OPTIMA 7

USER MANUAL

MRU AIRfair since 1984 ®
EMISSION MONITORING SYSTEMS

62876EN

Manufacturer:

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Edition: 20190227-V2.0

Content

1 Introduction

- This manual enables you to understand and safely operate this **OPTIMA7** combustion analyzer.
  Please read this manual with great vigilant and get familiar with the product before using it.
- This analyzer may only be operated by competent personnel and for its intended use.
- Please pay special attention to all safety directions and warnings to prevent personal injuries and damaging of the product.
- We can't be held responsible for any injuries and/or damages that occur by not following the instructions in this manual.
- Always keep the manual near you when working with the analyzer, to be able to read instructions as needed.
  Please ensure to hand over all documents to when handing the analyzer over to others.

1.1. Intended use

The **OPTIMA7** analyzer is intended for short-term measurement in the context of emission control measurements and adjustments at small furnaces. The analyzer measures the measurements provided by VDI4206 and EN50379 metrics and stores them for further processing.

The **OPTIMA7** analyzer is specifically not intended as a safety device or personal protective equipment; it should not be used as a warning device to warn people against the presence of harmful gases.

The **OPTIMA7** analyzer may only be used as indicated in this manual. Our analyzers are checked according to the following regulations: VDE 0411 (EN61010) and DIN VDE 0701 before they leave the MRU GmbH factory.
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.
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).

1.2. The company MRU GmbH

The **OPTIMA7** analyzer is manufactured 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.

Plant 1: Sales, Service, R&D

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1.3. Analyzer details

- The analyzer is not suitable for long term (continuous) measurements (this is a spot analyzer).
- 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 the analyzer up it will take between 1 – 3 minutes to set to zero depending on the condition of the sensors and ambient conditions. (Zeroing).
- 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; vapors 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 battery life is at least 500 charge-discharge cycles. With increasing number of charging cycles the battery capacity (indicated in operating hours) is reduced.

1.4. Packaging

Please keep and store the packaging material to be able to use it when your analyzer must be sent back for service and calibration.

1.5. Return of hazardous materiales

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

1.6. Return of electronic equipment

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.

2 Safety

Safety and warning notices point out possible dangers to the reader of this manual.
In this manual safety and warning notices are typically above actions that might cause harm or danger.

2.1. Safety details

The explanation of safety notices:

Not following the safety and warning notices may cause physical harm and/or property damages, as well as the loss of warranty of your analyzer.
The following safety and warning notices must be obeyed at any time!

• **DANGER**

Describes an immediate threat of danger which can cause mayhem or can even cause death.

• **WARNING**

Describes an immediate threat of danger which can cause mayhem, property damage or can even cause death.

• **CAUTION**

Describes a possible danger that can cause risk of injury.

ATTENTION

Describes a possible harmful situation which can damage the analyzer or its surroundings.

NOTE

Gives user hints and other important information.

The explanation of safety notices:

• **CAUTION**

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

Physical harm and property damage can be caused.

► Cool down the probe tube.

2.2. Ensure safety

- The analyzer may only be used for its intended purpose and within its defined technical parameters. Don't use any force and avoid dropping the analyzer.
- Don't use the analyzer when there are visible damages of the enclosure, the charger or supply lines.
- Don't store the analyzer together with solvents and don't use any drying agents.
- Only perform maintenance procedures that are described in this manual and always obey the instructions.
- Only operate the analyzer in closed and dry rooms, protect the analyzer against rain and moisture.
- Only operate the analyzer with the supplied battery charger.
- Never us the probe tube and other metal parts / accessories as electric conductors.
- The analyzer may not be positioned near open fire or extreme heat.
- The defined temperature range of the extraction probe / probe tube may not be exceeded, the probe tube and/or thermo-element can be destroyed.

2.3. Lithium-Ion battery user guidelines

NOTE

The battery is inside the analyzer and is not accessible to the end-user.

Below are some guidelines you need to know about Lithium Ion batteries and the handling of these.

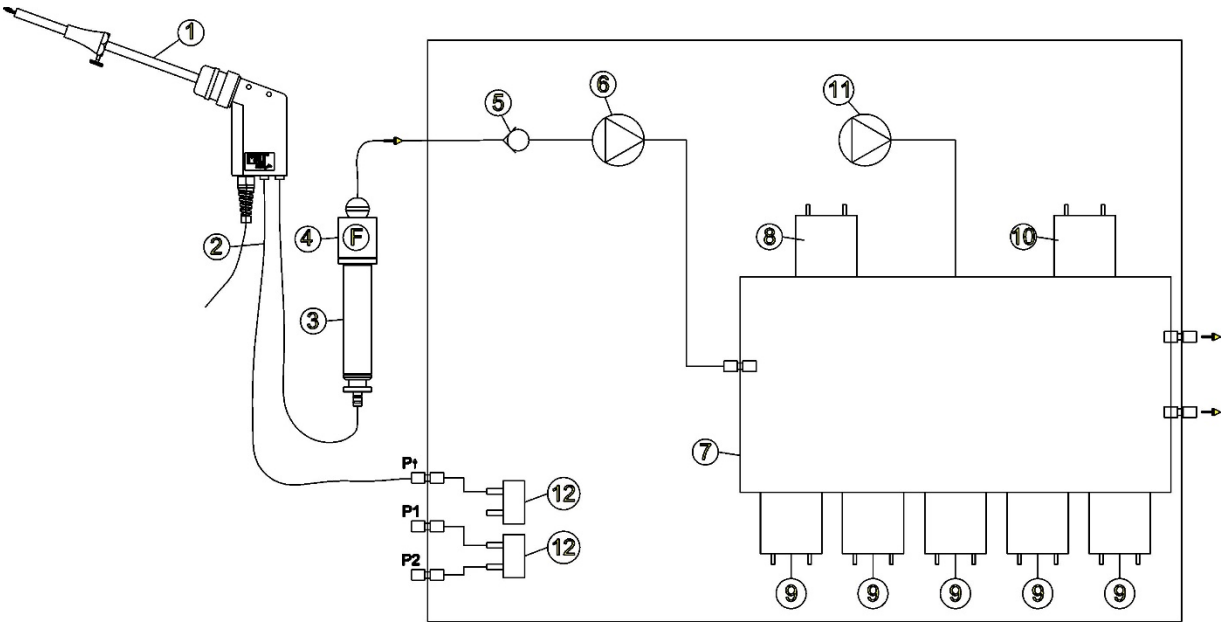
- The rechargeable battery may only be used for this ***OPTIMA7***analyzer.
- Don't charge the analyzer in extreme heat, don't store the battery in a hot environment and don't throw the battery into fire.
- Don't try to modify the battery, shortcut it or put any mechanical force to it!
- The battery may not be used in or under water.
- Avoid mechanical force and don't throw that battery.
- Don't cut or squeeze the battery cables!
- Don't carry or store the battery together with sharp objects.
- Don't connect the (+) contact with the (-) contact or connect these to a metal object.
- Not obeying the above instructions can cause heat, fire and explosion.

3 Description

The main task of the **OPTIMA7** analyzer is to assist with precision control and adjustment measurements of gas, oil and wood fired furnaces.
Available options for this and other analyzers can be found on the MRU Homepage or speak to a member of our sales team.

Gas schematics diagram

In combination with the extraction probe (inserted in the stack) the internal gas pump of the **OPTIMA7** analyzer extracts a portion of the flue gas and analyzes it using electro-chemical sensors.
The thermo-element in the probe tube measures the flue gas temperature and due to the construction of the probe pressure (draft) can be measured as well.



1	Sampling probe
2	Triple hose
3	Condensate separator
4	Star filter
5	Non return valve
6	Gas pump
7	Sensor chamber
8	O2-Sensor
9	Further electrochemical sensors optional*
10	CO2 NDIR *
11	CO Purge pump * / not available with CO2-NDIR
12	Pressure sensor *
	*optional

3.1. The Analyzer

The compact analyzer is made from a fiber re-enforced plastic material with all measurement related connections at the bottom of the analyzer.

1	Display
2	Key pad
3	Temperature connector T2
4	Temperature connector T1
5	Pressure connector P1
6	Pressure connector P2
7	Gas outlet
8	IR-Interface
9	USB-port and charging port
10	SD-card reader
11	Fixing magnets
12	Analyzer feet
13	Handle strip
14	Gas outlet
15	Pressure connector P3
16	Connector AUX

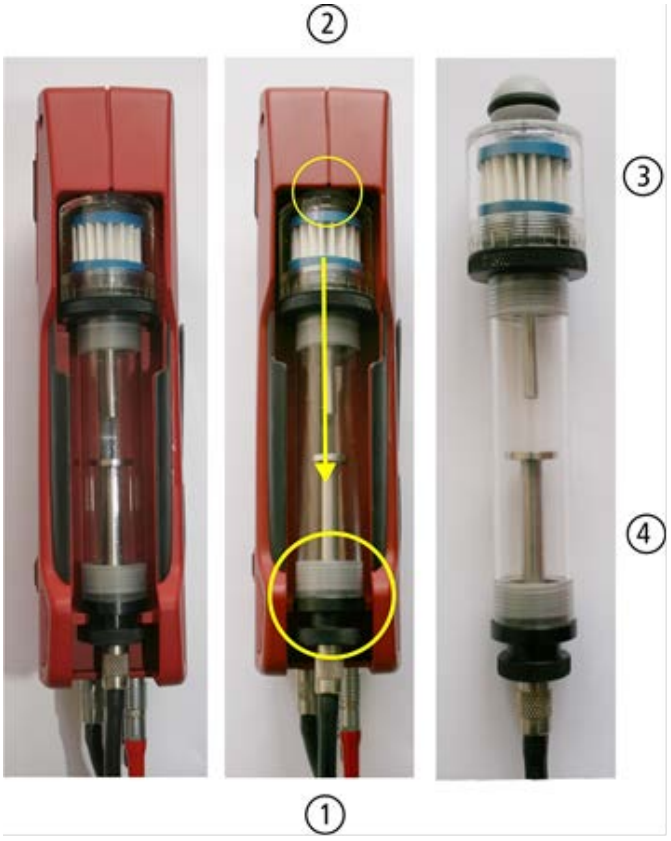
IMORTANT

Gas outlet:

During measurement the gas outlet must not be covered

3.2. The condensate separator (water trap)

During the measurement accumulating condensate is collected in the condensate separator



Remove the condensate separator by pulling it towards you (1) out of the groove of the OPTIMA 7 housing, then pull it downwards (2).

