

# USER MANUAL



**EiUK**



**RASI 800**



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## Inspect Shipment for Damage

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

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



## Important notice!

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

### **Failing to properly charge the batteries will void your warranty!**

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

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

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



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

EIUK 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.



## 2 INTRODUCTION

### 2.1 The RASI 800 MCERTS

For download of the MCERTS certificate please select the following site:

[www.siraenvironmental.com/UserDocs/mcerts/MC13023300.pdf](http://www.siraenvironmental.com/UserDocs/mcerts/MC13023300.pdf)

The main task of the RASI 800 MCERTS gas analyzer is in supporting the following applications:

- Precise control- and adjustment measurements for all kind of combustions

The CO sensor is protected with the automatic purging pump.

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



## 2.2 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, and the connectors for damage and/or blockages.

When starting up the analyzer it will take approx. 4 minutes to zero depending on the condition of the sensors and of ambient.

Repeated zeroing time approx. 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<sub>2</sub> - 2 years; CO, NO, NO<sub>2</sub> and SO<sub>2</sub> 2 - 3 years.

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

## 2.3 Important information about the users/operation manual

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

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



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

## 3 SAFETY INFORMATION

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

### 3.1 Safety regulations

1. The RASI 800 MCERTS 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 EiUK factory.
3. EiUK 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. EiUK assures that the analyzer complies to the essential requirements of the legal regulations of the member states of the electro-magnetic compatibility (**89/336/EWG**) and to the low-voltage regulations (**3/23/EWG**).



### 3.2 Specific safety regulations

1. Use only the battery charger supplied with the analyzer for this instrument
2. No part of the analyzer, including the metal probe tube and all other metal parts & accessories are to be used as electric conductors.
3. The analyzer is not to be used in or under water.
4. The analyzer is not to be placed near or directly exposed to open fire or heat.
5. The specified probe temperature range is not to be exceeded, as the probe, temperature sensory mechanism and sensor could be damaged or destroyed.
6. The analyzer shall void dropping.

7. **Attention:** Caution: Moisture, being pumped out of the condensates trap can be slightly acidic. In case of skin contact IMMEDIATELY: clean affected parts of the body. Avoid getting liquid in eyes. Please carefully clean all parts that come into contact with the condensates. After measurement, vent the analyzer with ambient air and allow the probe to cool. A hot probe could cause burns or ignite flammable material.
8. Electrochemical sensors are by their operating principle not only sensitive to the gas they are intended for, but for other gases as well. This cross sensitivity is compensated by EiUK 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 EiUK in detail.



### 3.3 Guideline for Li-Ion Batteries

- The battery pack is not accessible for end users
- Li-Ion rechargeable battery pack for RASI 800 MCERTS
- 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 EiUK

## 4 RETURNED GOODS

### Packing regulation of 12.07.1991

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

#### 4.1 Return of hazardous waste

- Waste Disposal/Returns/Warranty -

EiUK 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 EiUK prepaid.

