EMISSION MONITORING SYSTEMS

We *care* *about the environment*

USER MANUAL

Flue gas meas., Light oil no. 2

O2 [%]	2.35
CO [ppm]	87
NO [ppm]	203
NO2 [ppm]	13
SO2 [ppm]	466
Tgas [°C]	325

optima 7 biogas

MRU® AIR fair since 1984
EMISSION MONITORING SYSTEMS

OPTIMA 7
BIOGAS

TABLE OF CONTENTS

> ## User Manual – Please carefully read and follow all instructions before operating the analyzer.

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 every 4 – 6 weeks, *even if the analyzer is not in use.* When it is fully charged*,* the analyzer should be switched on and allowed to zero itself before being switched off again. (see chap. 10.8)

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:

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

Fon (+49) 71 32 99 62 0 (Reception)

Fon (+49) 71 32 99 62 61 (Service)

Fax (+49) 71 32 99 62 20

Email: info@mru.de, Homepage: www.mru.eu

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

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

Electrochemical sensors are by their operating principle not only sensitive to the gas they are intended for, but for other gases as well.

This cross sensitivity is compensated by MRU for the typical application of 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.

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

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

Safety instructions

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

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

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

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

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

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

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

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

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

1 INTRODUCTION

1.1 The OPTIMA 7 BIOGAS

The OPTIMA 7 BIOGAS analyzer is used for:

- for BIOGAS simultaneous measurements of O_2, CH_4, CO_2, H_2S and optional the BIOGAS pressure

- optional for combustion measurements of the engine: O_2, CO, NO, NO_2 and CO_2 (NDIR) including the calculation of: mg/m^3, NOx as mg/m^3 NO_2, true NOx-measurement NOx = NO + NO_2, referencing (normalisation) to user settable value

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

- Flow velocity measurement

- Differential measurement of pressure and temperature

- Combustibles detection with external HC sensor

- Automatic measurement with data logging

You will find a list of all optionals for this analyzer on our web page or you can contact MRU or our local representative. The OPTIMA 7 BIOGAS Analyzer is available in different versions. This manual will describe all versions indicating optionals and features not always available on all versions.

Diagram BIOGAS site
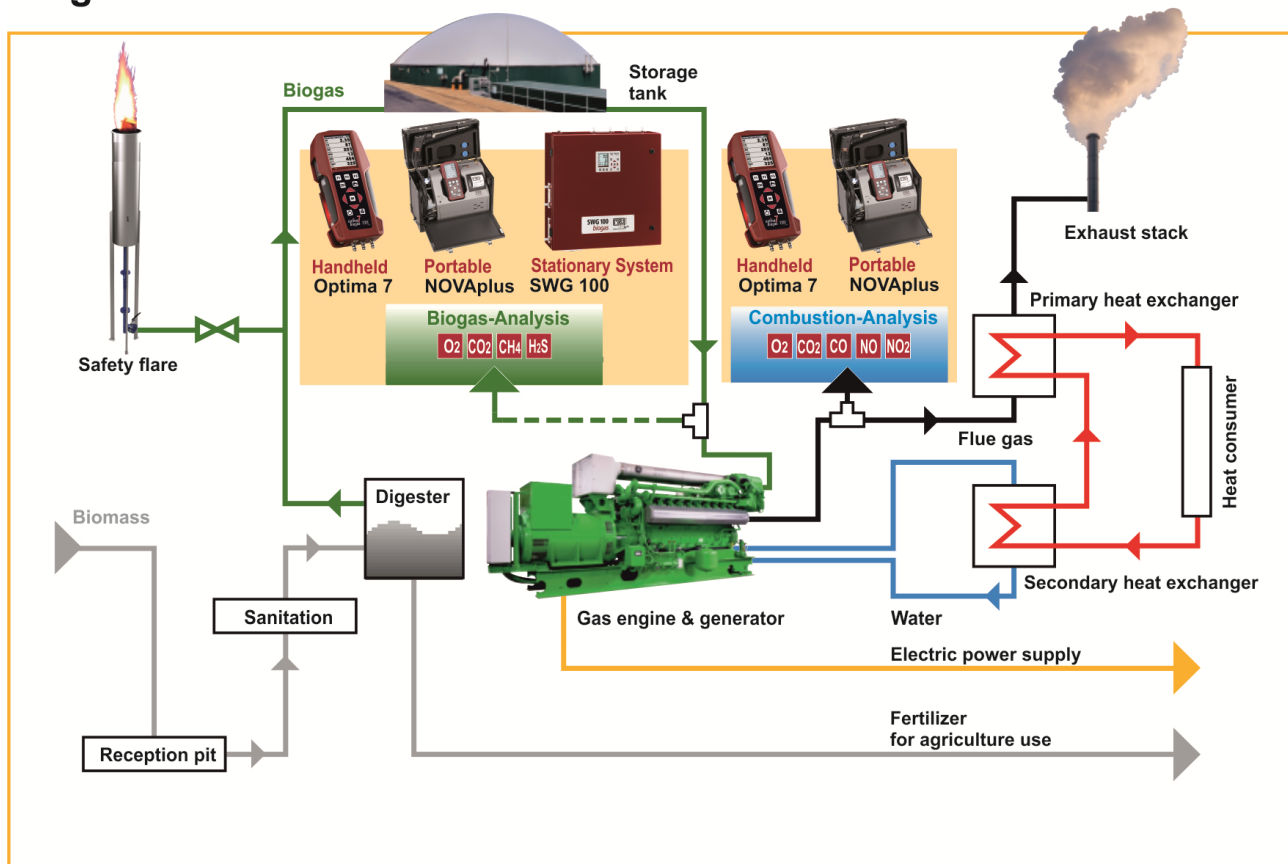
1.2 The company MRU GmbH

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 one of the previous page.

Factory 1 (service departrment, development division, administration)

Factory 2 (Product division)

1.3 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: O_2 - 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.

1.4 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 procedues.

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 SAFETY INFORMATION

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

2.1 Safety regulations

1. The OPTIMA 7 BIOGAS analyzer 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)**.

2.2 Specific safety regulations

1. Use only the battery charger supplied with the analyzer for this instrument.

2. No part of the analyzer, including the metal probe tube and all other metal parts & accessories are to be used as electric conductors.

3. The analyzer is not to be used in or under water.

4. The analyzer is not to be placed near or directly exposed to open fire or heat.

5. The specified probe temperature range is not to be exceeded, as the probe, temperature sensory mechanism and sensor could be damaged or destroyed.

6. The analyzer shall void dropping.

7. **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.

8. After measurement, vent the analyzer with ambient air and allow the probe to cool. A hot probe could burns or ignite flammable material.

9. The fumes from certain materials (for. example, cleaners, petrol, spirit, varnish) may damage the sensors of the analyzer. Do not store or use these or other similar fluids near the analyzer.

Your quality management MRU GmbH

2.3 Guideline for Li-Ion Batteries

- The battery pack is not accessibly for end users

- Li-Ion rechargeable battery pack for OPTIMA 7 BIOGAS Analyzer

- Do not heat or throw the battery pack of in fire.
  Do not charge and leave the battery pack at the high temperature.

- Do not deform, short-circuit, disassemble or modify the battery pack

- Do not allow the battery to be immersed in or wetted with water or sea water

- Do not subject the battery pack to a strong impact or throw it

- Do not cut, squeeze, tear at the cables of the battery pack

- Do not carry or store the battery pack together with material which have sharp edges or is electrical conductive in the same custody

- Not letting (+) terminal come in contact with (-) terminal or metal

  The above items may cause heat, fire and explosion

Your quality management MRU GmbH

3 RETURNED GOODS

Packing regulation of 12.07.1991

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

3.1 Return of hazardous waste

- Waste Disposal/Returns/Warranty -

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

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.

4 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 dryed 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.

4.1 Gas flow diagram
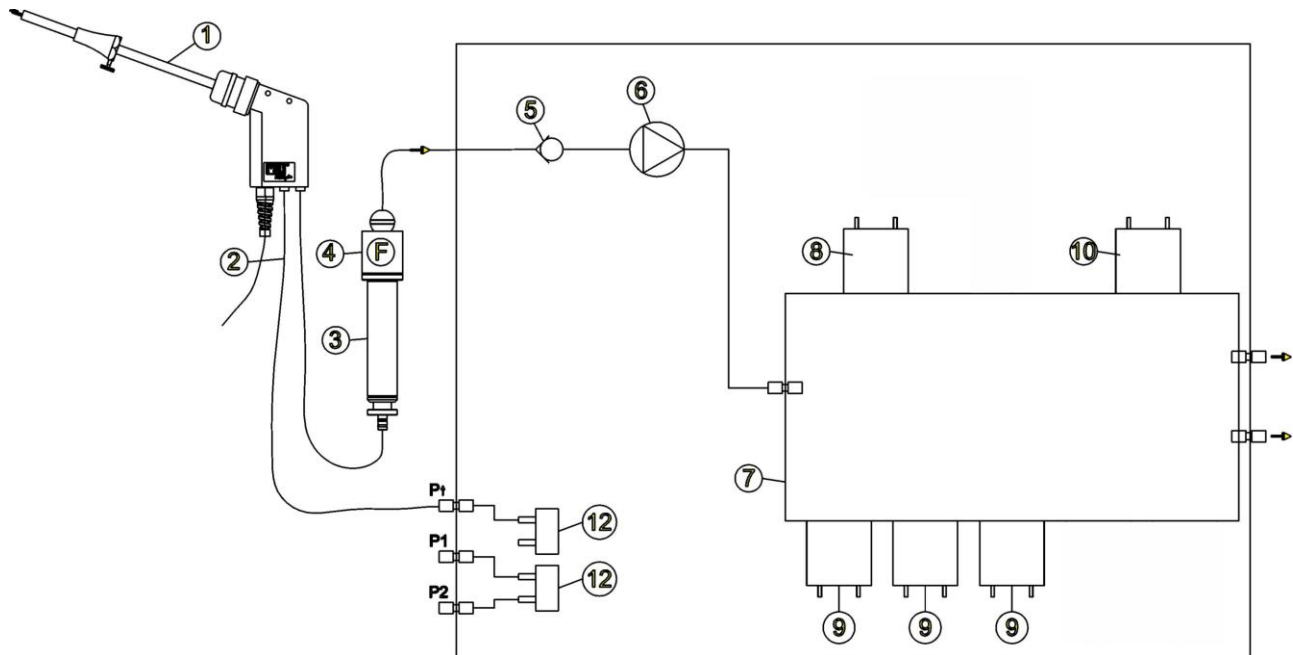
Position	Description
1	Sampling probe
2	Triple hose
3	Condensate separator
4	Star filter
5	Non return valve
6	Gas pump
7	Sensor chamber
8	O2-Sensor
9	Further electrochemical sensors * (CO, NO2, H2S)
10	CO2/CH4 NDIR Sensor
11	Not connected
12	Pressure sensor *

* optional

4.2 Electrochemical measured principle

The oxygen content of the sample gas is measured with a 2 electrode electrochemical sensor.

Toxic gases like carbon monoxide (CO), nitrogen oxide (NO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and hydrogen sulphide (H_2S) are measured with 3 electrode sensors.

The electrochemical sensors are based on gas diffusion technology.

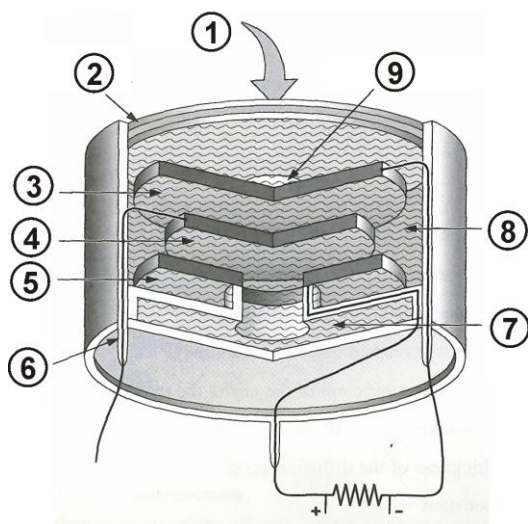The advantage of this technology is that the signal generated is direct proportionally and linear to the volume concentration (% or ppm) of the analysis gas components.

| Pos.	
1	Sample gas
2	Particle filter
3	Sensing Electrode
4	Reference Electrode
5	Counter Electrode
6	Connection pin
7	Electrolyte reservoir
8	Electrolyte
9	Capillary diffusion

When the gas being measured contacts the sensing electrode, it reacts on the electrode surface either through oxidation (for example CO, SO_2, NO) or reduction (like NO_2, and Cl_2).

