = NOx \left[\frac{mg}{m^3} \right] \cdot \frac{O_2 \max - O_2bez}{O_2 \max - O_2}$$

$$NOx \left[\frac{mg}{kWh} \right] = NOx \left[\frac{mg / m^3}{0\% O_2} \right] \cdot \frac{V_{AG \min, tr}}{H_{u, n}} = NOx \left[\frac{mg}{m^3} \right] \cdot \lambda \cdot \frac{V_{AG \min, tr}}{H_{u, n}}$$

$$NOx \left[\frac{mg}{MJ} \right] = \frac{NOx \left[\frac{mg}{kWh} \right]}{3,6}$$

$$NOx \left[\frac{ppm}{14\% CO_2} \right] = NOx [ppm] \cdot \frac{O_2 \max - 1,8\%}{O_2 \max - O_2}$$

14.6 Fuel type list

Deutschland		O2max	20,96	
Brennstoff	CO2max	A1	A2	B
Prüfgas	0,0	0,00	0,00	0,000
Erdgas (LL)	11,8	0,37	0,66	0,009
Erdgas (E) (*)	12,1	0,37	0,64	0,009
Heizöl EL	15,4	0,50	0,68	0,007
Heizöl S	15,9	0,50	0,66	0,007
Flüssiggas P/B	13,7	0,42	0,63	0,008
Propan	13,7	0,43	0,66	0,007
Butan	14,1	0,45	0,67	0,007
Bio-Diesel	15,7	0,46	0,62	0,005
Holz trocken	20,3	0,60	0,62	0,009
Pellets	20,3	0,74	0,77	0,000
Kohle	19,1	0,59	0,65	0,009
Braunkohle	19,4	0,39	0,42	0,009

Torf	19,8	0,66	0,70	0,010
Kokereigas	10,8	0,29	0,60	0,011
Stadtgas	11,7	0,35	0,63	0,011

Österreich		O2max	21,00	
Brennstoff	CO2max	A1	A2	B
Prüfgas	0,0	0,00	0,00	0,000
Heizöl EL	15,3	0,52	0,71	0,007
Heizöl L	15,8	0,53	0,70	0,007
Heizöl M + S	16,1	0,54	0,70	0,007
Erdgas H	11,9	0,39	0,68	0,009
Erdgas H gebf.	11,9	0,41	0,72	0,009
Propangas g31	13,7	0,45	0,69	0,007
Prop. g31 gebf	13,7	0,47	0,72	0,007
Butan	14,1	0,45	0,67	0,007
Zechenkoks	20,6	0,74	0,75	0,001
Holz trocken	19,4	0,60	0,65	0,009

Fuel lists for further countries receive you on requirement or on our Internet site: www.mru.eu

14.7 Errors

14.7.1 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 too 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.

14.7.2 Error diagnosis regarding the condensate separator

1. Effect	2. Cause	3. Solution
Dirt and / or humidity inside the device No filter effect Sensor failure Pump failure	Fine filters are wet and / or dirty.	Check filters more often Renew them if necessary (white = OK) Brown-black = renewal
Wrong measuring values	Cover, intermediary unit, plexiglass tube and locking pieces are not tightly fixed respectively screwed	Check tightness with every filter change.

14.8 Declaration of conformity

Messgeräte für Rauchgase und Umweltschutz GmbH

Fuchshalde 8
74172 Neckarsulm - Obereisesheim
Tel 07132 / 9962-0
Fax 07132 / 9962-20



EG - Konformitätserklärung Declaration of conformity

Hiermit bescheinigt das Unternehmen / The company

**MRU Messgeräte für Rauchgase
und Umweltschutz GmbH
74172 NSU - Obereisesheim**

die Konformität des Produkts / herewith declares conformity of the product

Bezeichnung / Designation **NOVAplus**

Mit folgenden einschlägigen Bestimmungen/ with applicable regulations below

EMV-Richtlinie: **2004/108/EG**

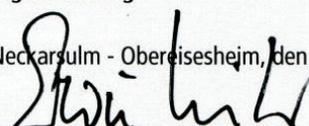
angewendete harmonisierte Normen/ Harmonized standards applied

Niederspannungsrichtlinie: **2006/95/EG**

Angewendete nationale technische Spezifikationen /
National technical specifications applied

Gemeldete Stelle, EG Baumusterprüfung / Notified body, type test
Eigenerklärung

Neckarsulm - Obereisesheim, den 26.02.2012


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