• CAUTION

Condensate is acidic

The condensate from the container can be slight acidic and can cause chemical burn.

► Immediately clean with plenty of water once you have encountered acid

Condensate vessel and plugs are screwed together. To change the filter and dry and clean the condensate separator this can be easily disassembled and screwed together again. After cleaning, a leak test must be proceed

In the condensate separator of the OPTIMA7 an exhaust gas filter is attached. This filter out the first coarse dirt. This pocket star filter is washable and can be used 4-5 times afterwards. Frequent measurements result in a high degree of contamination which requires regular replacement of this filter.

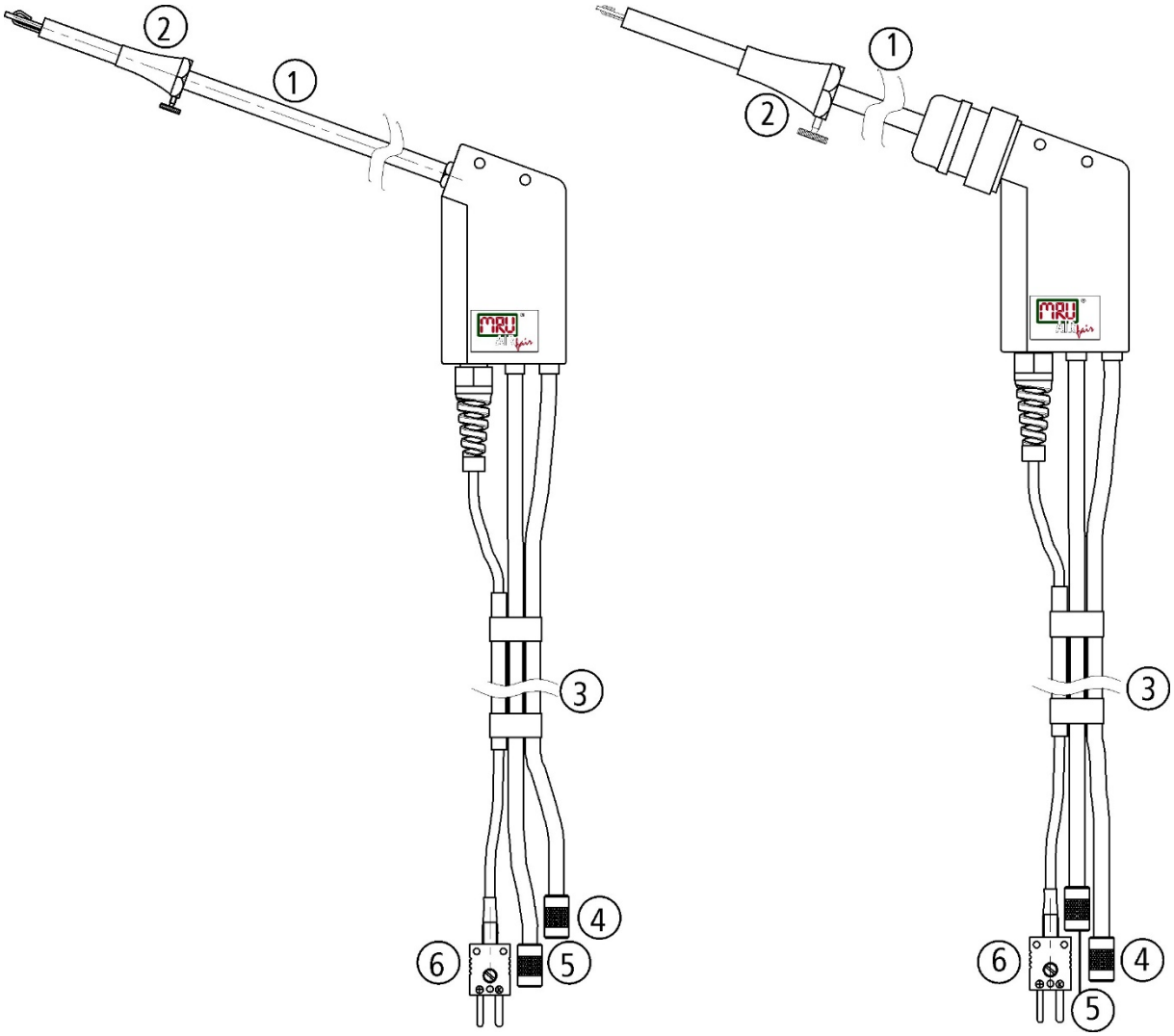
3.3. Extraction probes

The **OPTIMA7** is available with either a probe with fixed probe tube or with exchangeable probe tubes. A complete list of available probe options can be found in our effective price list.

Here are 2 possible options:

Probe ST
With 180 mm probe pipe (fixed)
and 1,5 m sampling line

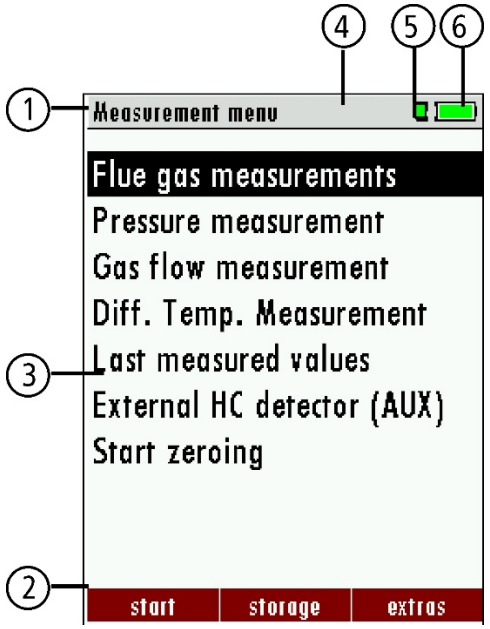
Probe SF
With 300 mm exchangeable probe pipe
and 2,7 m sampling line



1	Probe tube
2	Probe cone (high grade steel)
3	Triple hose (NBR or Viton)
4	Connector for sample gas measurement
5	Connector for draft measurement
6	Connector for temperature measurement

3.4. The display

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



1	Menu bar
2	Function key bar
3	Display panel 1. Menu 2. Measurement value 3. …
4	Zeroing active
5	SD-Card in the slot 4. Indication green Read- and write access 5. Indication yellow only Read access (SD-Card write protected)
6	Battery charge condition

3.5. The keypad

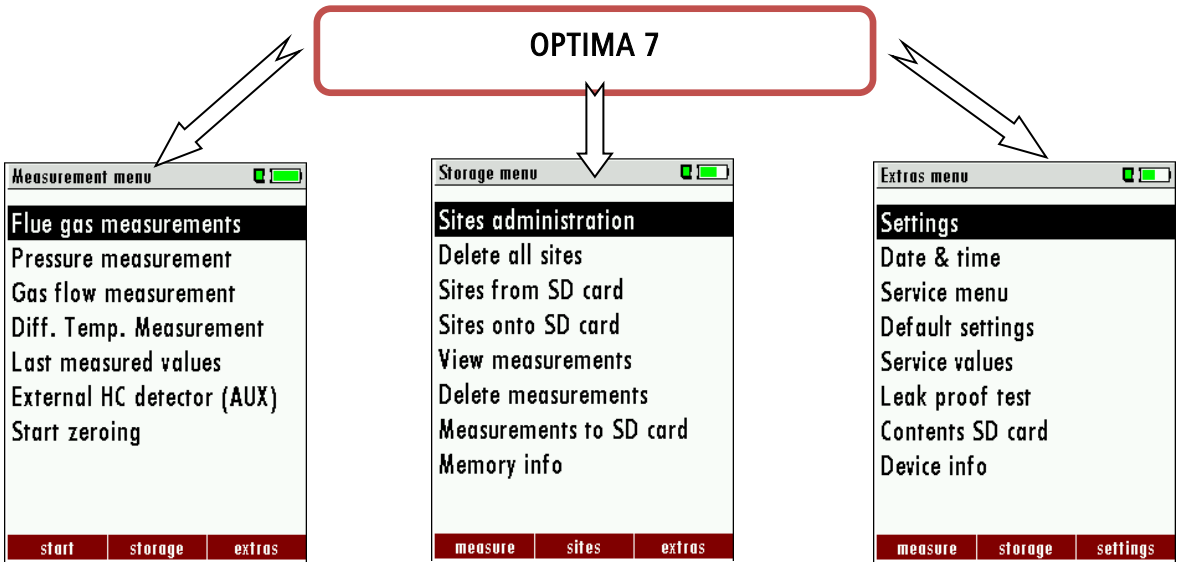
Description and function of the keys:

ON/OFF 	Press to start the analyzer without delay. The power off function will be delayed to protect the sensors. If there is not enough ambient air the analyzer will recommend the purging of the sensors.
Function Keys 	Activates the functions seen on the display (2 function key bar)
Menu Key 	Will show all available functions in the window that is currently in use – also those which have an individual key on the key pad like the printer and the three function keys.
ESC Key 	Abort or return to the menu above
Arrow Keys	Jump in between lines, change values
OK Key 	Confirmation key, select a marked menu point
Printer Key 	Activates the printer function in the measurement and service window.

3.6. Menu configuration

The OPTIMA 7 organizes all available actions in three main menus:

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



The topic „Flue gas measurements „is a standard feature in every analyzer and is explained in chapter 7
Other menu points are optional and will be explained either in this manual or in an additional manual or flyer.

Please read chapter 8 for details.

Please read chapter 9 for details.