Example: CO sensor:

CO reacts at the sensing electrode as follows:

$$CO + H_2O \ -> \ CO_2 + 2H+ + 2e-$$

and at the counter electrode, oxygen from air will be re-oxidized to water:

$$½ O_2 + 2H+ + 2e- \ -> H_2O$$
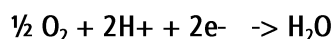
The sensor supplies a constant current signal (μA-range) that is monitored and analyzed. The current intensity is dependant upon the volume concentration of the sample gas, while other parameters like temperature and cross sensitivity are calculated by the analyzer.

4.3 Principle of the IR-bench

A regulated infrared source (IR) provides light in the range of 2 to 8 microns (µm). The infrared light is directed through the sample cell to the optical detector. The source is electronically modulated with no chopper wheels and no moving parts.

The residual infrared energy, not absorbed by the sample gas, is guided to the optical detector. It passes an optical narrow band pass.

Infrared light passed through the filter is collected by a pyro-electric detectors. It produce a voltage that is proportional to light intensity.
Unlike electrochemical sensors, the NDIR measurement shows no ageing due the gas concentration measured.
It's lifetime is only limited by the lifetime of the IR source.

5 ANALYZER DESCRIPTION

5.1 Analyzer front

1	Display
2	Condensate separator
3	Key pad

5.2 Analyzer Connectors - top
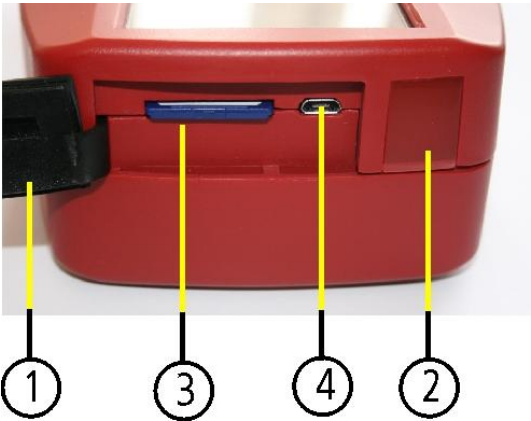
1	Cover
2	IR-interface
3	SD-card reader (only by using a MRU-SD-CARD we can assure the compatibility of all analyzer functions)
4	USB-port and charging port

5.3 Analyzer Connectors - bottom side
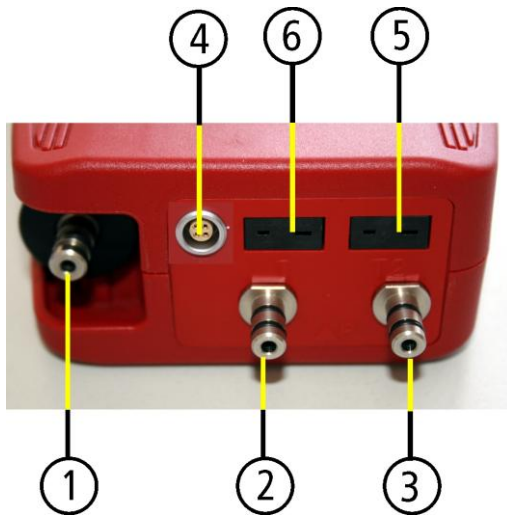
1	Sampling probe connection Condensate separator
2	Pressure connection 1 (Draft)
3	Pressure connection 2 (Differential pressure)
4	Connector AUX (optional)
5	Temperature connection 1 / T-Ambient air (combustion air)
6	Temperature connection 2 / T-gas

Note:
If during zeroing T air (5) is disconnected, then value of T gas at the end of zeroing will be used. In this case, the measuring value will be displayed green coloured.
If T air (5) will be connected during the measurement, then true T air measurement will occur and the display color changes from green to black.

5.4 Analyzer Back

1	Fixing magnets
2	Gas outlet
3	Handle strip
4	Analyzer feet

⚠️

Important!
During measurement the gas outlet must not be covered

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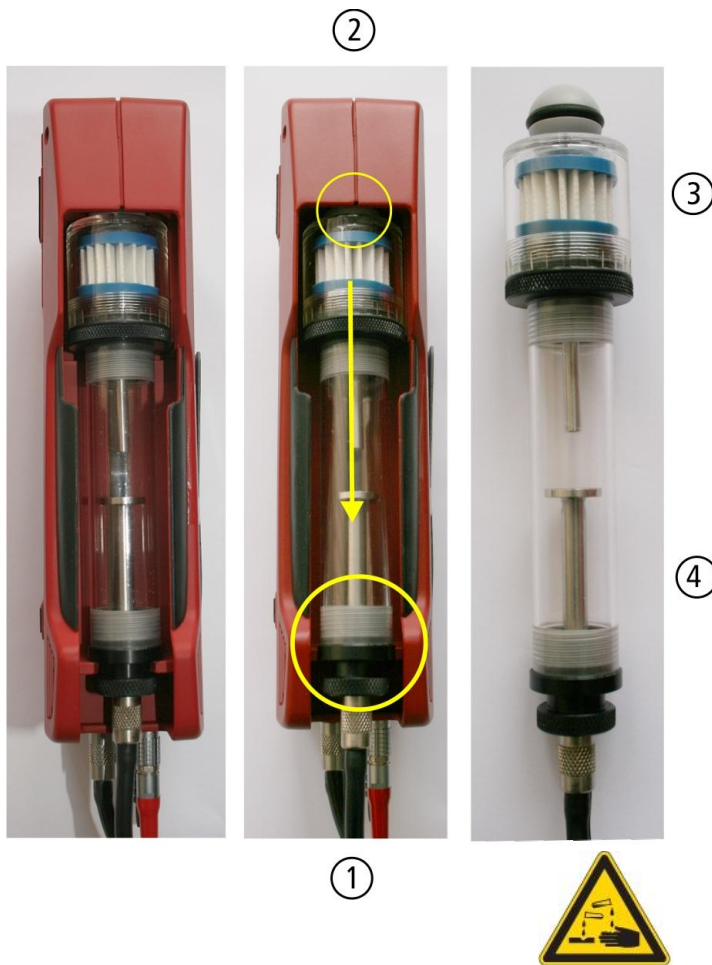
Remove the condensate separator by pulling it towards you (1) out of the groove of the OPTIMA 7 housing, then pull it downwards (2).

The condensate show glass is screwed into the plug. The complete condensate separator can easily be taken apart for cleaning or for exchanging the star filter. (Condensate separator details are included in the service manual)

After cleaning a leaknes check (see chap. 13.4) must be done!

6 ACCESSORIES

6.1 Sampling gas probes

The OPTIMA 7 BIOGAS s available with different probes, both with exchangeable probe tubes.
A complete list of available probes can be found in the current price list of this analyzer.

Probe

With 300 mm exchangeable probe pipe
and 2,7 m sampling line
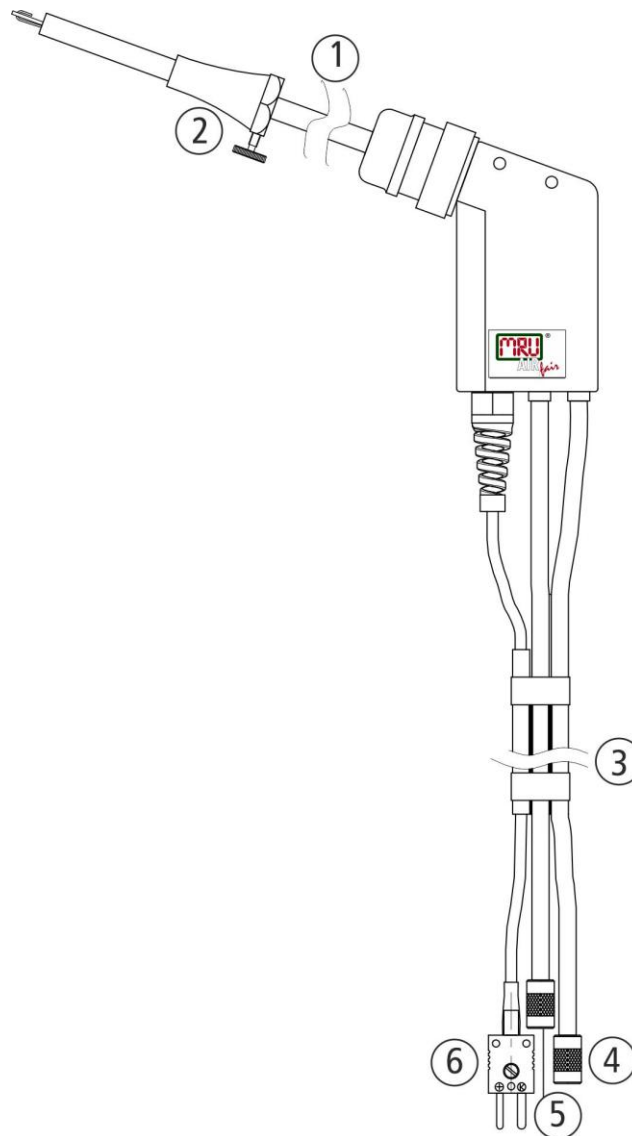
1	Probe tube
2	Probe cone (high grade steel)
3	Triple hose (NBR or Viton)
4	Connector for sample gas measurement
5	Connector for draft measurement
6	Connector for temperature measurement

7 OPERATING THE ANALYZER

7.1 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)
6	Battery charge condition

7.2 The Keypad

Description and function of the keys:

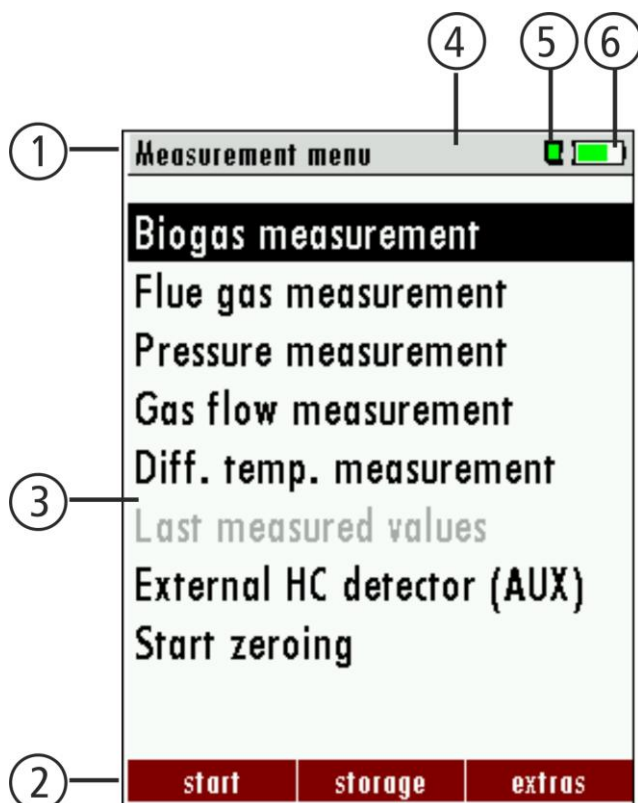|		
ON/OFF		Press to start the analyzer without delay. The power off function will be delayed to protect the sensors. If there is not enough ambient air the analyzer will recommend the purging of the sensors.
Function Keys		Activates the functions seen on the display (2 function key bar)
Menu Key		Will 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.

7.3 Menu configuration

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

- Menu Measurement → all tasks for the measurement programs of the analyzer. Here you can select all installed and available measurement programs.

- Menu Memory → all tasks for the management of the data memory available – if activated in EXTRAS/settings.