#### 4.2 Return of analyzer according to ElektroG

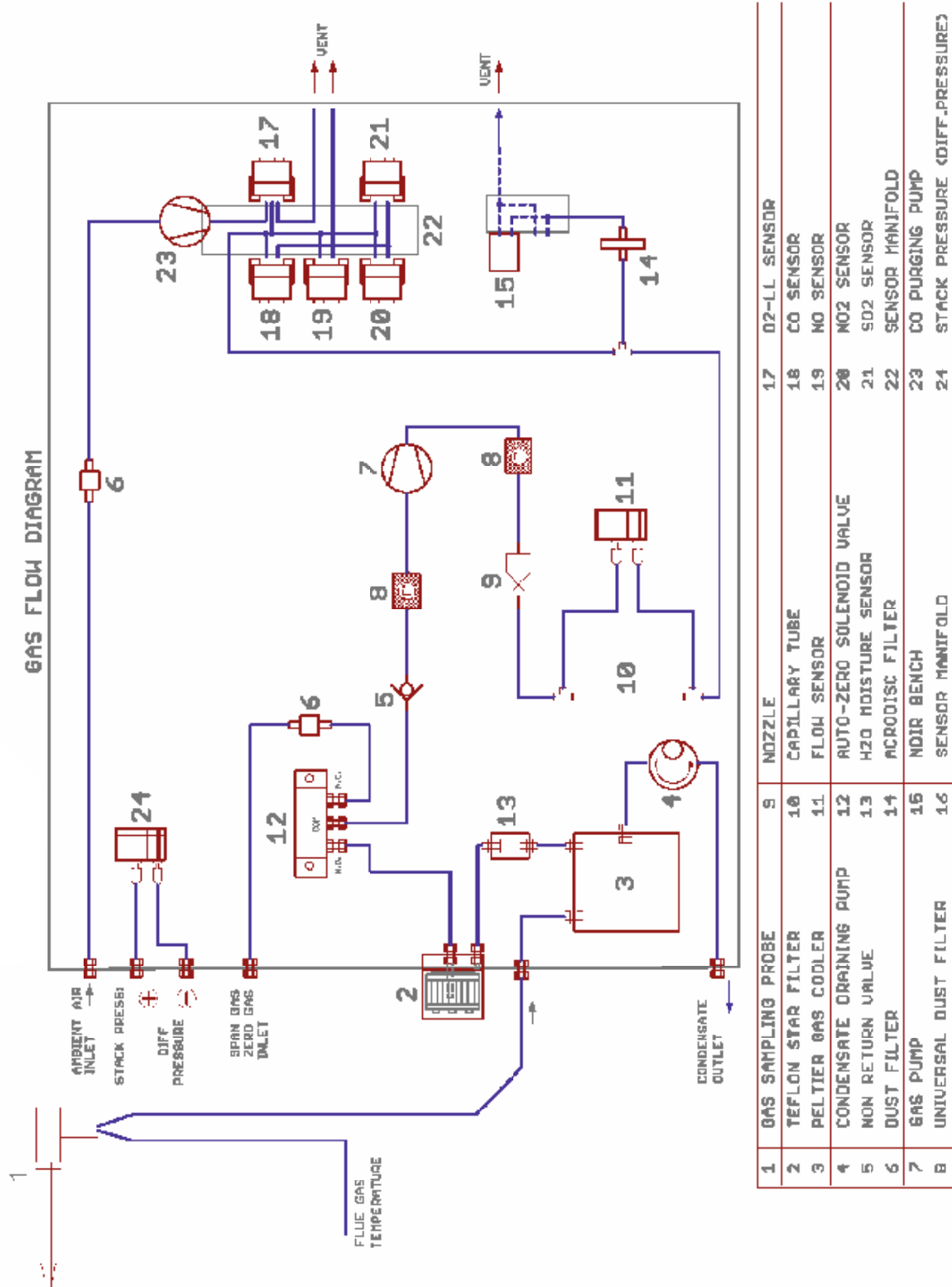
EiUK is required to accept the return, for proper disposal, of all analyzers delivered after 13<sup>th</sup> of August 2005. Analyzers must be returned to EiUK prepaid.

## 5 MEASUREMENT PRINCIPAL

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

The temperature is measured at the tip of the sampling probe.