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

4 First usage

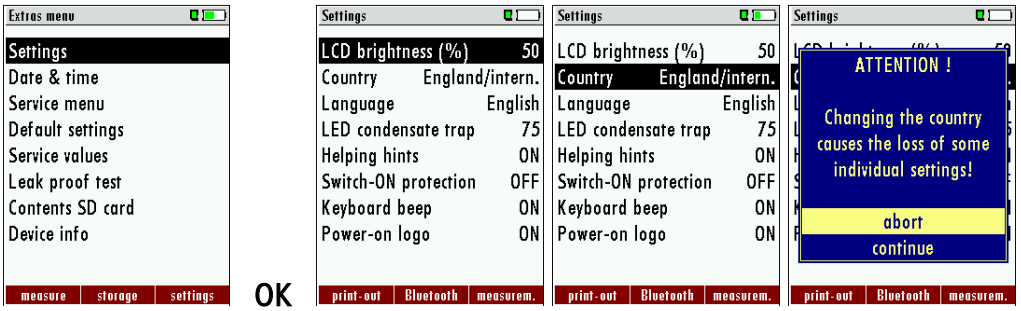
Once you have determined that the analyzer is safe to be used, it can now be customized to meet your needs, these modifications can be changed at any time.

4.1. Preparing steps

- Remove the analyzer from its packaging and read the complete manual.
- The analyzer has left the manufacturer completely assembled and ready to use. Check if everything indicated has been delivered and that there are no visible damages.
- Charge the battery for at least 8 hours.
- Check and modify date and time if needed.

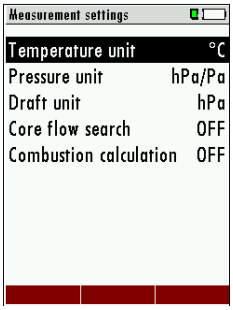
4.2. Settings

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 temperature and also on the personal judgement of the user, at 20°C a value of ca. 50% is normal
Language	option	Select device languages
Country	option	Enables some country specific parameters like fuel types, calculated values etc.
LED condensate trap	0 … 150	Change the brightness of the condensate separator LED
Helping hints	ON / OFF	Helpful hints activated or deactivated (explanation below)
Switch-ON protection	ON / OFF	If activated and if ON key is pressed (possibly inadvertently), then the message „3 seconds OK key press " displays
Keyboard beeper	ON / OFF	Keyboard beeper activated or deactivated
Power-on logo	ON / OFF	Logo will be show during power-ON of the analyzer

Settings measurement:



Temperature Unit	°C, °F	Change the unit for temperature in all screens
Pressure Unit	Pa, hPa/Pa, hPa, kPa/Pa, kPa, mbar, mmH2O, cmH2O, inH2O, mmHg, inHg, PSI,	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.
Draft Unit	Pa, hPa/Pa, hPa, kPa/Pa, kPa, mbar, mmH2O, cmH2O, inH2O, mmHg, inHg, PSI,	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
Combustion calculation	ON / OFF	If the combustion calculation is switched off following items will be changed: - no fuel types, respectively always "Sample Gas" - no measuring values losses, Verluste, ETA, ETAcond, Dev. point - no measuring value CO2, except it will be measured - no measuring values CO/NO/„,. in [mg/kWh]/[mg/MJ] - no fuel type will be shown on the menu bar and print-out

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:

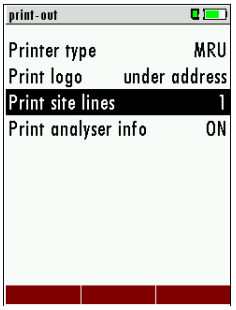
“Zeroing finished, Sensors are ready. Analyzer ready for measurement.”
“Reminder! Charge batteries at regular intervals!”
“Measurement stopped/started.”

4.3. Switch-ON protection

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

4.4. Setting printer type and print out

F1



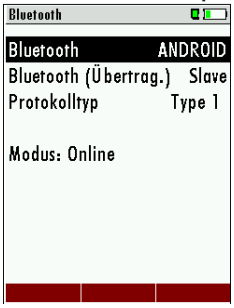
Printer type	Select printer type MRU / HP
Print logo ON/OFF	Print logo
Print option SHORT/LONG	SHORT: Print-out without area for signature and site information
Print site lines 0 … 9	Line 1 (Site no.) is necessary
Print device info	To measuring print out can be shorter designed, while the device info will be left out. In some print outs (adjustment, service ...) the info will be printed forever.

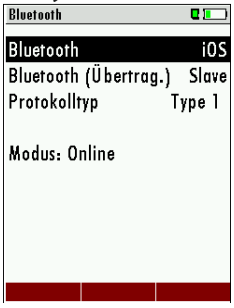
4.5. Bluetooth settings

The following MRU software can be used:
MRU4u (Bluetooth) Available in the Apple App Store and Google Play
For iOS communication with PC, tablet or smartphone is additionally the Low power module # 66173 required

SMARTdata (Bluetooth) (SMARTdata Version 1.2.0 or newer)
MRU-Win (USB) (MRUwin Version 2.7.4.0 or newer)
ONLINEview (USB/Bluetooth) (ONLINEview Version 2.9.5 or newer)

The Bluetooth passkey is: 1234





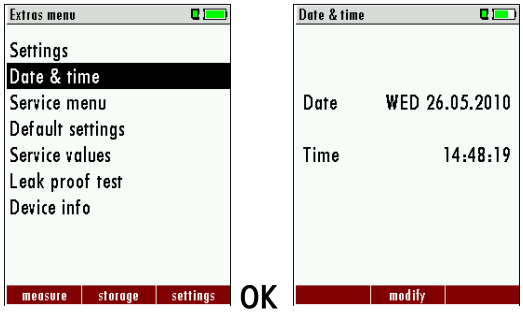
Bluetooth	-> ANDROID or iOS
Bluetooth (transmiss.)	-> Slave
Protocol	-> **Type 1**
Auto-connect	-> OFF *(if available)*

Devices as of firmware version 1.66.00 with dual Bluetooth module:
The Bluetooth mode can be selected under EXTRAS / SETTINGS.
For Android devices, select the mode: ANDROID
For Apple- devices, select the mode: iOS.
Always set the BLUEGAZsmart setting to OFF!

ONLINEview must be operated in master mode - please select "Master" under Setup.
Please select "Master" under SETUP.

For further information please refer to the corresponding documentation for the respective software program

4.6. Set time and date



F2	Edit
▲, ▼	Change the marked number
◀ ▶	Move the cursor to the next position
ESC	Return to *Extra-Menu*

The time and date must be modified in case the battery has been discharged completely.

4.7. Measurement program configuration

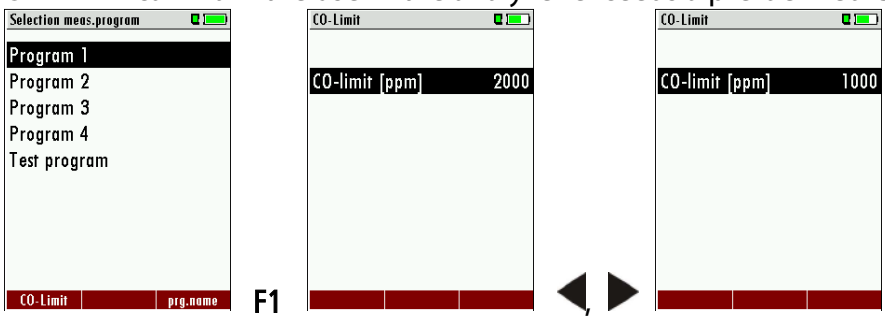
(Flue gas measurements) Select one of the 6 configurable measurement programs.
For each of the programs the following parameters can be configured:

1. 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)
2. Selectable fuel types: choose and select from the available fuel type list
3. Measurement windows: configuration of what and where will be displayed in the 3 measurement value windows.
4. Zoom – window: select what will be displayed in the zoom - window
5. Program name

The following program is pre-configured:
"Test Program" indented for use at instrument maintenance and calibration

4.8. Set CO limits

High CO concentrations in the gas stream can shorten the life span of your CO sensor. The **OPTIMA7** can warn the user if the analyzer exceeds a pre-defined CO limit.

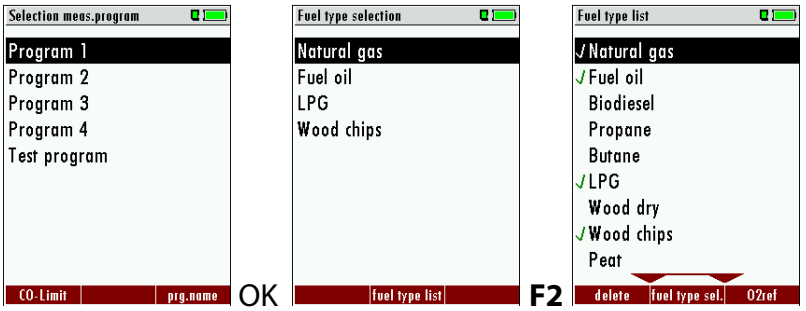


▲, ▼	Select one available program
F1	Open the CO ppm limit window
◀ ▶	The CO-ppm limit value can be adjusted in 100 ppm steps between 300 ppm and 4.000 ppm / 10.000 ppm
OK oder **ESC**	Return to the measurement window

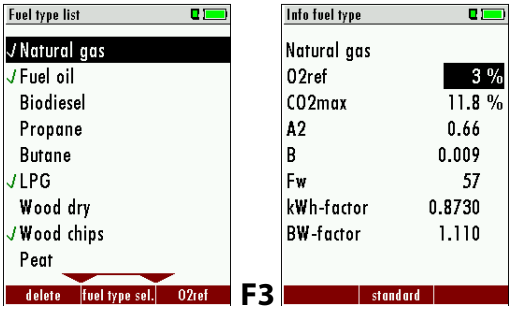
The CO limit can be defined for each of the 4 measurement programs.
Using during the measuring the context menu and you can press the CO limit key – the CO limit can be changed in 100 ppm steps.

4.9. Select fuel types and O_2 reference

After selecting a measurement program, you can select or add fuel types. You can define what fuel types you want to see for each measurement program by using the fuel type list.