- Menu Extras → all the other available tasks – for management and customizing your analyzer.

OPTIMA 7 Biogas

Measurement menu	Storage menu	Storage menu	Extras menu
Biogas measurement	View measurements	Sites administration	Settings
Flue gas measurement	Delete measurements	Delete all sites	Date & time
Pressure measurement	Measurements to SD card	Sites from SD card	Service menu
Gas flow measurement	Memory info	Sites onto SD card	Default settings
Diff. temp. measurement		View measurements	Service values
Last measured values		Delete measurements	Leak proof test
External HC detector (AUX)		Measurements to SD card	Contents SD card
Start zeroing		Memory info	Device info
start storage extras	measure View extras	measure View extras	measure storage settings

or

Please read chapter 11 for details.   Please read chapter 12 for details.   Please read chapter 13 for details.

The sites administration can be switched off. Therefore only one site is active.
Each measurement will be stored on site 1!

Attention!
All measurementa will be deleated by switching the site administration ON/OFF!

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

8 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.

8.1 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

8.2 Analyzer settings

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

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

- LED condensate separator

- Language

- Helping hints

- Tastatursignal an/ab – stellen
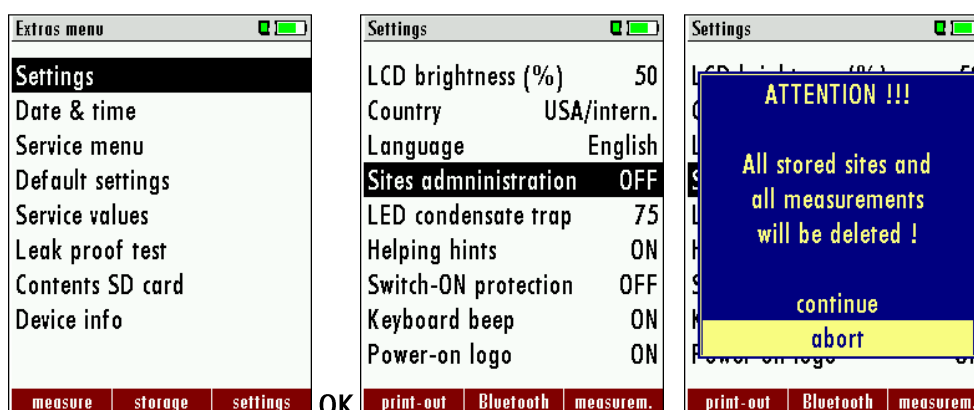
LCD brightness	5 – 100 %	Display-brightness, depending on temperature and also on the personal judgement of the user, at 20°C a value of ca. 50% is normal
Language	option	Select device languages
Country	option	Enables some country specific parameters like fuel types, calculated values etc.
Site adminstration	ON / OFF	The sites administration can be switched off. Therefore only one site is active. Each measurement will be stored on site 1! **Attention!** All measurementa will be deleated by switching the site administration ON/OFF!
LED condensate separator	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
Logo switch ON	ON / OFF	Logo will be displayed

Settings measurement:
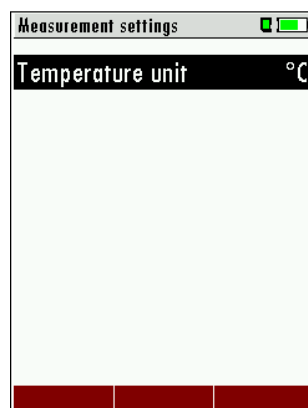
Temperature Unit	°C, °F	Change the unit for temperature in all screens
Pressure Unit	Pa, hPa/Pa, hPa, kPa/Pa, kPa, mbar, mmH2O, cmH2O, inH2O, mmHg, inHg, PSI,	Change the unit for pressure in all screens. The meaning of hPa/Pa and kPa/Pa is that the instrument performs a dynamic change of unit depending on the absolute value of pressure.

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."

8.2.1 Switch-ON protection

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

8.2.2 Setting printer type
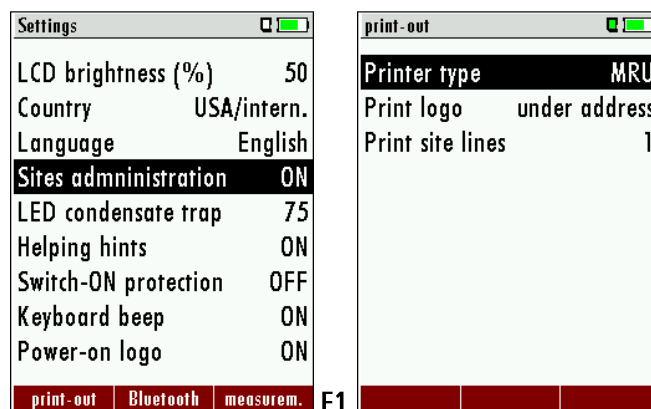
Printer type	MRU / HP	Select printertype

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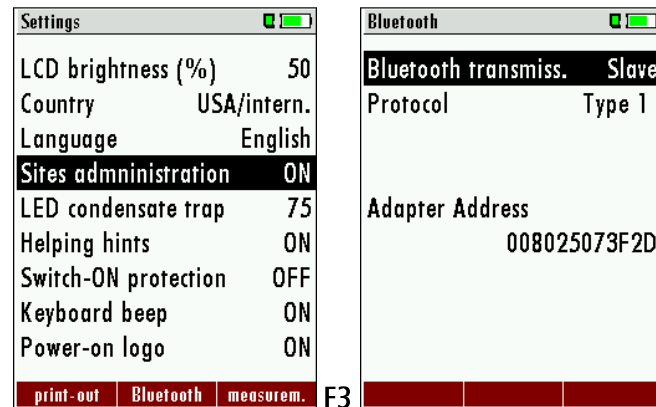
If RemoteData, OnlineView or MRUConnect (PDA) with Bluetooth is used, the SLAVE move mode must be selected. The auto connect mode must be switched OUT.

8.3 Setting time and date
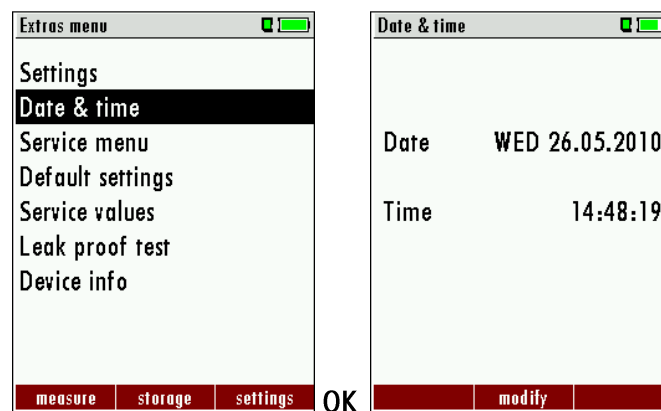
F2	Edit
▲, ▼	Change the marked number
◄ ►	Move the cursor to the next position
ESC	Return to *Extra-Menu*

8.4 Configuration of measurement program

The following settings are possible:

- 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

8.4.1   Setting the CO ppm limit values (only flue gas measurement)

The CO ppm limit can be adjusted in the window „Measuring program selection".

Select one of the available programs (arrow up/down) then press the F1 key.
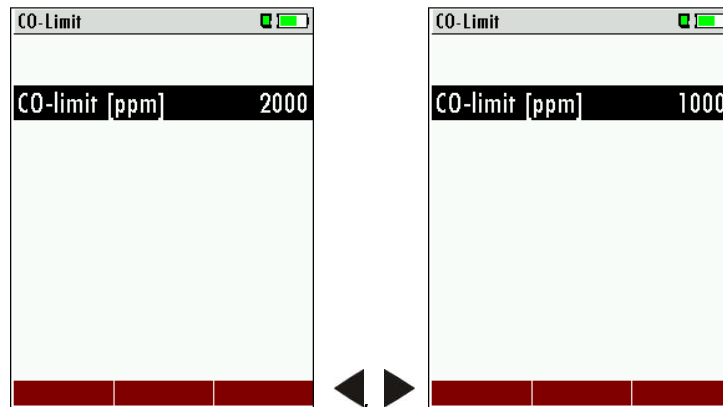
▲▼◄►	The CO-ppm limit value can be adjusted in 100 ppm steps between 300 ppm and 4.000 ppm / 10.000 ppm
OK or **ESC**	Return to the measurement window

8.4.2   Configuration of the measurement window (display content) – only BIOGAS measurement

Start the measuring program – once you are inside the measuring window press the ![menu icon] key.

![Menu key icon] **Menu key**

8.4.3   Configuration of the measurement window (display content) – only Flue gas measurement

Start the measuring program – once you are inside the measuring window press the ![menu icon] key.

![Menu key icon] **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 postion 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.

8.4.4 Configuration of the zoom function

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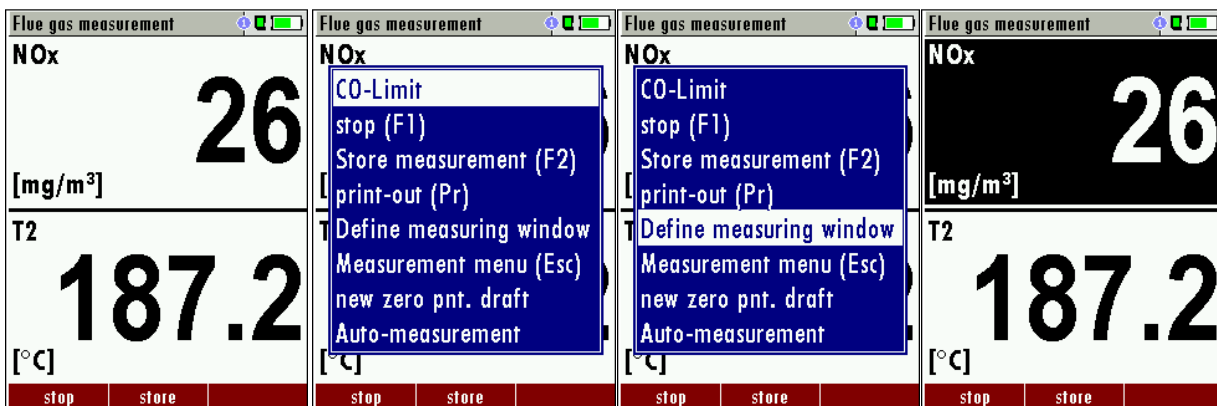
 Menu key

▲▼	Change Zoom window 1..3
◄►	Change measuring values
	Save measuring window and save configuration

9 MAINTENANCE

9.1 Maintenace and cleaning

The OPTIMA 7 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 OPTIMA 7, so that the hose can dry

- after longer disuse load battery first and afterwards approx. all 4 weeks

10 PREPARATION FOR EACH MEASUREMENT

10.1 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!

10.2 Auto OFF

The instrument is automatically switched off after 60 minutes. During a measurement or a battery charging cycle the auto off is deactivated.
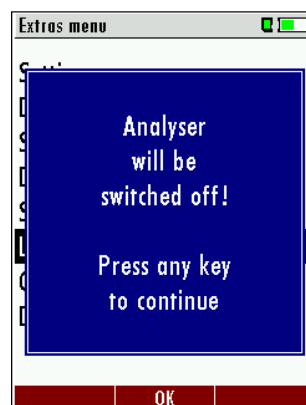
During a measurement or battery charging with the power supply or USB cable is Auto OFF deactivated. Auto-off Funktion deaktiviert.

10.3 Measurement with battery charger/battery charging

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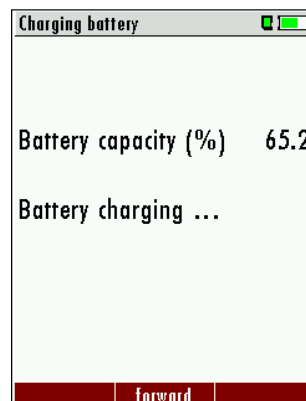
Once the battery is fully charged the analyzer will switch to trickle charge mode.
At the moment, if the battery is fully charged and the trickle charge mode begins, an acoustic feedback will be played.