### 5.1 Gas flow diagram



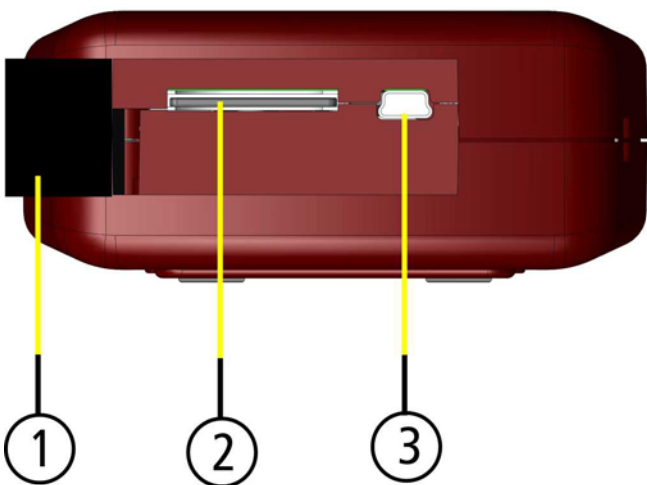
## 6 ANALYZER DESCRIPTION

### 6.1 Remote control unit (RCU) front



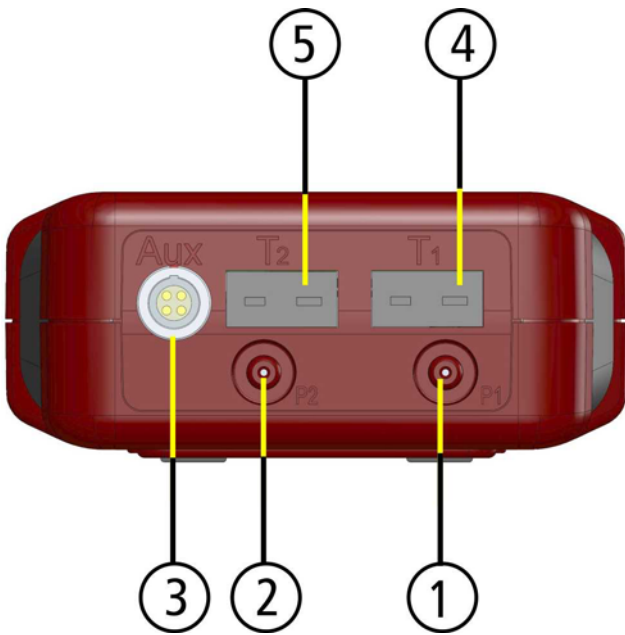
1	Display
2	Keypad

### 6.2 Remote control unit (RCU) Connectors - top



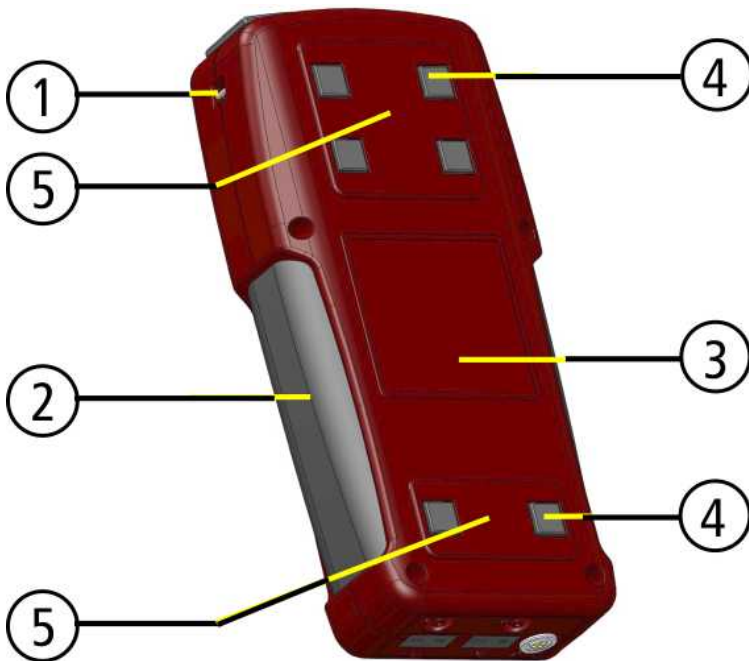
1	Cover
2	SD-card reader (only by using a EIUK-SD-CARD we can assure the compatibility of all analyzer functions)
3	USB port