▲, ▼,	Select a program
F1**OK**	Show a pre-selected fuel type
F1**F2**	Show the list of all fuel types



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

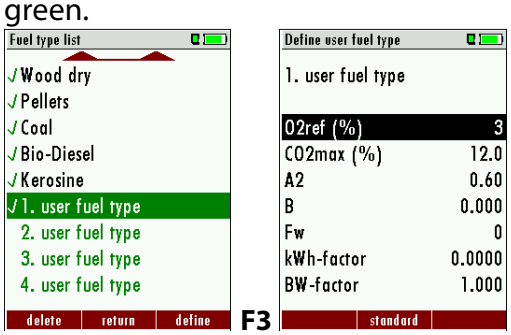
First select a program then press OK – then press the F2 key in the window “Fuel type selection”. All available fuel types are displayed: they can be added to or removed from the short list by using the F1 key. Added fuel types have a check mark in front of the fuel type. To each fuel type the parameters are displayed by selecting F3 “O2Ref”. All parameters are displayed read-only except the O” reference value that can be changed

4.10. User definable fuel types (only If combustion calculation is ON)

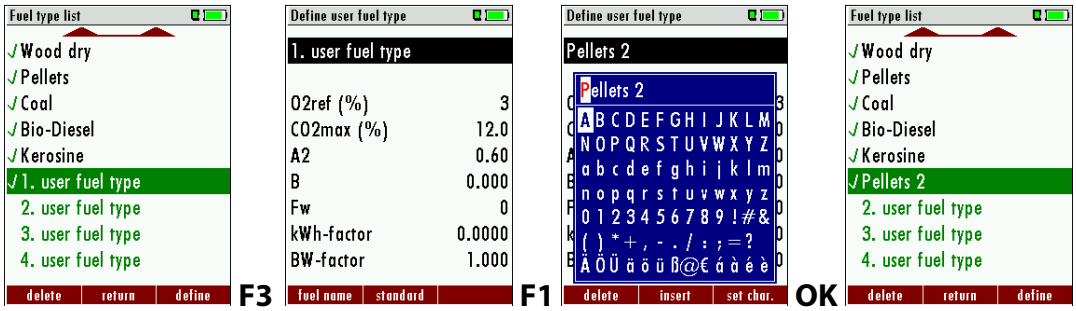
Here, four fuels are adjusted individually. The name as well as the parameters are adjustable. As the other fuel types, they can be pre-selected or left out.

Note:

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



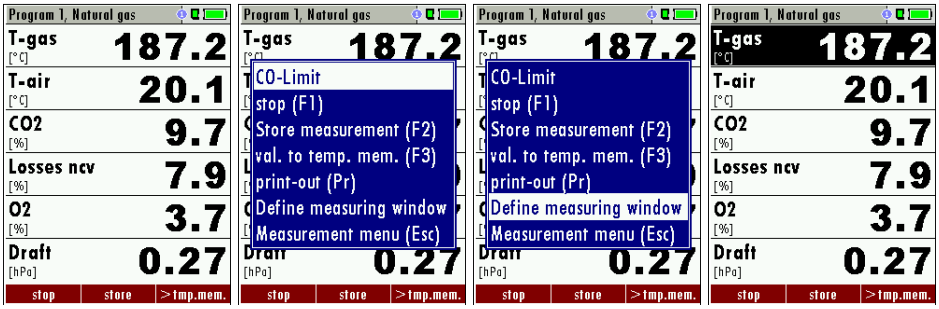
F1	Add or remove selected fuel to the pre-selected fuel types
F2	Back to the window “Fuel type selection”
F3	Modify fuel type parameters



F3	Modify fuel type parameters
F2	Modify fuel type name Text input see chapter 10.2
OK	Save the new fuel type name

4.11. Define the measuring window

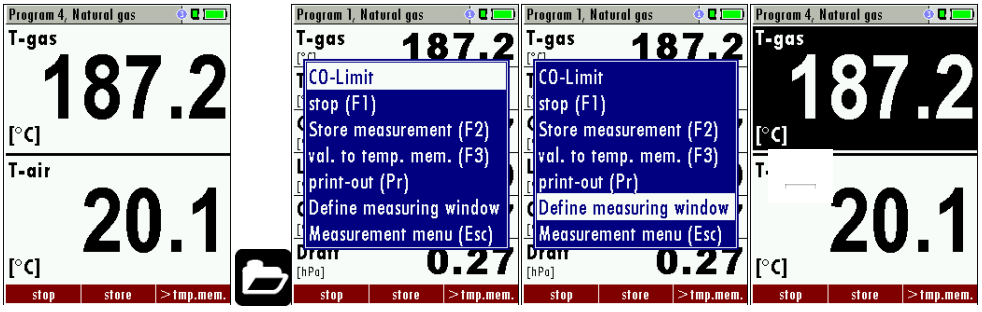
Start the measuring program – once you are inside the measuring window press the menu- key.



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 van uses 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.

4.12. Define 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

4.13. 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.

4.14. 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 4.2

5 Maintenance

The OPTIMA 7 needs to the long value preservation only one very low maintenance need:

5.1. Cleaning

Taking good care of your **OPTIMA7** will ensure long-term maintenance value:

- **CAUTION**

Condensate is acidic

The condensate from the container can be slight acidic and can cause chemical burn.

► Immediately clean with plenty of water once you have encountered acid

- After each measurement: removed the hoses of the sampling from the

  OPTIMA7 and let them dry (condensate inside the hoses). Open and empty the condensate separator and let it dry.

- Occasionally: clean the sampling line.
- The pleated filter in the condensate separator can be washed 4 to 5 time (with your work clothes in the washing machine). The grade of contamination depends on the fuel types and the number of measurements performed. Replace the filter frequently when it looks dirty.
- The internal battery has only a minor self-discharge effect. If the analyzer is not being used over a period it is recommended to charge the battery before storing it and then recharge the battery every 8 weeks.

5.2. Annual service and calibration

An annual service and calibration is highly recommended. Please contact your local service partner for details.

6 Preparation for each measurement

6.1. Power supply

The analyzer can be used with:

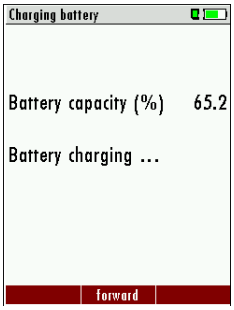
- with the internal MRU battery (provided)
- with the MRU battery charger (provided)

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

6.2. Auto OFF

The instrument is automatically switched off after 60 minutes. During a measurement or a battery charging cycle the auto off is deactivated.

6.3. Measurement with battery charger/battery charging



Whenever you connect the analyzer with external battery charger (90...260 V / 50/ 60Hz) the battery will be charged
Once the battery is fully charged the analyzer will switch to trickle charge mode.
At the moment, if the battery is fully charged and the trickle charge mode begins, an acoustic feedback will be played.

6.4. Measurement with battery (Battery monitoring)

The battery symbol 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 will start to blink red (about once per second).

When 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.

6.5. Operation temperature

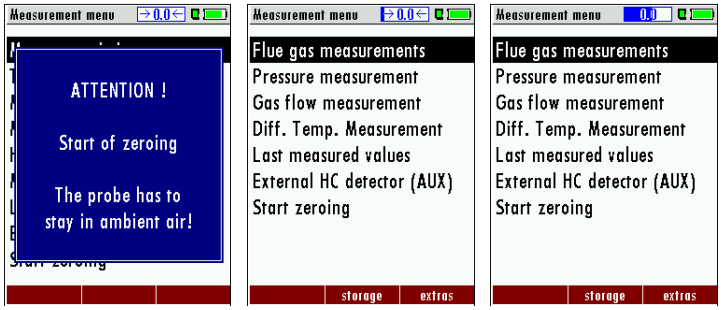
If the analyzer has been stored at low temperatures, it will require some time to equilibrate to the ambient temperature before being switched on. If it does not equilibrate, condensation will occur inside the analyzer!
If the temperature is out of its operation range you will see the following messages on the display: *"Analyzer too hot"* or *"Analyzer too cold"*
Once one of these messages appears you will not be able to use the analyzer, it will give an acoustic signal until it has reached the specified operation temperature between +5°C and +45°C

7 Operation

7.1. Power ON and zeroing

Press the ON key. The analyzer will start zeroing without any further action from the user.
The probe shall **NOT** be installed in the stack during zeroing!

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

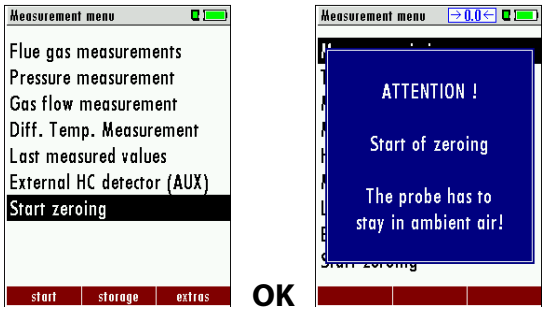


Once the zeroing cycle is finished the analyzer is ready for measurement.

If any defective sensors will be detected during the zeroing cycle you will get an error message on the display.

Repeating the zeroing

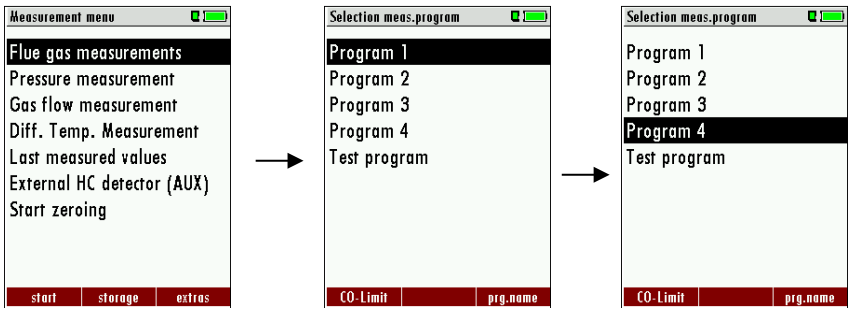
The zeroing can be repeated at any time as long as the probe is not inside the stack. In the main menu you select "Zeroing", and after the displayed message press the OK key.



▲, ▼	Zeroing
OK	Start zeroing

7.2. 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

7.3. Combustion test

• DANGER

Poisonous gas can be present

The possibility of death through intoxication.
Flue gases are extracted by the analyzer and then evacuated into the ambient air.

► Only operate the analyzer in well ventilated rooms.

NOTE

Wrong measuring results

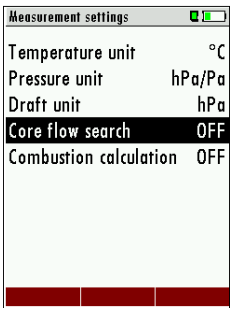
The extracted flue gas must be able to evacuate the analyzer without obstruction.