10.4 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.

10.5 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. 14), you will see the following messages on the display.

 or
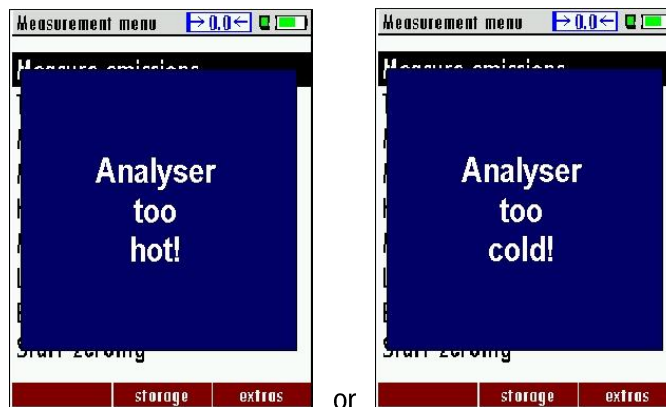
Once one of these messages appears you will not be able to use the analyzer, it will give an acoustic signal until it has reached the specified operation temperature between +5°C and +45°C.

10.6 Condensate separator

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

10.7 Connectors and leak tightness

- Check all push on connectors for proper fit.

- Check all hoses, hose connectors and the condensate separator.

- Start separate instrument tightness test (see chap. 13.4)

10.8 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.
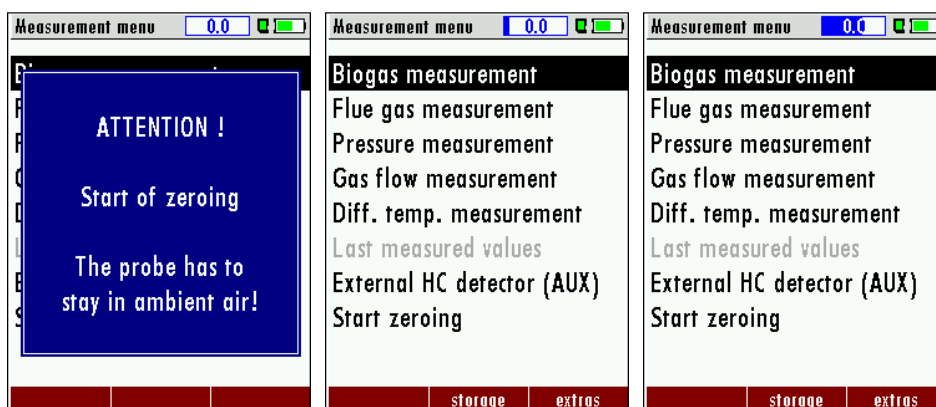
Once the zeroing cycle is finished the analyzer is ready for measurement.

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.
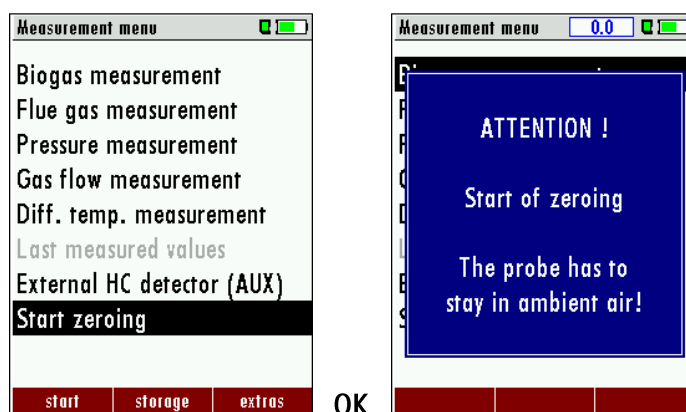
▲, ▼	Zeroing
OK	Start zeroing

11 HOW TO TAKE A MEASUREMENT

Every OPTIMA 7 BIOGAS is capable of making a complete BIOGAS measurement. How to perform this is described below.

11.1 Selection of the measurement program

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

▲▼	change measuring program
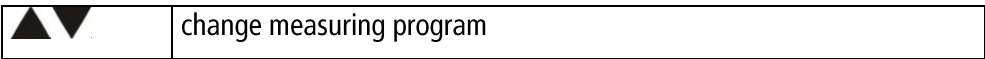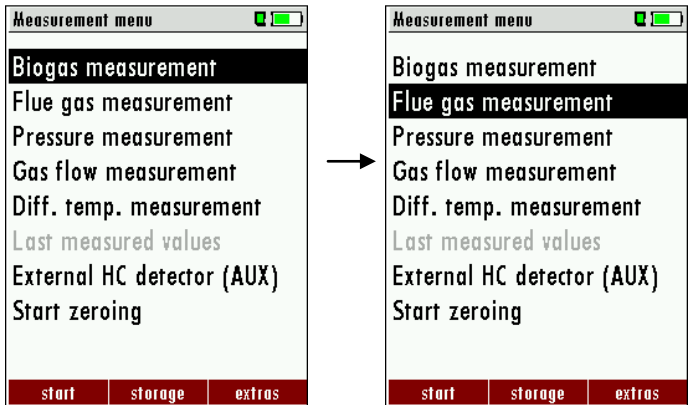
11.2 BIOGAS measurement
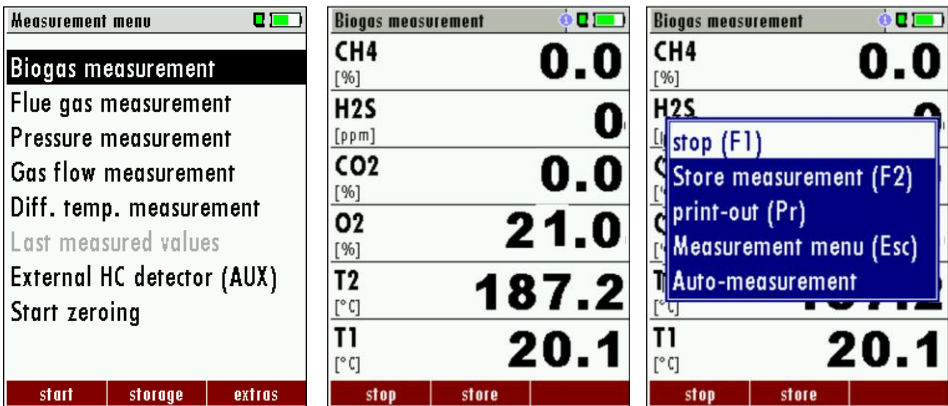
F1	Measurement: start / stop
📁	Menu key
F2	Store measurement
Printer	Print display content
ESC	Back to measurement menu
	Automatic measurent with data logging (chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)

11.3 Flue gas measurement (option)

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

The order of the display is operator settable. (see chap. 8.4.2).
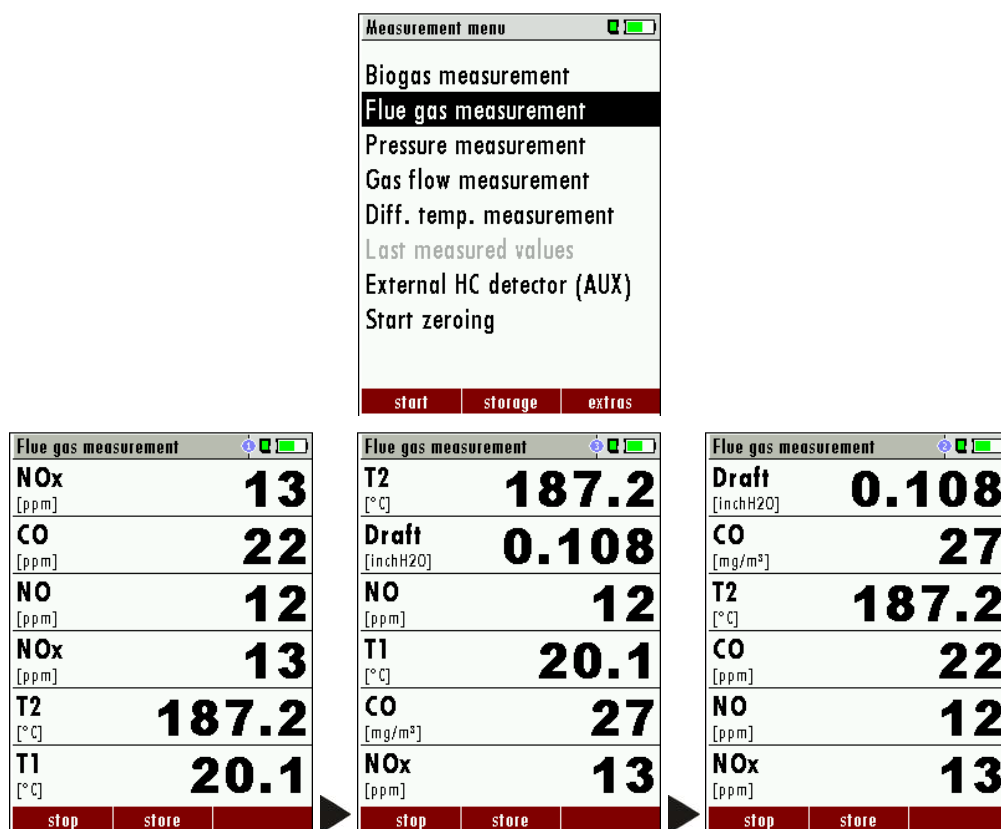
There are direct measured values available such as Oxygen and Temperature as well as calculated values such as dew point, efficiency and CO_2. You will also find the same measurement value in different calculated values such as CO in ppm or CO in mg/kWh.

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". (see chapter 6)

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

Zoom function, each with two values, is activated by moving the arrow keys up and down. Moving arrow keys left and right pages between the two zoom windows.
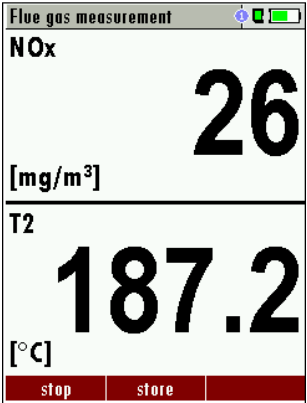
11.4 CO-limit (only with optional flue gas neasurement)
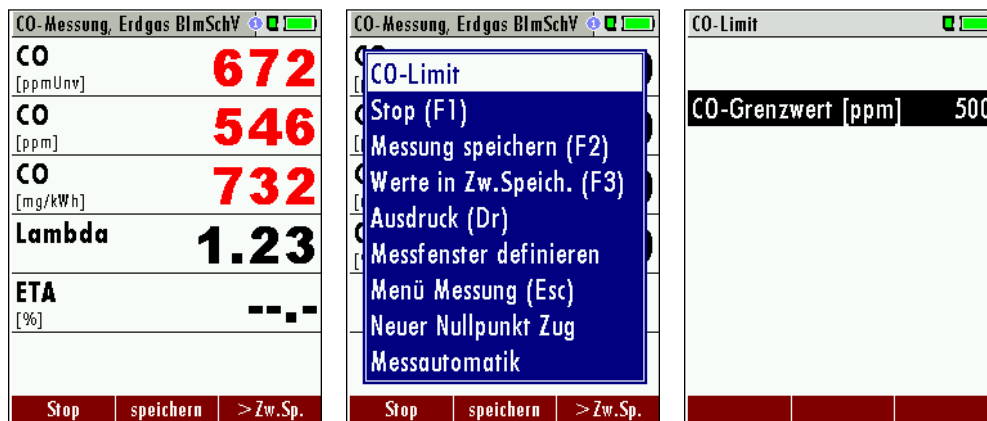
If the CO limit value is exceeded, the color of the measured CO values changes (red).

11.5 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 12.