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



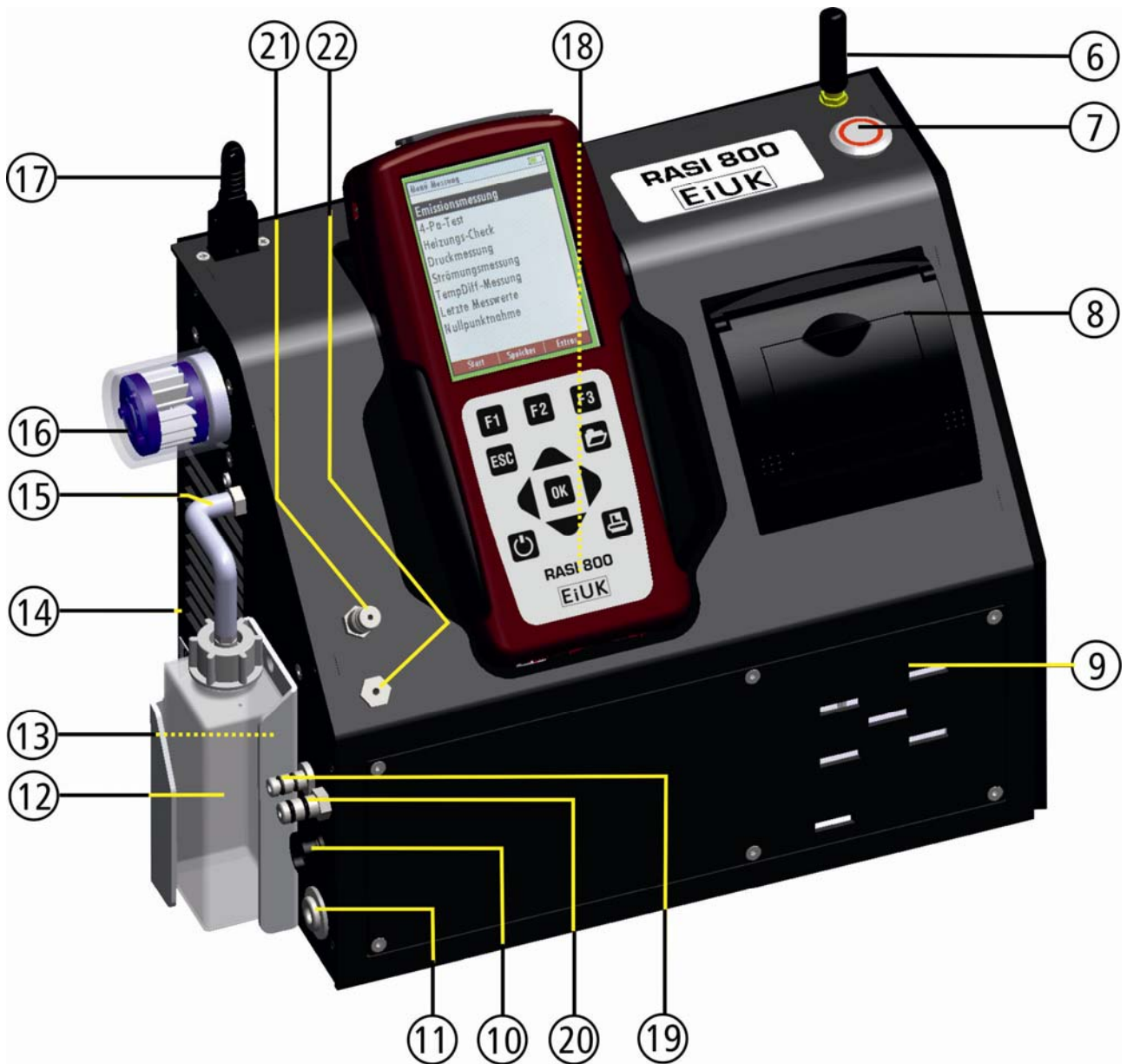
1	Pressure connection 1
2	Pressure connection 2 (Diff. pressure)
3	AUX connector
4	Temperature connection 1
5	Temperature connection 2