► The exhaust outlet at the rear of the analyzer may never be covered during a measurement, never operate the analyzer in a transport case.

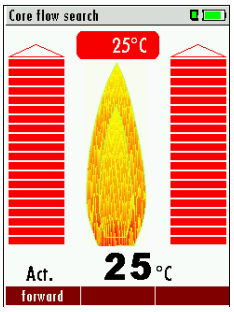
7.4. Core flow search

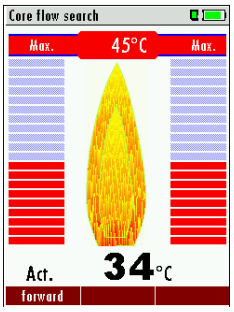
Before using the core flow search it must be switched-on:

F3.



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





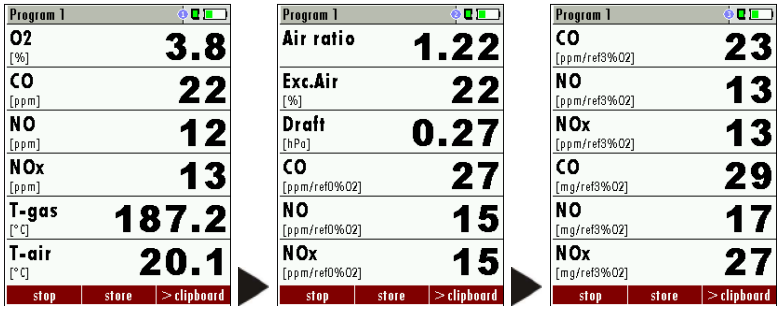
Temperature rising
Approaching the maximal flue gas temperature

<u>Positioning the probe in the core flow:</u>

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.

7.5. Measured value display

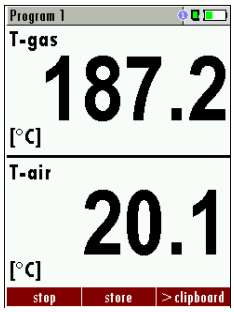
After the core flow search you will see the measurement values on the display.
Measurement values can be organized on three pages, each page displaying 6 measurement values.
The order of the display is operator settable.



There are direct measured values available such as Oxygen and Temperature as well as calculated values such as dew point, efficiency and CO_2. 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:

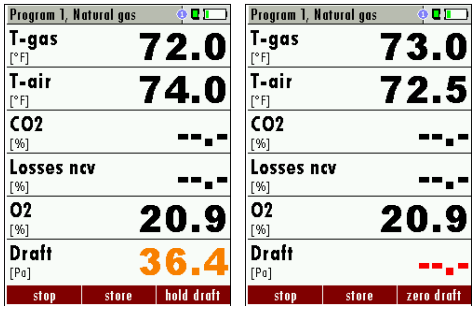
- ⚠ Electro chemical sensor was detected as defective during zeroing.
- ⚠ External temperature sensors are not connected.

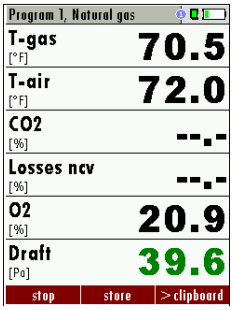


The measurement value T-Gas is usually read at the connector "T-Gas/AUX" (depending on configuration) or if not available from the connector "T1".
There are three measurement windows available, with the arrow keys left and right moving between them.
Zoom function, each with two values, is activated by moving the arrow keys up and down. Moving arrow keys left and right pages between the two zoom windows.

7.6. Non-continuous draft measurement

The Optima7 provides for a non-continuous draft measurement. The draft measurement is disabled when a maximum time after zeroing has elapsed or a significant change in temperature has been detected by the instrument. The maximum time is configured to 10 minutes.
If the draft measurement is disabled it is displayed with "--.-". The draft measurement can be enabled again by zeroing the draft: F3 key "zero draft".
To indicate that the draft measurement is not continuously available it is displayed in colour red.

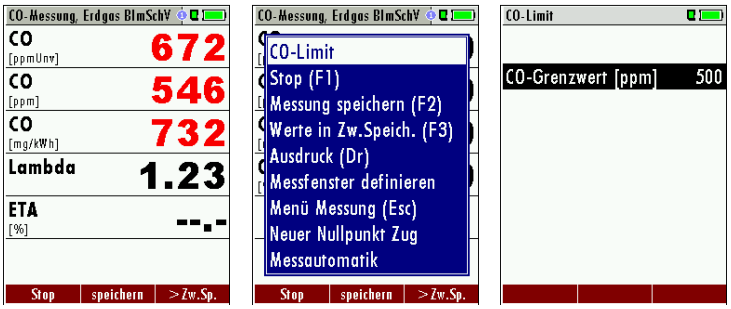




The user can freeze the draft data by means of the F3 key “hold draft”.
The frozen data is displayed in green.
The unfreeze the measurement one has to exit the menu and enter again.

All other measurements are processed continuously independent of the draft measurement status.

7.7. CO-limit (without purging)



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

7.8. CO-purging (optional)

If the CO value exceeds the CO threshold, then the measured value is displayed red and air purging pump is activated. This will protect the CO electrochemical cell from too high CO gas concentrations.
If the CO value decrease below the CO threshold, then the CO value will be displayed again in black colour.
Air purging pump is still running and can be deactivated only by accessing the “menu” key and confirm “purge pump off”

Note: *Unit switching: 10000pmm values are displayed in%.*

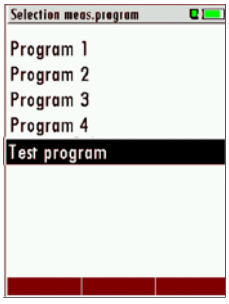
The actual CO value will then be displayed again.
If a measurement with active purging will be stored, the device documented the device the CO value as CO limit value.

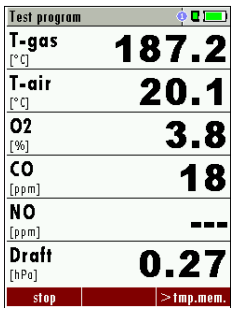
7.9. CO/H2 and CO high (optional)

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 again.

7.10. Test program

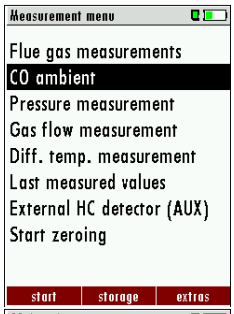
This test program is made for testing facilities that will test these analyzers with test gases and don't need to make any modifications.
In this program you will only see measured values and no calculated values at all.





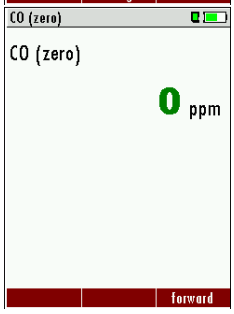
7.11. CO-ambient

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 „CO ambient".

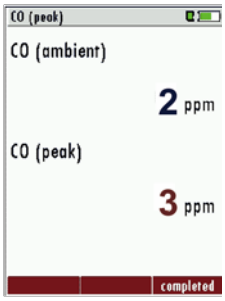


Before that CO ambient measurement a zeroing at fresh air (outside of the environment of the measuring point) must be taken.

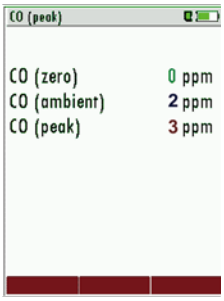
Start thereafter the function „CO ambient "at fresh air with the **OK**



F3



F3



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.

- **CAUTION**

HOT – danger of burns and fire hazards from gas extraction probe.
Physical harm and property damage can be caused.
1. Cool down the probe tube.

ATTENTION

Thermo-element can be damaged

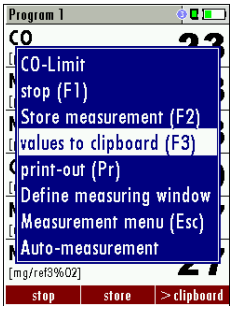
The thermo-element at the tip of the probe tube is very delicate and can easily be damaged.

2. Once the probe has cooled off slide the probe cone to the tip of the probe tube and fixate it to protect the thermos-element.

7.12. Temporary buffer

The OPTIMA 7 gives the possibility to set the momentary values into a temporary buffer during effecting and continuing the measurement. Later on, the values can be brought back from the temporary buffer to the measuring window in order to print them out or / and to save them

Set values into temporary buffer



During an actual measurement you can set the actual values into the temporary buffer

Operation:

1The function „val. to temp. mem." of the menu (accessible about the menu button)

2or, provided that offered, the function key F3 with the text 

To bring values back from the temporary buffer

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

Operation:

➔ the function „v./tmp.mem." of the menu (accessible about the menu button), or

➔ the function key F3 with the text 

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

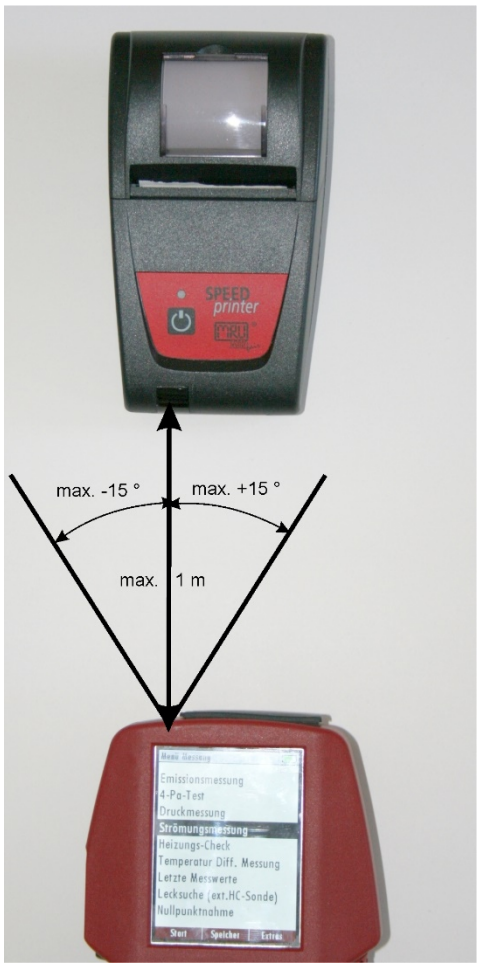
Now it is possible to print and save as usual one of both measurements.