11.6 Printing the measurement 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:
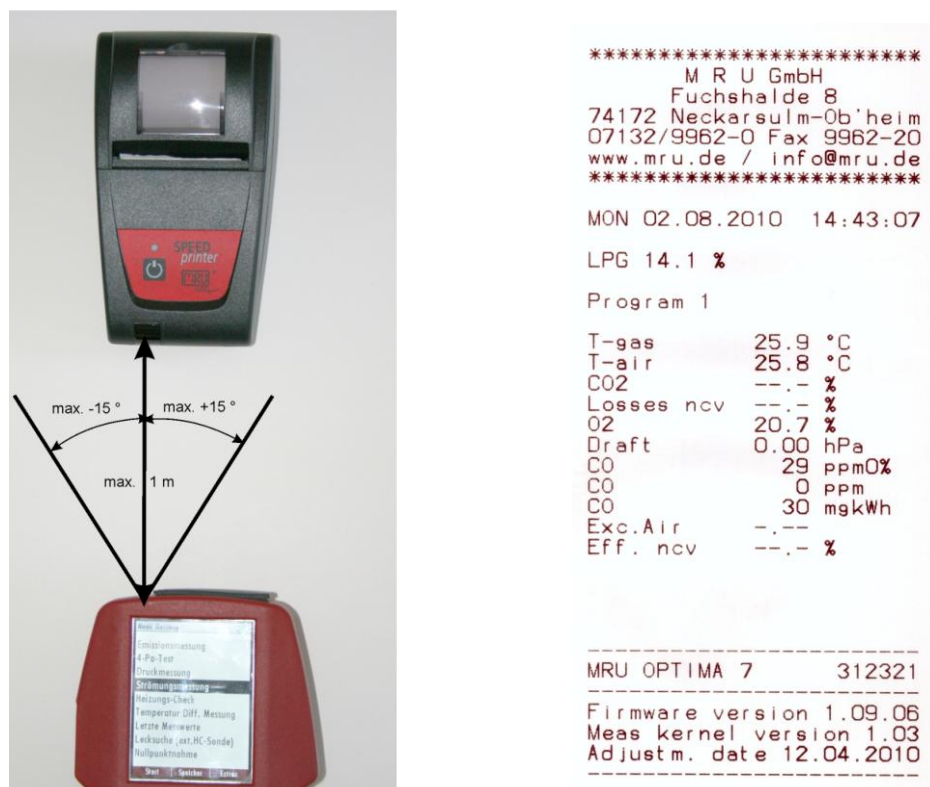
All values that can be seen in the measurement window on all three pages will be printed, double measurement values will only be printed once.

Further technical specifications as well as battery and paper rolls changes please see separate printer manual.

11.7 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. 11.10).

Return to the measurement menu by pressing the ESC key.

11.8 Pressure measurement (option)

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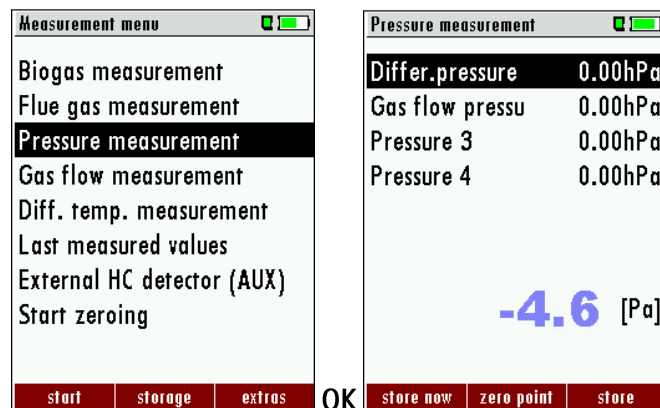
▲, ▼	Select the measurement name 1-4
F1	Save the measured value to one of the measurement name
F2	Zeroing the pressure sensor
F3	Change the name of the measurement category
ESC	Return to the measurement menu

11.9 Differential temperature measurement (option)

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.
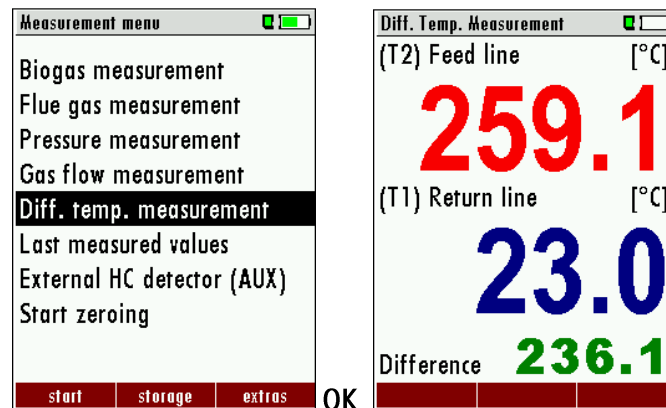
Note:

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

11.10 Last measurement results

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

In the main menu ″Measurement″ select the point ″last meas. values″.
The last values can be viewed, printed and/or saved.
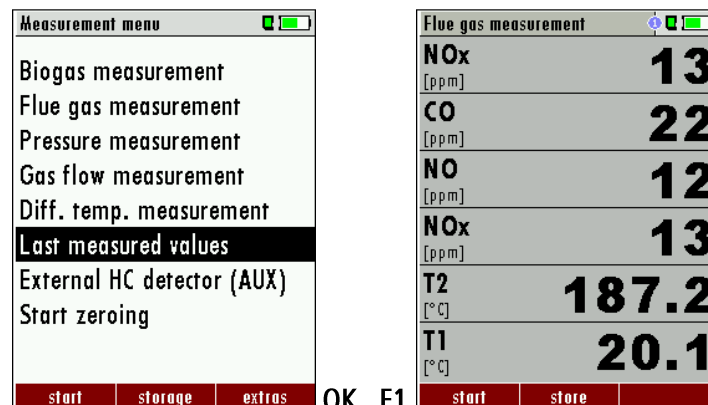
Above the F1 key ″Start″instead of ″Stop″ is displayed. Pressing this key will continue the measurement.

12 DATA STORAGE (SITE ADMINISTRATION)

Only availiable if the site administration is activated (EXTRAS/settings)
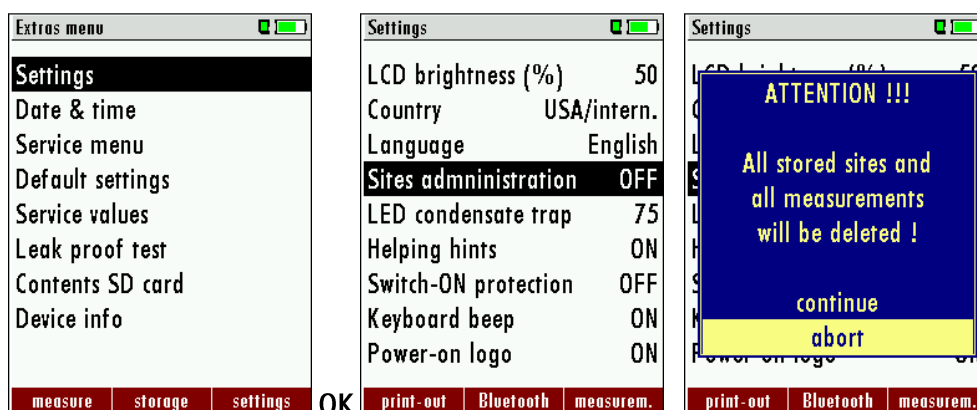
12.1 Organisation of the data memory

Basis of the data memory of the OPTIMA 7 BIOGAS is a set of sites stored in the device. Every site exists of an unique site number and 8 freely usable text lines which can have, e.g., the address, customer name etc.

The device can store up to 4000 different sites.

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

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

12.2 Information about the data memory

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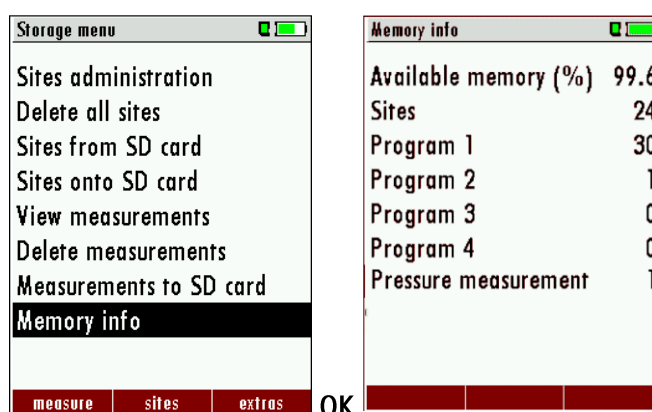
12.3   Site administration

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.

12.3.1   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"
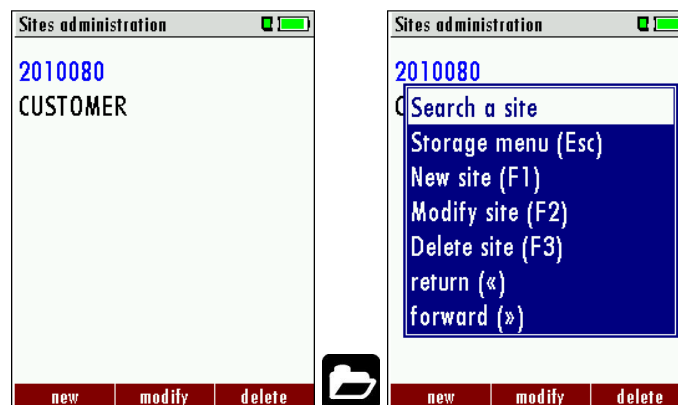
- Now you can enter the text to be searched for the first line, i.e. the site number, or for the second line, or for the rest of the text lines.
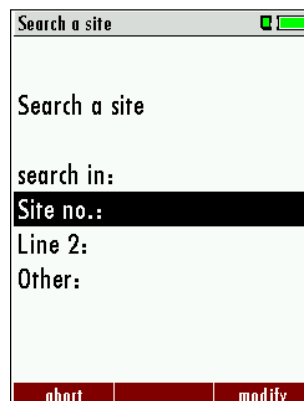
- Select the line for searching (site no. No., line 2, or rests) and select F3 "modify"

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

- Select after input of the search text F2 = "start"
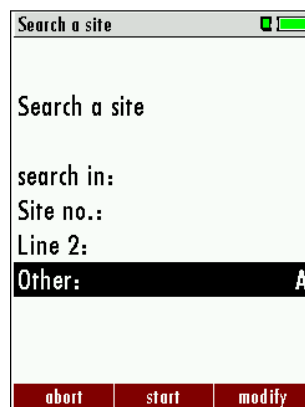
- If only one site is found as a result of the search, this is displayed. If became several sites the total number is found in the header viewed and you can scroll by this found standing with the arrow keys.

◄►	Page through the sites
📂	Menu key: Search site ▲, ▼: Selection of the input field **F3:** Input mask, see chap. 15.1 **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

12.3.2 New entry and change of sites

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

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

- The first line which must contain an unequivocal site number to the identification of the site. With the function F2 = „auto no. "can assign the device automatically a free site number.

- All further free text lines which can contain, e.g., name and address.

Storage menu	Sites administration	Modify site
Sites administration	**2010080**	**Site no. (required)**
Delete all sites	CUSTOMER	Free text (e.g. name)
Sites from SD card		Free text (e.g. name suppl.)
Sites onto SD card		Free text (e.g. street & no.)
View measurements		Free text (e.g. ZIP & town)
Delete measurements		Free text
Measurements to SD card		Free text
Memory info		Free text
		Free text
measure sites extras **OK**	new modify delete **F1**	modify auto no. **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".