**6.4 Remote control unit (RCU) back side**



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

**6.5 Base unit**



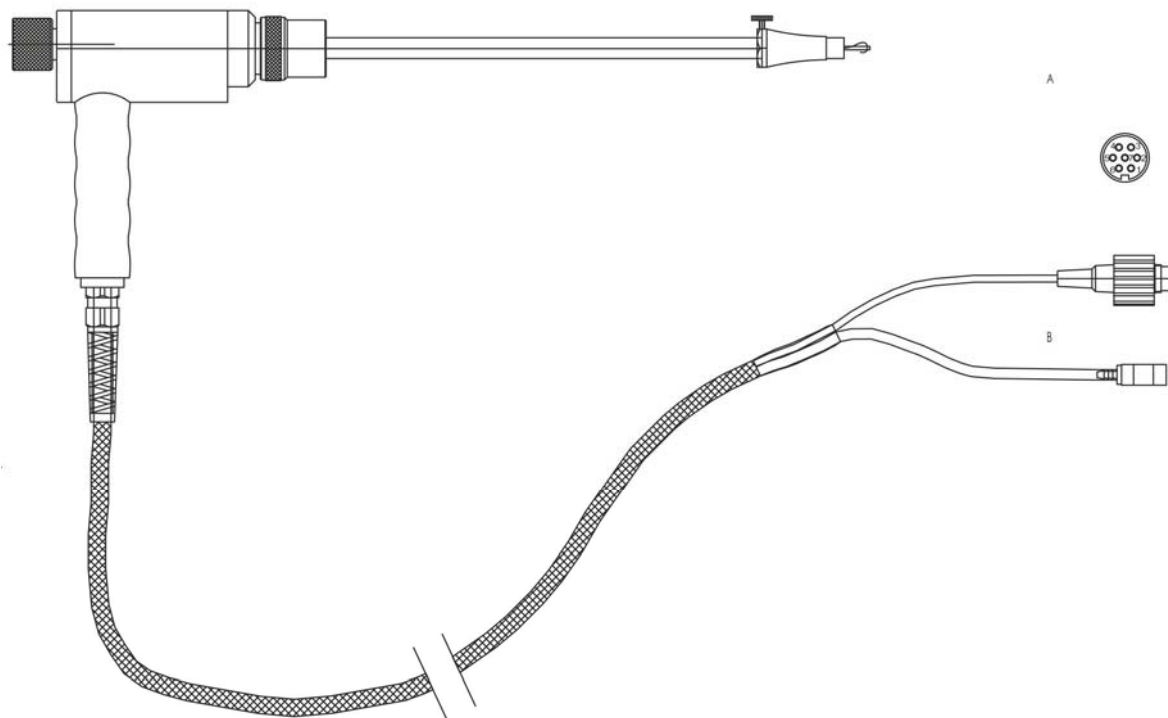
6	Aerial	15	Connector condensate outlet
7	ON-/OFF key button	16	Teflon star filter
8	Built-in speed printer	17	Connector T-Ambient air (combustion air)
9	Gas outlet	18	Charging frame for Remote control unit
10	Connector T-gas	19	Connector pressure -
11	Charging socket	20	Connector sample gas inlet
12	Condensate container	21	Connector pressure +
13	LED condensate container	22	Fresh air for zeroing
14	Fan gas cooler		

## 7 ACCESSORIES

### 7.1 Probe

The RASI 800 MCERTS is available with different probe tubes.

A complete list of available probe tubes can be found in the current price list of this analyzer.

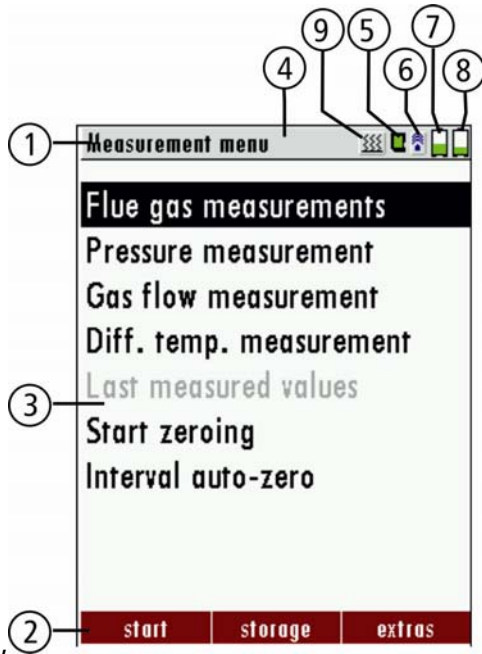




## 8 OPERATING THE ANALYZER

### 8.1 Display







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



1	Menu bar
2	Function key bar
3	Display panel - Menu - Measurement value,...
4	Zeroing active
5	SD-Card in the slot - Indication green Read- and write access Indication yellow only Read access (SD-Card write protected) Indication red SD-Card is damaged SD-Card is damaged
6	Blue: Bluetooth connection base unit to RCU Red: No Bluetooth connection base unit to RCU Yellow: Base unit is in the update mode (Press ON-key at the base unit for changing to the measurement mode)
7	Battery charge condition base unit
8	Battery charge condition RCU
9	Probe heating