7.13. 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 8.

7.14. Printing the measuring results

While in the measurement window pressing the printer key will send the information to the IR printer.
The speed printer (IR desktop printer) Art. No. 62693 must be aligned in addition as follows:



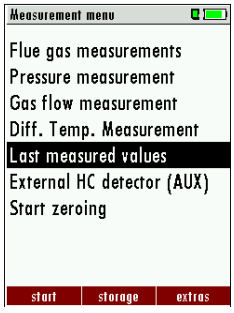

```
************************
      M R U GmbH
     Fuchshalde 8
74172 Neckarsulm-Obʼheim
07132/9962-0 Fax 9962-20
www.mru.de / info@mru.de
************************

MON 02.08.2010  14:43:07

LPG 14.1 %

Program 1

T-gas        25.9 °C
T-air        25.8 °C
CO2          --.- %
Losses ncv   --.- %
O2           20.7 %
Draft        0.00 hPa
CO             29 ppmO%
CO              0 ppm
CO             30 mgkWh
Exc.Air      -.--
Eff. ncv     --.- %


----------------------
MRU OPTIMA 7      312321
----------------------
Firmware version 1.09.06
Meas kernel version 1.03
Adjustm. date 12.04.2010
----------------------
```

Example: Measurement

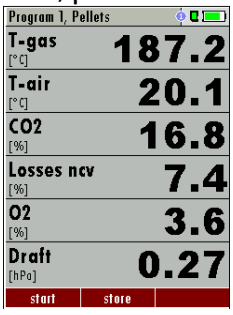
All values that can be seen in the measurement window on all three pages will be printed, double measurement values will only be printed once.
Further technical specifications as well as battery and paper rolls changes please see separate printer manual.

7.15. 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.

ATTENTION

Analyzer can be damaged by faulty operation

The pressure sensor can be damaged or destroyed when the supplied pressure is too high.

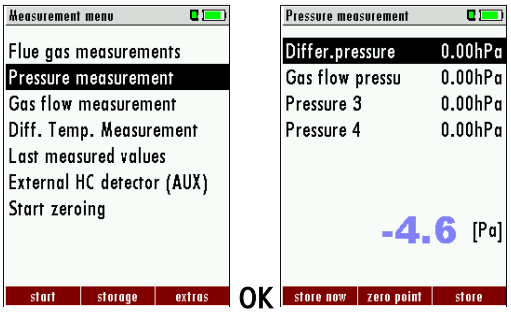
► Check the pressure sensor range before applying pressure.

7.16. 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.

The hose on the draft + connector must be connected for draft measurements.

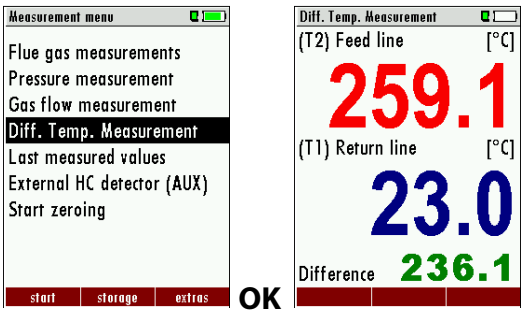
The second hose on the Delta P- connector must be connected for differential measurement.



▲, ▼	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

7.17. Differential temperature measurement (optional)

In the differential temperature measurement menu two temperatures can be measured simultaneously by using the T1 and T2 connectors. Both measured temperatures and the difference between the temperatures will be displayed.



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

7.18. Last measured values

The **OPTIMA7** offers the possibility to display the last measured values even if they have not been stored inside the analyzer. In the main menu you select „last measured values“. You can view the values, print them or store them. These values are erased once you power down the analyzer.

8 Data Storage

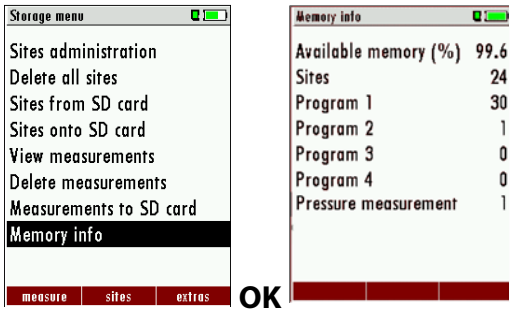
8.1. Data storage organisation

The basis for the data storage of the **OPTIMA7** are saved sets of sites inside the analyzer. Each site has a distinct site number as well as 8 additional free text lines for names and address.

The analyzer can store up to 1,000 different sites.
New sites can be added in the analyzer. Modifications can be done using an external PC program e.g. MRU Win.
Attention: New sites created in the analyzer will NOT be transferred back to the computer program. When transferring data from the analyzer to the computer only measurement data will be transferred, identified by the site number that has been assigned to the measurement, when the measurement was saved.

8.2. Data storage information

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



8.3. Sites administration

In the sub menu **Sites administration,** you can:

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

  New sites created in the analyzer will NOT be transferred to a PC program.

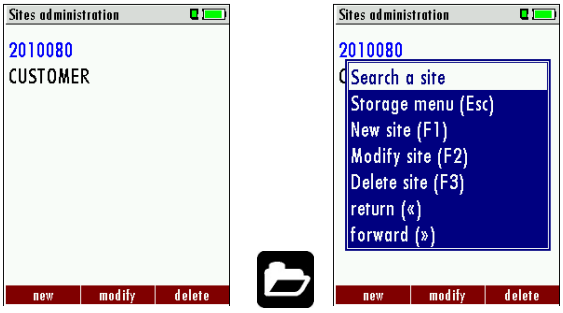
View and search sites

In the sub menu **Sites administration** each site will be displayed with:

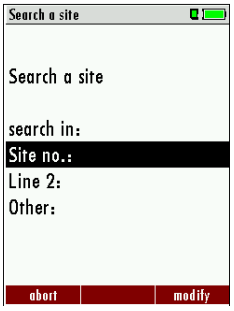
- of the unequivocal site number in the first line which is set down because of this meaning colourfully,
- the other 8 free text lines.

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.

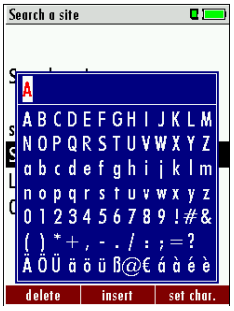
- select with the menu key "Search a site"



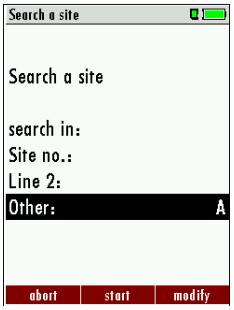
- Now you can enter the text to be searched for the first line, i.e. the site number, or for the second line, or for the rest of the text lines.



- 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 occurence is searched in the selected text field. Press then „OK“ "



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



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

	Page through the sites
	Menu key: Search site

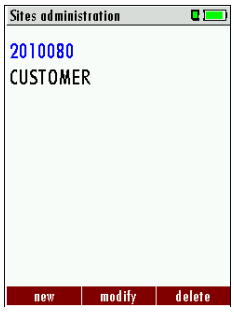
	▲, ▼: Selection of the input field **F3:** Input mask, see chap. 16.1 **F2:** Start search ◀▶: According to the search criteria found sites page through. If no saved site with the search criteria agrees occurred the Medung: „Search unsuccessfully“
ESC	Back to storage menu

8.4. New entry and change of sites

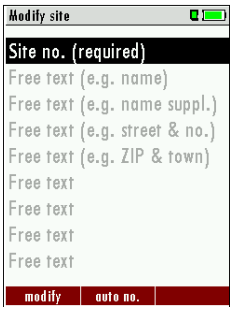
In the menu item "Sites administration" you can new entry sites and change data of existing sites.
Select F1 = "new" for a new site. Besides, it is displayed:

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

OK

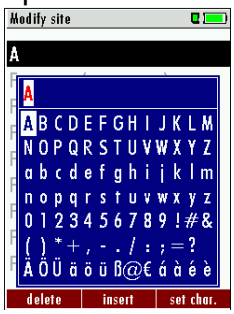


F1

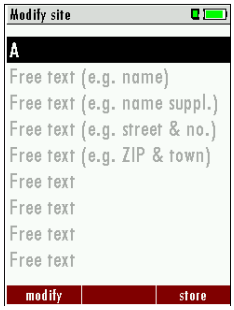


F1

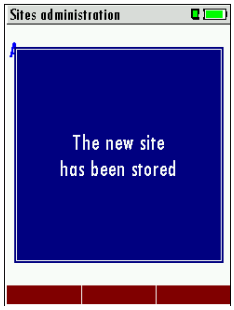
In the new site or an existing site you can change the data while you select the too change line, F1 = "modify" select and use the text input field for editing of the text. Conclude the text input field with "OK" and store the
updates with F3 = "store".



or F2



F3



8.5. 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

8.6. Data transfer using the SD card

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. Optima 7 uses a semi-colon ';' as value separator (other implementations use sometimes a comma). Implementations of CSV can often handle field values with embedded line breaks or separator characters by using quotation marks or escape sequences. CSV is a simple file format that is widely supported, so it is often used to move tabular data between different computer programs, for example Microsoft Excel™ or Access™, that support the format. Also other computer programs offer this type of interface because it is widely spread and easy to use.

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

- Import of Sites
- Export of Sites
- Export of Flue Gas Measurements
- Export of Differential Pressure Measurements

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.

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 it's the same as described above „Import of Sites".

Only the file name is different, the file name will be ‚ANLxxxxx.csv', 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 "anlagen.csv".

Export of Combustion Tests

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 cannot be imported again!