Modify site	Modify site	Sites administration
A	**A**	A
A	Free text (e.g. name)	
A B C D E F G H I J K L M	Free text (e.g. name suppl.)	
N O P Q R S T U V W X Y Z	Free text (e.g. street & no.)	The new site
a b c d e f g h i j k l m	Free text (e.g. ZIP & town)	has been stored
n o p q r s t u v w x y z	Free text	
0 1 2 3 4 5 6 7 8 9 ! # &	Free text	
( ) * + , - . / : ; = ?	Free text	
Ä Ö Ü ä ö ü ß @ € á à é è	Free text	
delete insert set char. **or F2**	modify store **F3**	
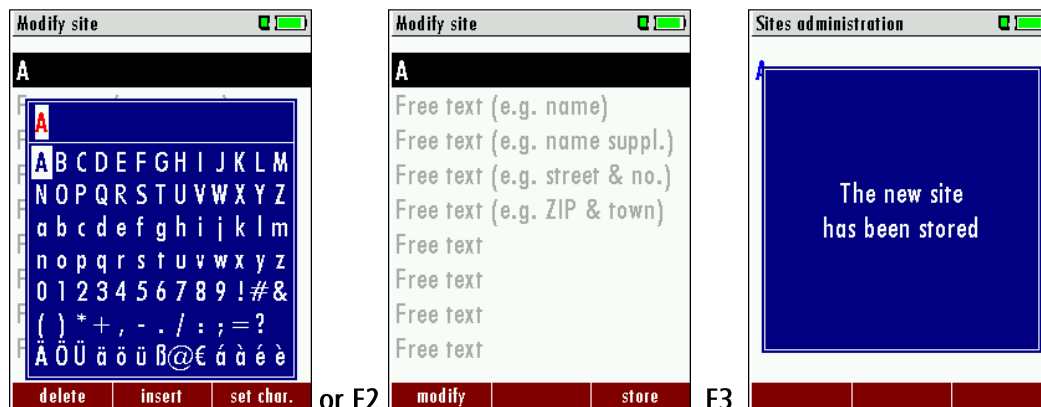
12.3.3 Delete sites

You are able to

- delete the displayed sites only by selecting the menu entry "F3" = "delete

- or delete all sites at the same time

Storage menu	Storage menu
Sites administration	**ATTENTION !!!**
Delete all sites	
Sites from SD card	All stored sites and
Sites onto SD card	all measurements
View measurements	will be deleted !
Delete measurements	
Measurements to SD card	continue
Memory info	**abort**
measure sites extras **OK**	measure sites extras
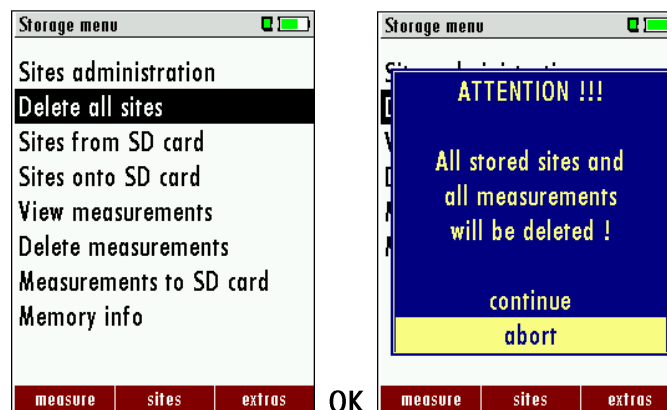
This user's decision must be confirmed. (see chap. 15.2).

12.4 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. 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

12.4.1 Import of Sites

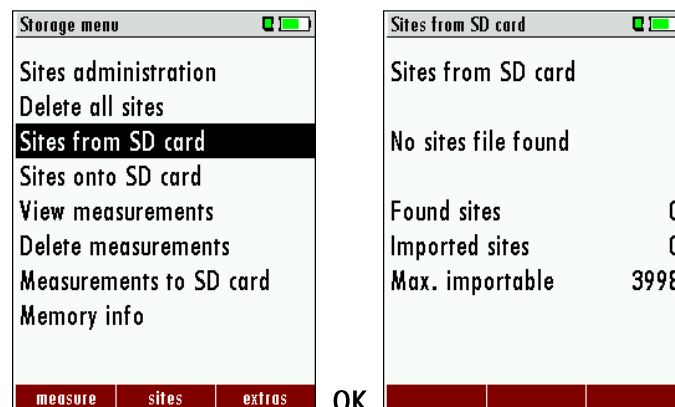| Storage menu	🔋	Sites from SD card	🔋
Sites administration		Sites from SD card	
Delete all sites			
Sites from SD card		No sites file found	
Sites onto SD card			
View measurements		Found sites	0
Delete measurements		Imported sites	0
Measurements to SD card		Max. importable	3998
Memory info			
measure	sites	extras	**OK**

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.

12.4.2 Export of Sites
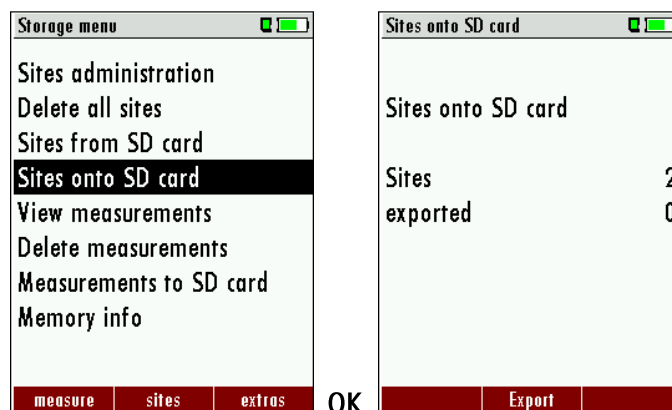
This function can be used for an analyzer back up or if you wish to supply the analyzer information to a computer program or another analyzer. This is very handy if you have made some modifications inside the analyzer (site) for example if you have modified the phone number of a customer and this modification 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 ‚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".

12.4.3 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 ‚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 (frequently the site name), 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.

12.4.4 Export of Differential Pressure Measurements

The same function as under 12.4.3(Export of Flue Gas Measurements) 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.

12.5 Measurements in the data memory

12.5.1 View measurements

In the menu item „View measurements"you can inspect the stored measurements. After selection of this item you receive first an overview of the number of the stored measurements according to measuring type.
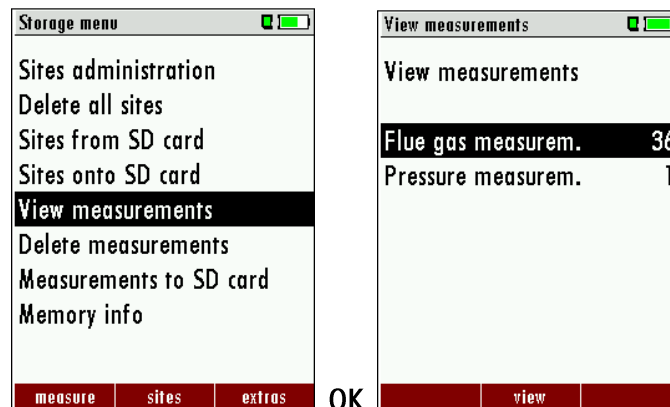
- Select flue gas measurement or another measuring type.

- Then you receive first a page with context information to the stored measurement. Scroll with the arrow keys by the context information of the stored measurements.
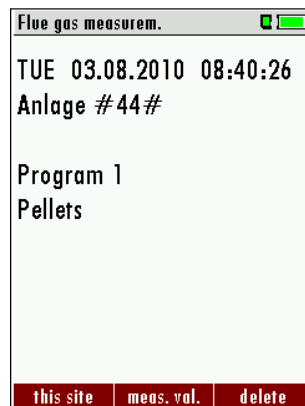
- With F2 = "measured value" are displayed the measured data of the stored measurement in detail, available in 3 measuring value pages, as they are defined in the measuring value window.
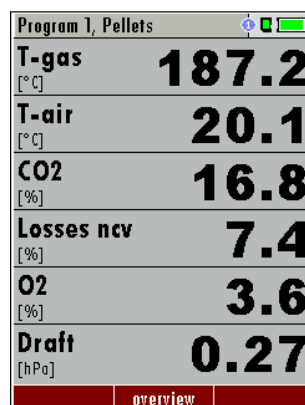
- With ESC you return to the context information of the measurement.

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

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

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

12.5.2 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.

12.5.3 Export measurements to a SD card (optional)

The OPTIMA 7 BIOGAS offers the possibility to export all stored measurements to a SD card.
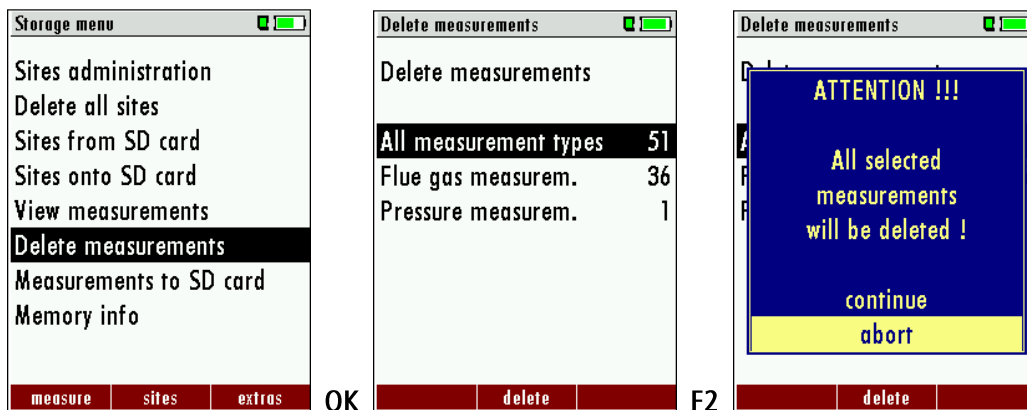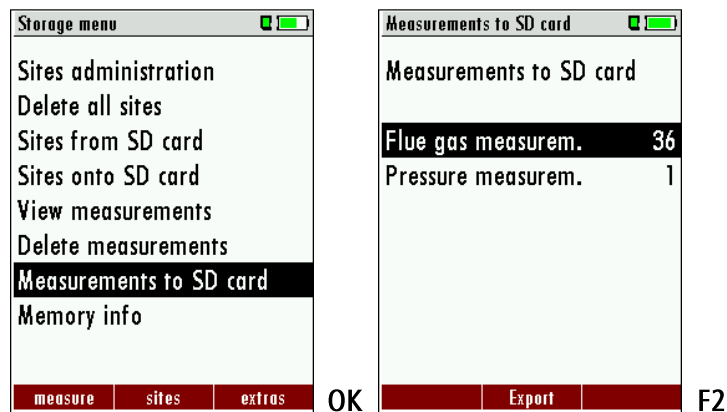

By confirming with the F2 key the data transmission / export on the SD card is started.

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

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

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

13 EXTRAS / ADJUSTMENTS

The OPTIMA 7 BIOGAS is delivered in a standard software configuration which should cover most needs. However, there are many ways to tailor the settings to your individual needs if required. The possibilities are highly flexible and individual adaptable.

Use the variable possibilities to adapt your analyzer to your own needs and customize the measurement menu, the measurement window, the printer out put and many other features. Usually this is something you will do once you

receive the analyzer, once you have adapted your analyzer you will most probably don't make much changes in future, but you can when ever you need and want to do so.

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

13.1 Maintenance adjustment menu

The Maintenance adjustment menu is secured with a Pin Code to protect it against unauthorized users.
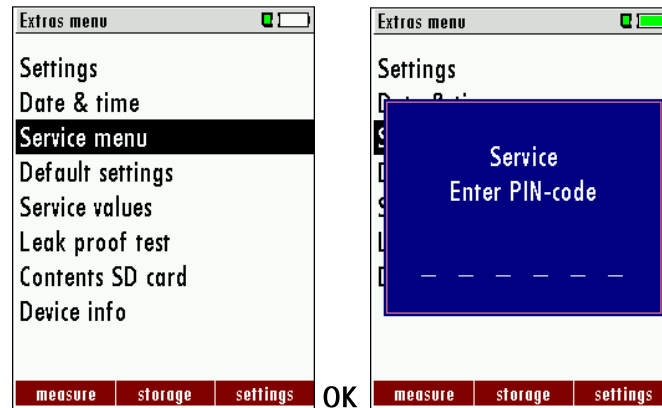
If you enter a wrong pin code you will be exited into the "Extra Menu" again.

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.