### 8.2 Keypad


Description and function of the keys:


ON/OFF 	By pressing the ON/OFF button the RCU will start up without delay. By pressing the ON/OFF button the base unit and the RCU (if RCU is placed in the charging doc) will start up. The powering down of the unit is timely delayed to protect the sensors if there is no fresh air inside the system. If there is no fresh air inside the system the analyzer will recommend a purging of the sensors.
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 	Abort or return to the menu above
Arrow Keys	Jump in between lines, change values
OK 	Confirmation key, select a marked menu point
Printer Key 	Activates the print out of the measuring results in the measuring screen in a pre-defined format. Linefeed when there is no printable display condition.



### 8.3 Connection RCU to base unit

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

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

: Bluetooth connection base unit to RCU

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

#### Connecting base unit to RCU

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

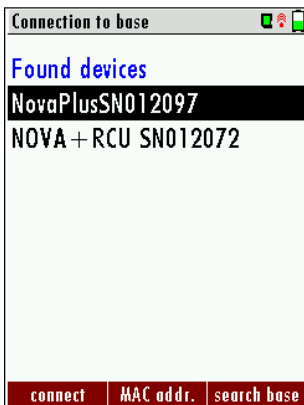


Press „connection“



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

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



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



The name consists of RASI 800 MCERTS and the serial number of the base unit.



MAC Adr.: display the Bluetooth address.

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

Delete list: Connection list will be deleted.

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

## 8.4 Reset and Blink codes

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

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

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

Illuminated constantly red: operating mode display

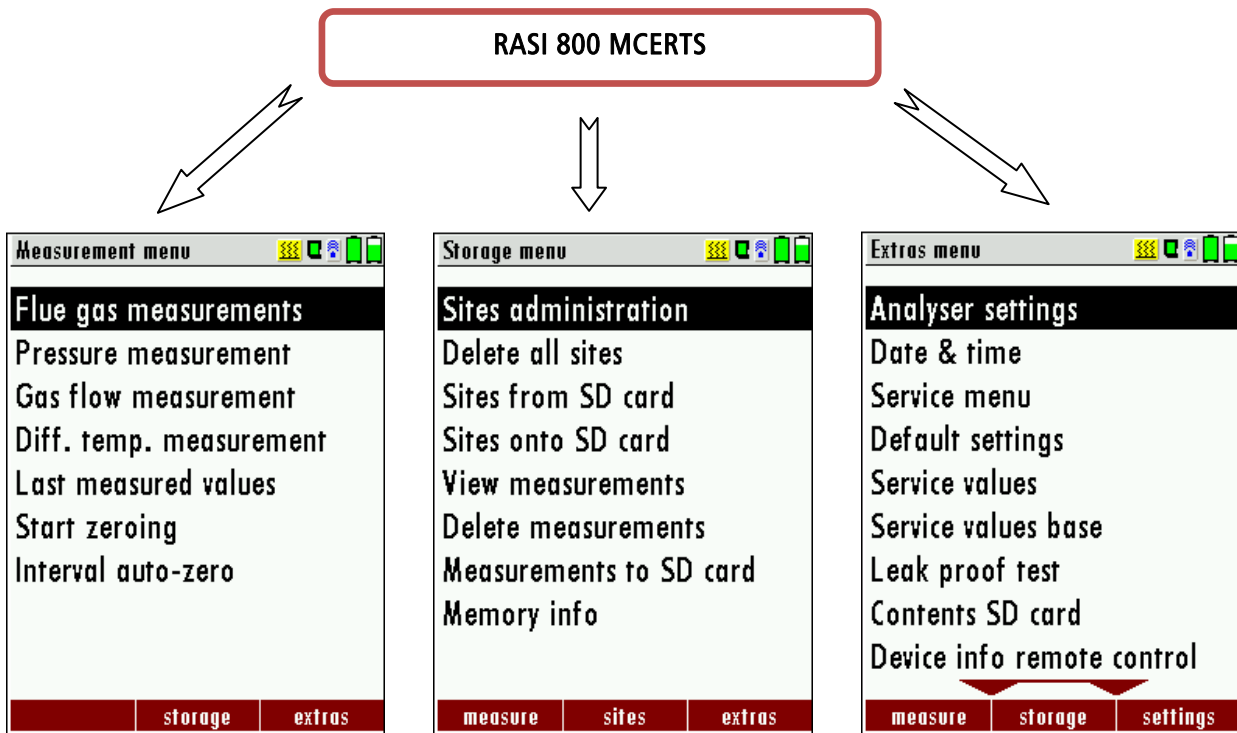
Flashes every five seconds: no connection with the RCU