The created file has the name ‚EMIxxxxx.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, 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 [°	O2 [%]	CO2 [%]
2	BOILER	THU 30.09.2(	Program 1	Natural gas	11.7	3.0	--.-	73.5	--.-	21.0	--.-
3	BOILER	THU 30.09.2(	Program 1	Natural gas	11.7	3.0	--.-	73.0	--.-	21.0	--.-
4	BOILER	THU 30.09.2(	Program 1	Natural gas	11.7	3.0	--.-	73.0	--.-	21.0	--.-
5	BOILER	THU 30.09.2(	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 05.10.2(	Program 1	Natural gas	11.7	3.0	81.0	--.-	113.0	11.7	5.2
8	A FURNACE	TUE 05.10.2(	Program 1	Natural gas	11.7	3.0	81.0	--.-	113.0	11.7	5.2
9	A FURNACE	TUE 05.10.2(	Program 1	Natural gas	11.7	3.0	82.5	--.-	112.5	11.7	5.1
10	A FURNACE	TUE 12.10.2(	Program 1	Natural gas	11.7	3.0	84.5	--.-	132.5	2.7	10.2

Export of differential pressure measurements

The same function as Export of combustion tests only the file name is different.

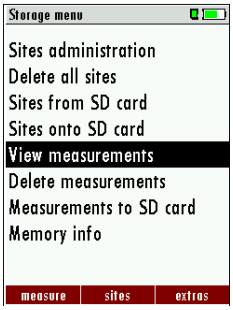
The created file has the file name "DDMxxxxx.csv", in which the xxxxx are continuing 5 digit numbers with leading zeros.

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

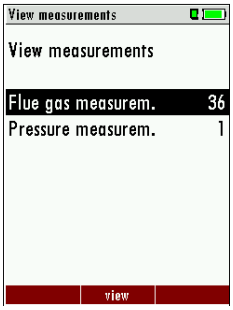
8.7. Measurement in Data storage

View measurement

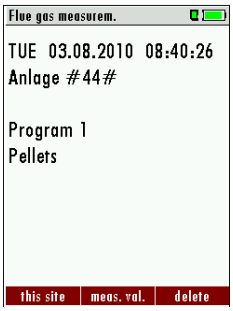
In the menu item „View measurements „you can inspect the stored measurements. After selection of this item you receive first an overview of the number of the stored measurements according to measuring type.



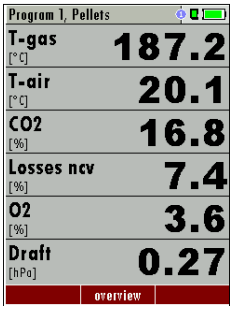
OK



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



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



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

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

- either F1 = „this site“ , while a measurement of the desired site is displayed. With F1 = „all sites“ you cancel this filter again.

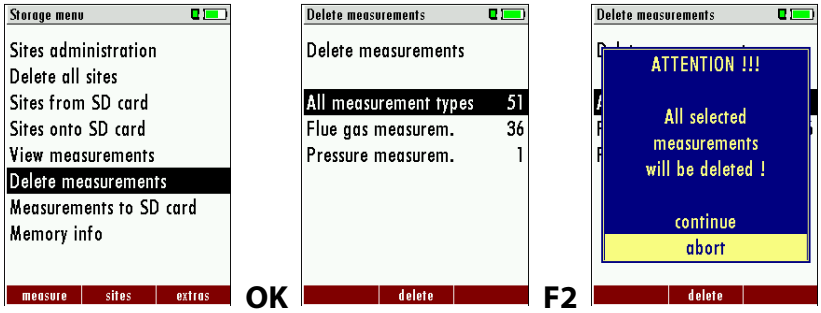
or while you select with the menu key the function "search a site" and execute, as described in the chapter site administration.

Delete a measurement

You are able to

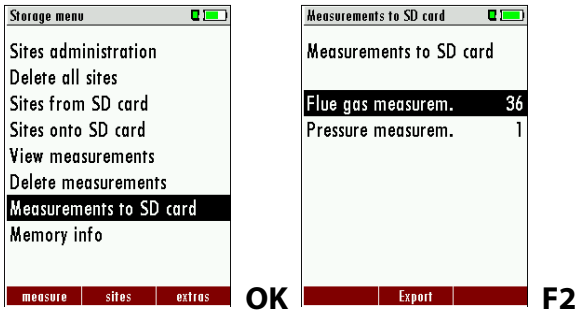
- delete single measurements, while they are displayed – press the key F3 = "delete" .

- or delete all measurements of a measuring type.



Transfer measurements to the SD card

The OPTIMA 7 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.

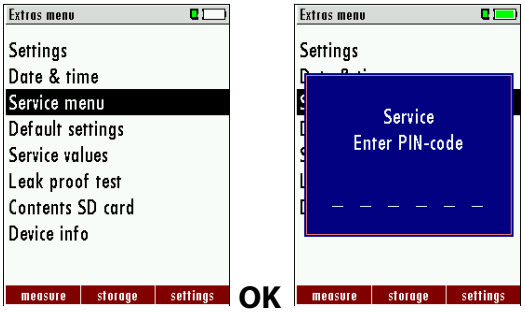
This file is editable on your Notebook/PC with a program like e.g. Microsoft® EXCEL or OpenOffice® Calc.
With possible problems with the using of your computer programs please read your software documentations or ask your software dealer.

9 Extras / Adjustment

The OPTIMA 7 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 output 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 whenever 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.

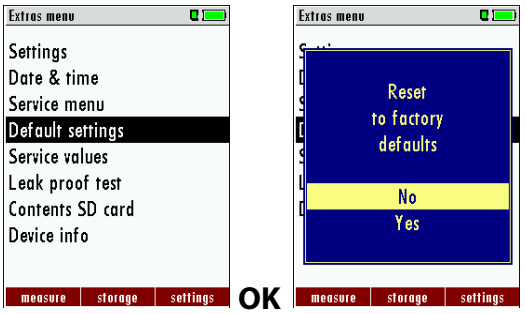
9.1. Service calibration menu

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.

9.2. Factory settings



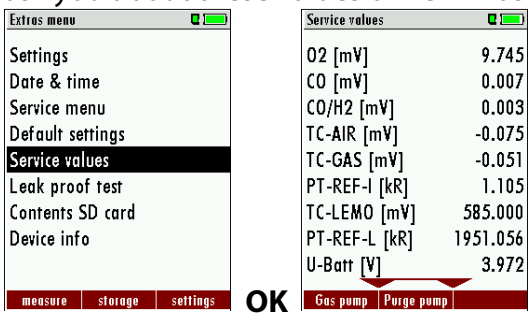
The analyzer will be reset to original delivery settings.
Be aware that your configurations will be deleted, such as:

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

9.3. Service values

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

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



▲, ▼	Jump between the lines
F1	Function test gas pump (on / off)
F2	Function test purge pump (on / off)
ESC	return

9.4. Analyzer and accessories leak test

When performing the leak tight test, the complete system including the probe, the sample line, the condensate separator and the analyzer are checked for leaks. The internal pump will create a vacuum, this vacuum is measured at the pressure sensor and the result will be displayed after 10 seconds of testing.

Performing the leak 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 sub pressure 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 leakness of the system will be determined.

NOTE

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

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

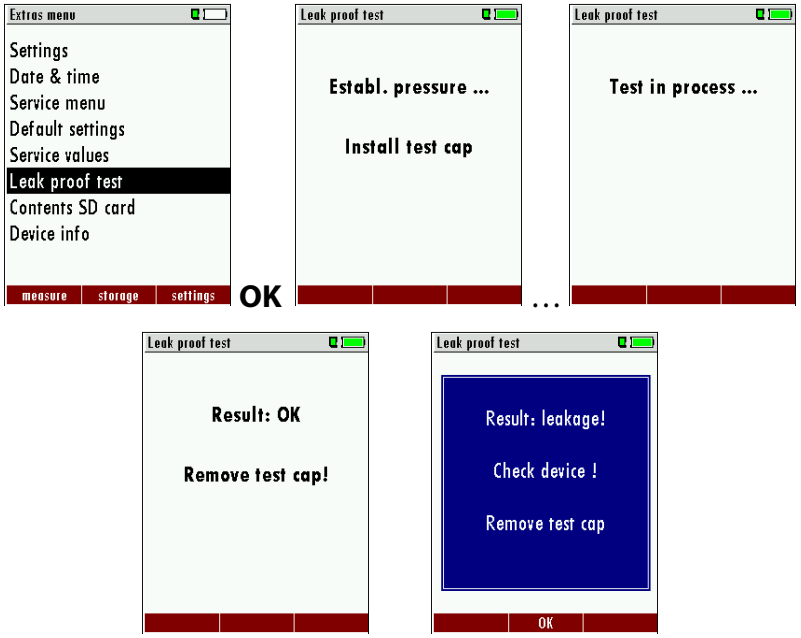
Operation:

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

ATTENTION:

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

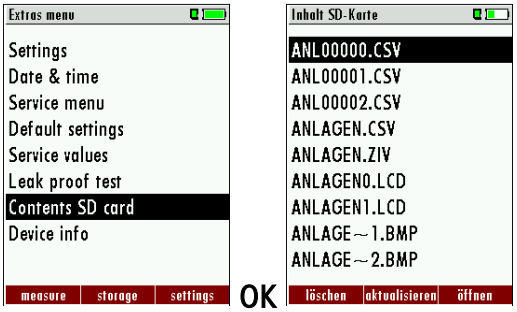
- Launch under “extras” the leak proof test on which the following window pop up:



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 OPTIMA 7 Combustion Analyzer has to be checked in a service department
(worldwide service departments see www.mru.eu)

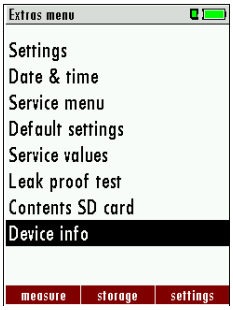
9.5. Contents SD card

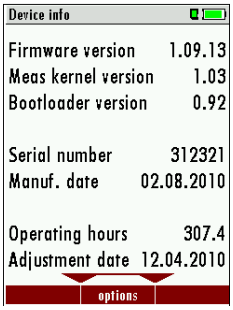


The contents of the SD card will be displayed. With F3 the selected file can be opened.

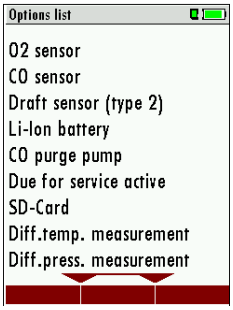
9.6. Contents Analyzer information,

The analyzer information can be viewed in the main menu **extras** and the sub menu **Device info** (use context key).
Here you will find information about the analyzer and the installed options.