13.2 Manufacturer default settings
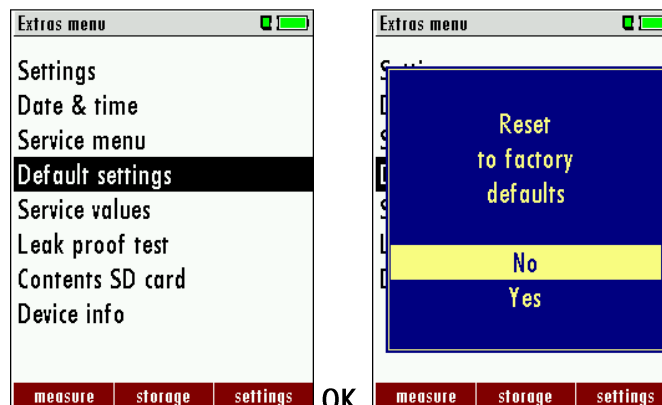
The analyzer will be reset to original delivery settings.

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

CO-ppm limits
Measurement window selection and others.

13.3 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.

Extras menu		Service values	
Settings		O2 [mV]	9.745
Date & time		CO [mV]	0.007
Service menu		CO/H2 [mV]	0.003
Default settings		TC-AIR [mV]	-0.075
Service values		TC-GAS [mV]	-0.051
Leak proof test		PT-REF-I [kR]	1.105
Contents SD card		TC-LEMO [mV]	585.000
Device info		PT-REF-L [kR]	1951.056
		U-Batt [V]	3.972
measure	storage	settings	OK	Gas pump	Purge pump
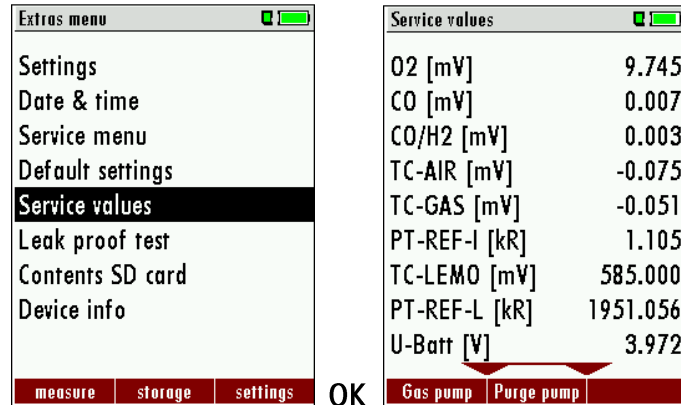
▲, ▼	Jump between the lines
F1	Function test gas pump (on / off)
F2	Function test purge pump (on / off)
ESC	return

13.4 Leak proof test

With the leak proof test the system is checked by the device (incl. the condensate separator) 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 leakness of the system will be determined.

Operation:

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

- Launch under "extras" the leak proof test on which the following window will pop up:
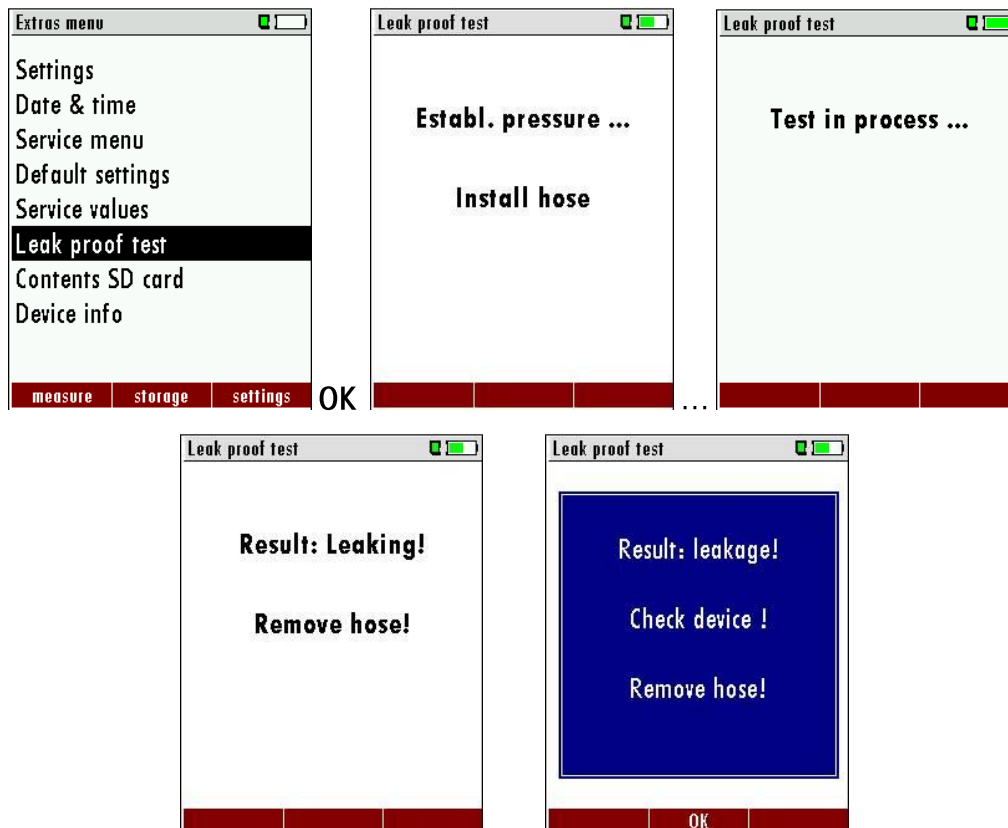
If no undensity is ascertained the OPTIMA 7 BIOGAS has to be checked in a service department (worldwide service departments see www.mru.eu).

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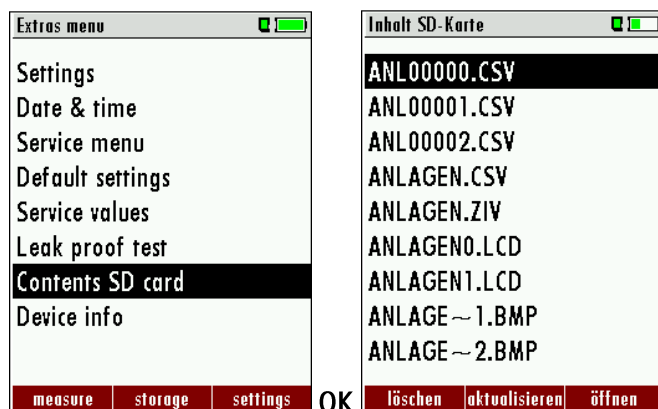
The contents of the SD card will be displayed. With F3 the selected file can be opened.

13.6 Analyzer info

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

14 TECHNICAL SPECIFICATIONS

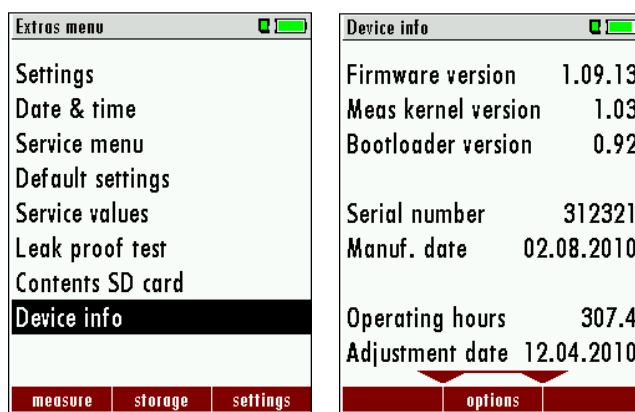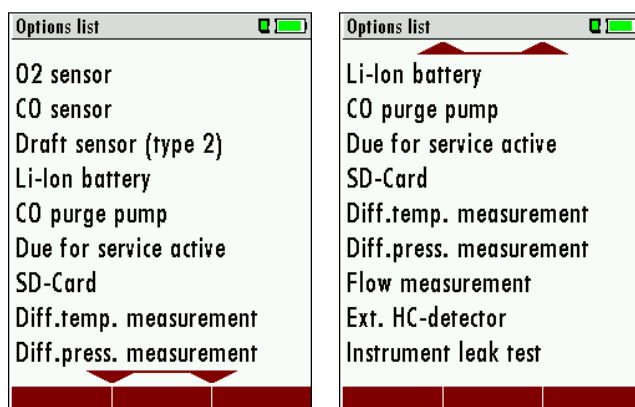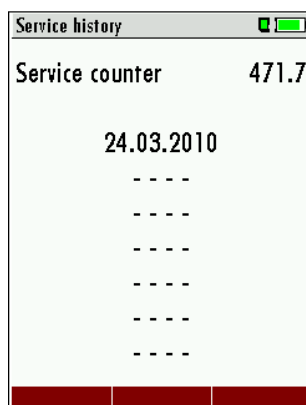| *Measured values*	*OPTIMA 7 BIOGAS*
O_2	
Measurement range	0 - 21,0 Vol-%
Accuracy	± 0,2 Vol-% abs.
Reaction time T90*	< 20 s
CH4 (2-gas NDIR)	
Measurement range	0 - 100 Vol-%
Accuracy	± 0,5 % abs. or** 5 % of the measured value
Reaction time T90*	< 35 s
CO2 (2-gas NDIR)	
Measurement range	0 - 60 Vol-%
Accuracy	± 0,5 % abs. or** 5 % of the measured value
Reaction time T90*	< 35 s
CO (H_2 komp.)	
Measurement range	0 - 4.000 ppm, overload up to 10.000 ppm***
Accuracy	± 10 ppm or** 5 % of the measured value up to 4.000 ppm
	or** 10 % of the measured value up to 10.000 ppm
Reaction time T90*	< 40 s
CO low	
Measurement range	0 - 300 ppm, with 0,1 ppm resolution
Accuracy	± 2,0 ppm or ** 5 % of the measured value
NO	
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
<	< 30 s
NO low	
Measurement range	0 - 300 ppm, with 0,1 ppm resolution
Accuracy	± 2,0 ppm or ** 5 % of the measured value
NO2	
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*	< 40 sec

H2S

Measurement range	0 – 200 ppm, overload up to 2.000 ppm***
Accuracy	± 5 ppm or** 5 % of the measured value up to 200 ppm
	or** 10 % of the measured value up to 2.000 ppm
Reaction time T90*	< 40 sec

Flue gas temperature T_A

Measurement range	0 - 1.000 °C
Accuracy	± 2 °C ≤ 200 °C
	1 % of the measured value > 200 °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

CO_2

Measurement range	0 - CO_2 max
Accuracy	± 0,3 Vol-% abs.
Dew point	°C
Losses qA	0 - 99,9 %
Efficiency ή	0 - 120 %
Excess Air	0 - 999 %
Air ratio	1,.. – 19,9
Measurement values as	mg/Nm^3, O_2 in relation, mg/KWh, NOx as mg/Nm^3 NO$_2$, 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
Stromversorgung	Internal: Li-Ion battery pack 3,7 V/ 5.800 mAh, Max. 10 h operation time dependent on the used options
	External:wall-plug grid power supply, 100 - 240 Vac / 5,0 Vdc / 1200 mA / 50 /60 Hz
Weight	ca. 750 g
Size	244 x 113 x 54 mm
	* typical sensor value, ** which ever is larger,
	***only for SHORT-TERM measurement

Technical changes possible at any time!