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

## 8.5 Menu configuration

The RASI 800 MCERTS 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 a gas measurement“ is a standard feature in every analyzer and is explained in chapter 12. Other menu points are optional and will be explained either in this manual or in an additional manual or flyer.

Please read chapter 13 for details.

Please read chapter 14 for details.

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

## 9 FIRST USE OF THE INSTRUMENT

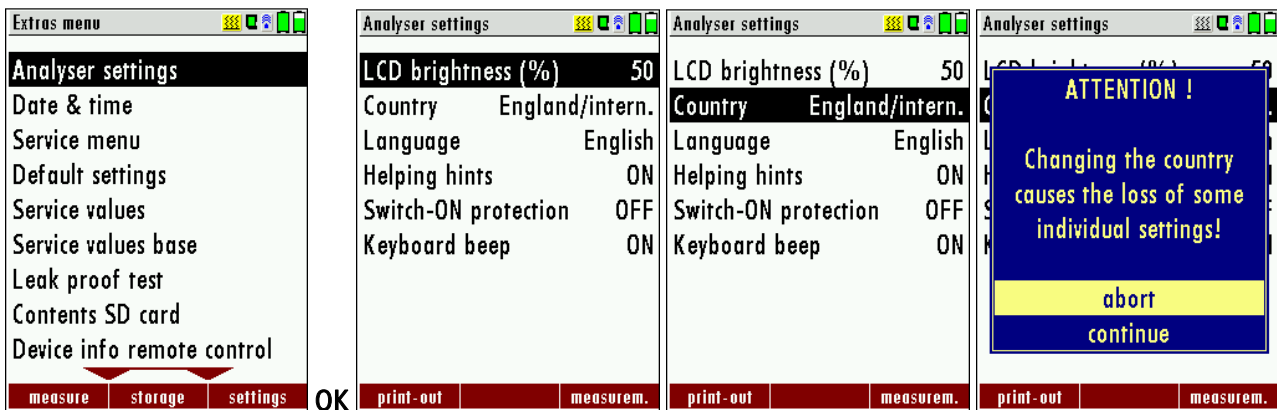
After the analyzer has been inspected and is ready for start up it can be switched on and personalized settings can be entered. These settings can be changed at any time.

### 9.1 Analyzer ready for operation

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

### 9.2 Analyzer settings

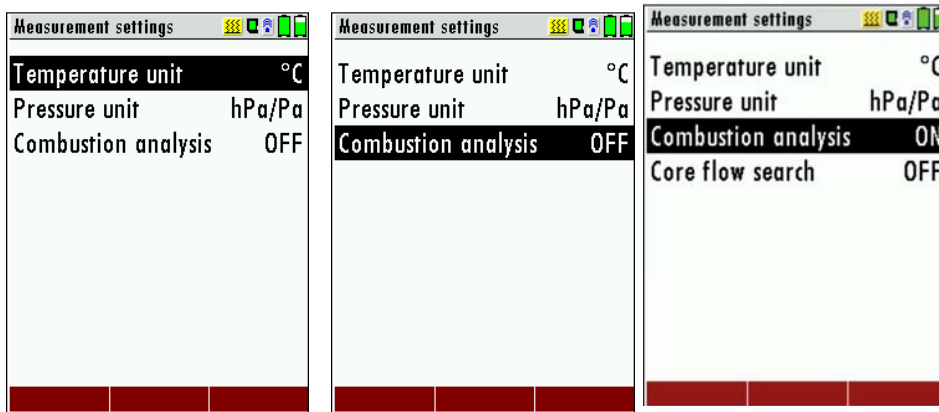
The “Settings” menu allows configuring some instrument specific parameters.