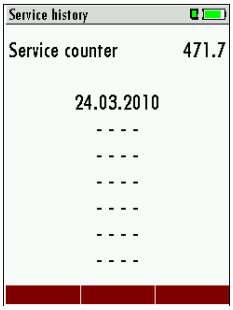




Press the F2-key to see the installed options.



With the F1-key you get information about the date of the last 7 service procedures

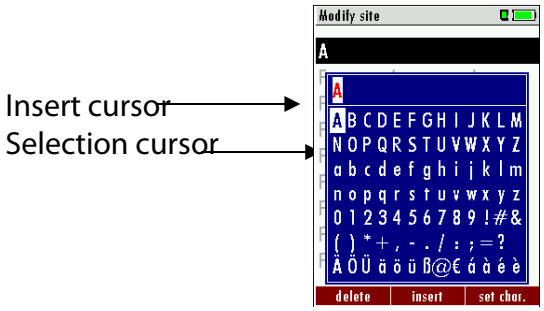


10 Appendix

10.1. 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)

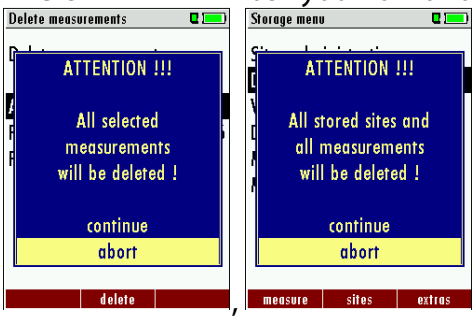
When you select the text input, the following window will pop up:



▲, ▼, ◀, ▶	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

10.2. Asking user for a decision

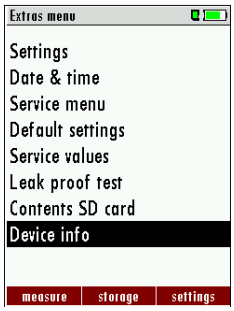
The OPTIMA 7 will ask you now and then to confirm the action that will be taken.



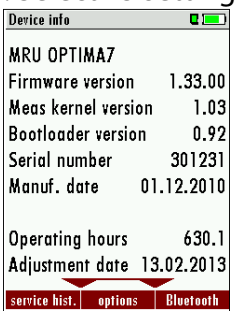
▲, ▼	Select a line
OK	Confirm the action
ESC	Abort the window, changes will NOT be saved

10.3. Firmware update

Switch ON the device. Select F3 settings/Device info



OK



The first line shows e.g.: Firmware-Version 1.33.00

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

Please write down your Firmware-Version (**e.g. 1.33.00)**_____

Please write down your serial number **(e.g. 301231)**_____

You need the latest file 'All_1083.fwb'. In case you get it in a zip archive you have to extract it before usage. This file contains all firmware types and the analyser will extract the correct type out of this file automatically.

Please follow these steps in order to update the analyser:

- copy the file 'All_1083.fwb' to a SD card in the root directory (that means in no directory)
- switch on the analyser
- insert the SD card into the analyser
- in most cases a message 'Searching firmware, please wait...' will be displayed for some seconds
- you will be asked: 'Firmware found. Install now?'
- acknowledge with 'install'
- for about 30 seconds the display will be dark, then the analyser will reboot with the new firmware
- Finished

10.4. 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 OPTIMA 7 and your PC / Laptop.

Your PC / Laptop will recognize the OPTIMA 7 as USB- HID (Human Interface Device).

Check list:

1. Switch on the OPTIMA 7
2. Connect the USB cable to the OPTIMA 7
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

10.5. Technical data

Measured values	OPTIMA 7
O2	
Measurement range	0 - 21,0 Vol-%
Accuracy	± 0,2 Vol-% abs.
Reaction time T90*	< 20 sec
CO2 NDIR	
Measurement range	0 - 40 Vol-%
Accuracy	± 0,3 % abs. or** 5 % of the measured value
Reaction time T90*	< 35 s
CH4 NDIR	
Measurement range	100 … 40.000 ppm, resolution 10 ppm
Accuracy	± 4 or** 5 % of the measured value
Reaction time T90*	< 35 s
CO (H2 comp.) (optional)	
Measurement range	0 - 4.000 ppm, overload up to 10.000 ppm***
Accuracy	± 10 ppm or** 3 % of the measured value up to 4.000 ppm
	or** 10 % of the measured value up to 10.000 ppm
Reaction time T90*	< 40 sec
CO low (optional)	
Measurement range	0 - 500 ppm, with 0,1 ppm resolution
Accuracy	± 2,0 ppm or ** 5 % reading
CO high (optional)	
Measurement range	0 - 4.000 ppm, overload up to 20.000 ppm***
Accuracy	± 100 ppm or** 5 % of the measured value up to 4.000 ppm
	or** 10 % of the measured value up to 20.000 ppm
Reaction time T90*	< 40 sec
CO very high (optional)	
Measurement range	0 – 4,0 %, overload up to 10 %
Accuracy	± 0,02 or** 5 % of the measured value up to 4,00 %
	or** 10 % of the measured value up to 20.000 ppm
Reaction time T90*	< 40 sec
NO (optional)	
Measurement range	0 - 1.000 ppm, overload up to 5.000 ppm***
Accuracy	± 5 ppm or** 5 % of the measured value up to 1.000 ppm
	or** 10 % of the measured value up to 5.000 ppm
Reaction time T90*	≤ 30 sec
NO low (optional)	
Measurement range	0 - 300 ppm, with 0,1 ppm resolution
Accuracy	± 2,0 ppm or ** 5 % reading
NO2 (optional)	
Measurement range	0 - 200 ppm, overload up to 1.000 ppm***
Accuracy	± 5 ppm or** 5 % of the measured value up to 200 ppm
	or** 10 % of the measured value up to 1.000 ppm
Reaction time T90*	≤ 60 sec
SO2 (optional)	
Measurement range	0 – 2.000 ppm, overload up to 5.000 ppm***
Accuracy	± 10 ppm or** 5 % of the measured value up to 2.000 ppm
	or** 10 % of the measured value up to 5.000 ppm
Reaction time T90*	≤ 40 sec

H2S (option)	
Measurement range	0 – 500 ppm, overload up to 2.000 ppm***
Accuracy	± 5 ppm or** 5 % of the measured value up to 500 ppm
	or** 10 % of the measured value up to 2.000 ppm
Reaction time T90*	≤ 60 sec
Flue gas temperature TA	
Measurement range	0 - 800 °C with high grade steel probe pipe
Measurement range	0 - 1.100 °C with Inconel probe pipe
Accuracy	± 2 °C ≤ 200 °C
	1 % of the measured value > 200 °C
Ambient air temperature TL	
Measurement range	0 - 100 °C
Accuracy	± 1 °C
Draft	
Measurement range	± 200 hPa
Accuracy	± 0,02 hPa or** 1% of the measured value
Differential pressure	
Measurement range	± 100 hPa
Accuracy	± 0,02 hPa or** 1% of the measured value
Max suction range gas pump	150 hPa
Typical gas flow	60 l/h
Calculated values	(Fuel type dependent)
CO2	
Measurement range	0 - CO2 max
Accuracy	± 0,3 Vol-% abs.
Air ratio	1 - 20
Excess Air	0 - 999 %
PI (Poison Index / Ratio)	0.0001 - 10.0
Dew point	°C
Losses qA	0 - 99,9 %
Efficiency ή	0 - 120 %
Measurement values as	mg/Nm3, O2 in relation, mg/KWh, NOx as mg/Nm3 NO2, CO/CO2 ratio
General specification	
Operating temperature	+ 5 - + 45 °C /+41 ... + 113° F, max. 95 % RH, not condensing
Storing temperature	- 20 - + 50 °C / - 4 ... + 122° F
Power supply	Internal: LI-Ion battery pack 20 h operation time
	External: wall-plug grid power supply, 100 - 240 V AC / 5,0 Vdc / 1200 mA / 50 … 60 Hz
Weight	ca. 750 g / approx. 1.65 lbs (with 2 sensors)
Sizes	244 x 113 x 54 mm / 4.3" x 8.8" x 2.04"
	* = typical sensor value, ** whichever is larger, ***only for SHORT-TERM measurement
Technical changes possible at any time!	Rev date: 20180814

Analisis and calculations

Measured values	**Unit**
O_2	[%]
CO	[ppm]
CO	[%]
NO	[ppm]
NO2	[ppm]
SO2	[ppm]
Temp. Ambient air (Thermo-Element)	[°C] [°F]
Temp. Flue gas (Thermo-Element)	[°C] [°F]
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

Continously caculated values	**Unit**
CO_2	[%]
Efficiency ETA	[%]
Efficiency condensed	[%]
Losses	[%]
Losses condensed	[%]
Lambda	-
Dew point	[°C] [°F]
CO/CO2 ratio	[%]

Losses and efficiency are calculated by means of net calorific value.
These values are than referenced for the gross calorific value for condensing boilers only.
(Efficiency > 100)

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

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

10.6. Fuel type list

Fuel types for different countries can be obtained from MRU GmbH:
Web page: www.mru.eu

10.7. Troubleshooting

Troubleshooting your analyzer

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 tough 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	Thermoelement defective, balancing network interrupted or not connected.	Call our after-sales service. Remove probe from the gas duct and condensate from the probe tube.
Wrong measuring values	Measuring range exceeded: Value O_2 too high Values CO and CO_2 to low	Connection probe – device not correct. Leakage at probe / tube / condensate separator, pump does not suck correctly	Effect tightness test! By visual control of probes, tubes condensate separator, leaking parts could be found.
Wrong measuring values	Gas temperature is too hot or alternates	Probe is not plugged in correctly, defective cable in the probe line, formation of condensate at the probe tip.	Check probe plug respectively probe line regarding damages (loose connection), remove condensate from the probe tip.

Troubleshooting 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.

10.8. Declaration of conformity OPTIMA7

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

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Person authorized to compile the technical documents

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Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung / *designation:*	Gasanalysator *Gas analyser*
Produktname / *name:*	OPTIMA 7
Funktion / *function:*	Gasanalyse / *gas analysis*

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

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

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

Neckarsulm, 02.01.2017

Erwin Hintz, Geschäftsführer / *Managing Director*