Rev date: 20121126

15 APPENDIX

15.1 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:

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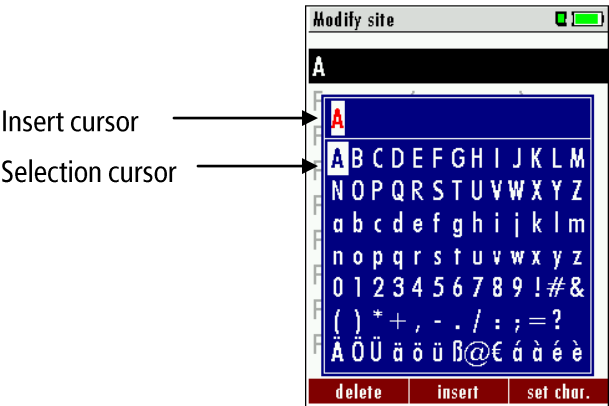
▲, ▼, ◄, ►	Select a letter, number or sign
F1 – delete	The letter left of the cursor will be deleted
F2 – insert	Selected letter or number will be inserted
F3 – over write	Selected letter or number will over write the current letter or number
ESC	Abort the window, changes will NOT be saved

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

The OPTIMA 7 BIOGAS will ask you now and then to confirm the action that will be taken.
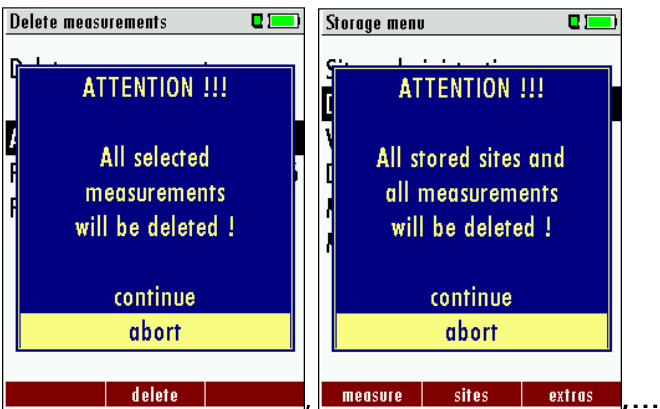
▲, ▼	Select a line
OK	Confirm the action
ESC	Abort the window, changes will NOT be saved

15.3 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 OPTIMA 7 BIOGAS and your PC / Laptop. (Requires operating system Windows XP or Windows 7).

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

Check list:

1. Switch on the OPTIMA 7 BIOGAS

2. Connect the USB cable to the OPTIMA 7 BIOGAS

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 OPTIMA 7 BIOGAS is as HID-conform unit registrated.

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.
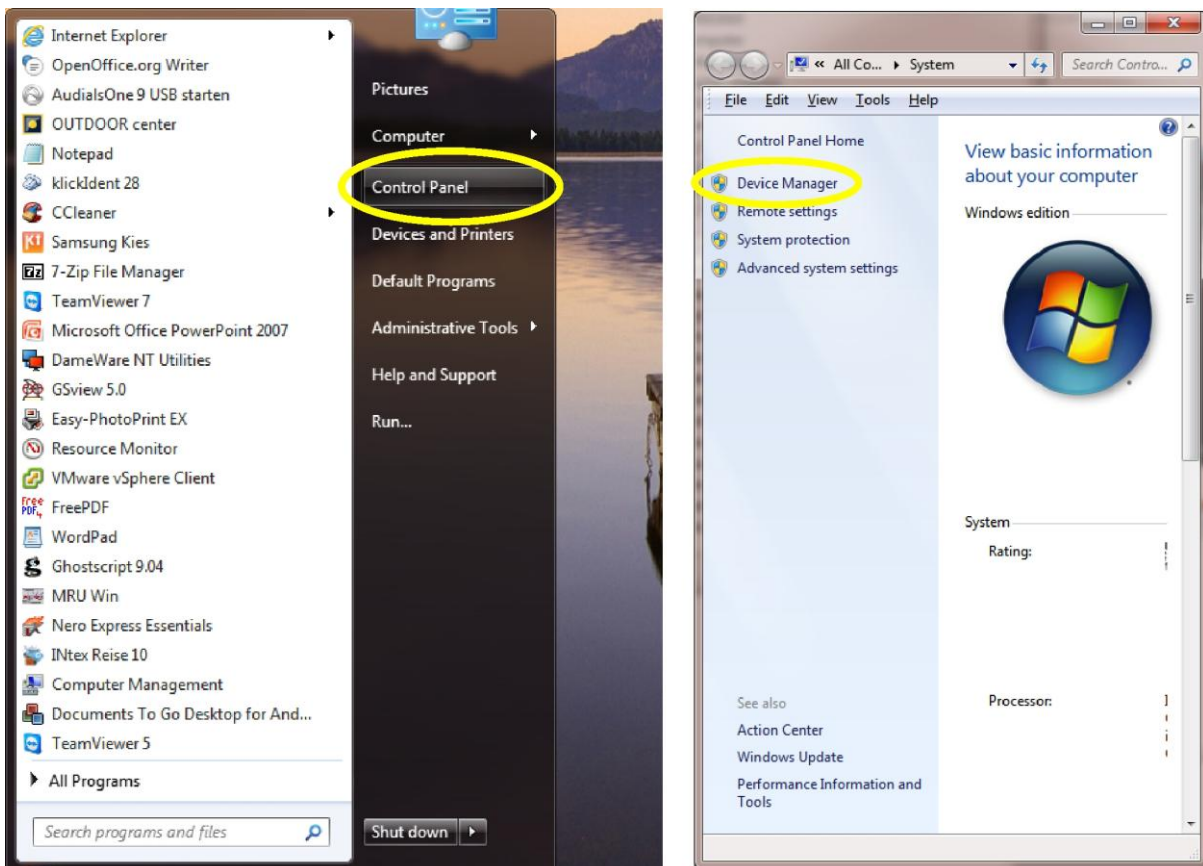
(The grafics may look different on your PC/Laptop as shown in this manual!)
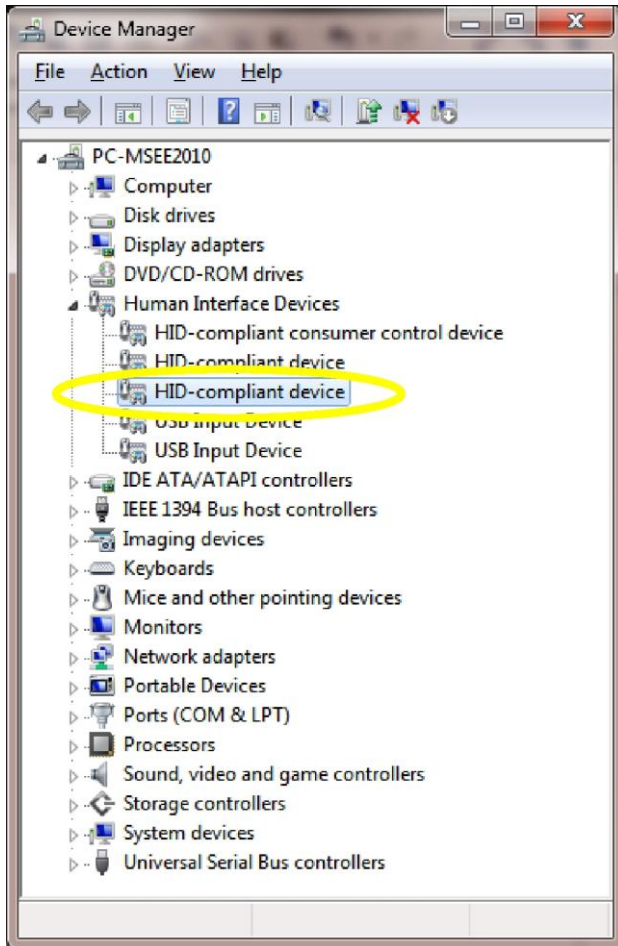
The OPTIMA 7 is registrated as HID-conform unit.
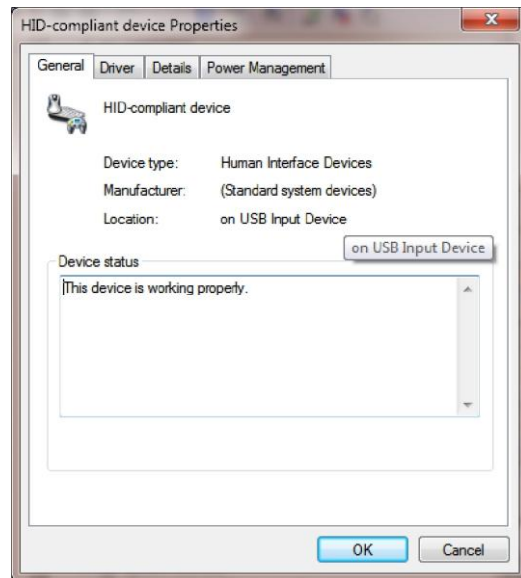
In the General folder you can see if the unit is ready for operation.
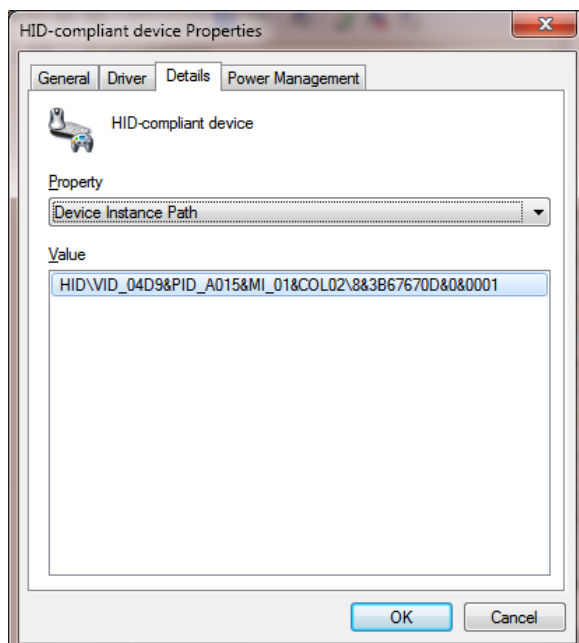
In case the analyzer id not ready for operation, choose a different USB instrument to check the USB port on your computer, and/or connect the OPTIMA 7 BIOGAS to a different computer to locate the error.

15.4 Bluetooth specifications

Bluetooth Class 2

Range: up to 10 Meter

Type-description: +B20

Bluetooth listing identifier: B011904

Option Bluetooth® Certification

EU countries

Belgium (BE), Bulgaria (BG), Denmark (DK), Germany (DE), Estonia (EE), Finland (FI), France (FR), Greece (GR), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Sweden (SE), Slovakia (SK), Slovenia (SI), Spain (ES), Czech, Republic (CZ), Hungary (HU), United Kingdom (GB) and Republic of Cyprus (CY).

Other EFTA Countries

Iceland, Liechtenstein, Norway and Switzerland

Non-european countries

Japan, Columbia, Turkey

15.5 Analysis and calculations

Measured values	Unit
O_2	[%]
Temp. Ambient air (Thermocouple)	[°C]
Temp. Flue gas (Thermocouple)	[°C]
CO	[ppm]
CO_2	[%]
Pressure	[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
Air ratio	-
Dew point	[°C]
CO/CO2 ratio	[%]

15.6 Errors

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

15.6.2 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.

15.7 Declaration of conformity

EG-Konformitätserklärung

Declaration of conformity

CE
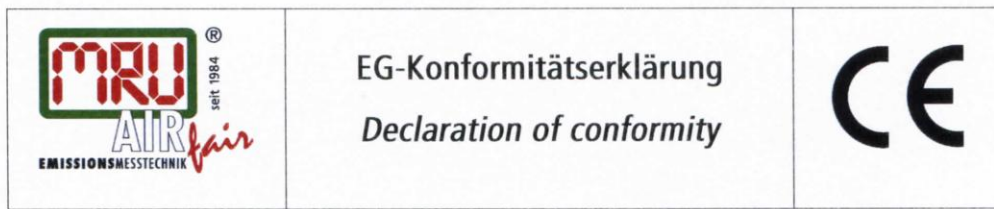
MRU Messgeräte für Rauchgase und Umweltschutz GmbH

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

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

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

Produkt/Product
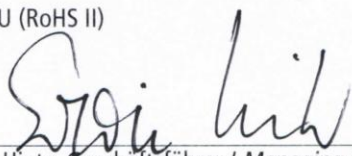
Bezeichnung /*designation:*	Gasanalysator
	Gas analyser
Produktname / *name:*	OPTIMA7 BIOGAS
Funktion / *function:*	Gasanalyse / *gas analysis*

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

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

- EMV-Richtlinie / *EMV-directive* 2004/108/EG
- Niederspannungsrichtlinie / *low voltage directive* 2006/95/EG
- RoHS-Richtlinie / *RoHS directive* 2011/65/EU (RoHS II)

Neckarsulm, 22.11.2013

Erwin Hintz, Geschäftsführer / *Managing Director*

Technical data change w/o notice!   Date of issue: 20131018

                                                                                          20131206

                                                                                          20140414

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