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



### 9.2.1 Measurement settings



Temperature unit	°C or °F	Change the unit for temperature in all screens
Pressure unit	hPa/PA, hPa, kPa/Pa, kPa, mbar, mmH2O, cmH2O, inchH2O, mmHG, inchHG, PSI, Pa	Change the unit for pressure in all screens. The meaning of hPa/PA and kPa/PA is that the instrument performs a dynamic change of unit depending on the absolute value of pressure.
Combustion analysis	ON / OFF	Combustion analysis activated or deactivated

#### Explanation for "Helping hints":

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

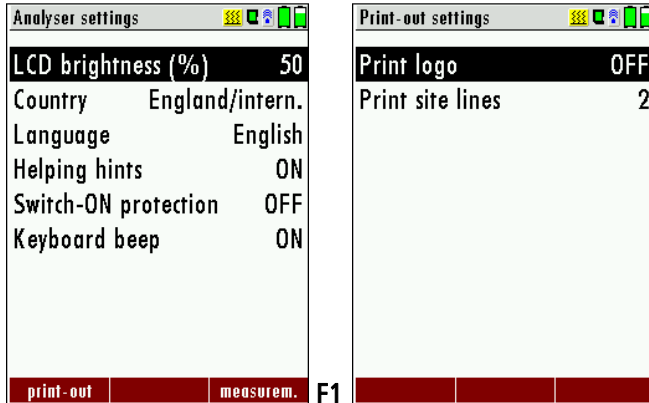
- "Zeroing finished, Sensors are ready. Analyzer ready for measurement."
- "Reminder! Charge batteries at regular intervals!"
- "Measurement stopped/started."

### 9.2.2 Switch-ON protection

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

### 9.2.3 Print-out settings

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



F1

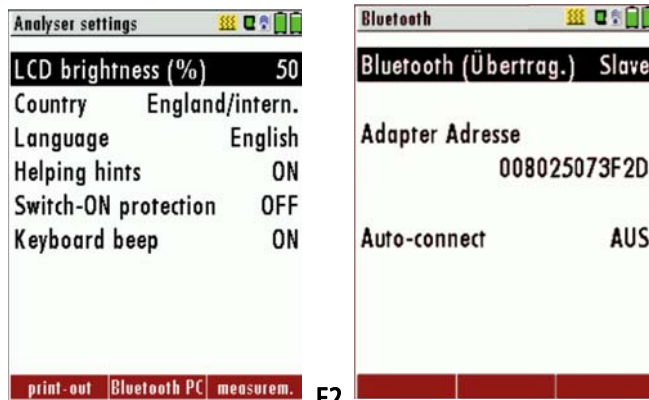
Print logo ON/OFF:

Print logo see chap. 14.1

Print site lines 0 ... 9:

Line 1 (Site no.) is necessary, further lines (freetext) printable if necessary see chap. 13.2

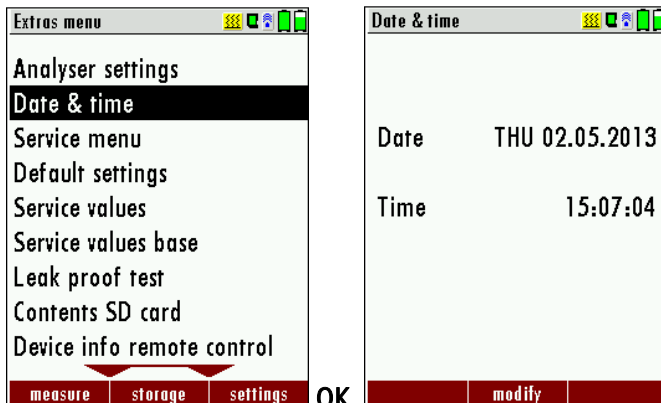
### 9.2.4 Bluetooth settings



F2

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

### 9.3 Setting time and date



OK

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

## 9.4 Configuration of measurement program

(Flue gas measurements) Select one of the 4 configurable measurement programs.

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

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

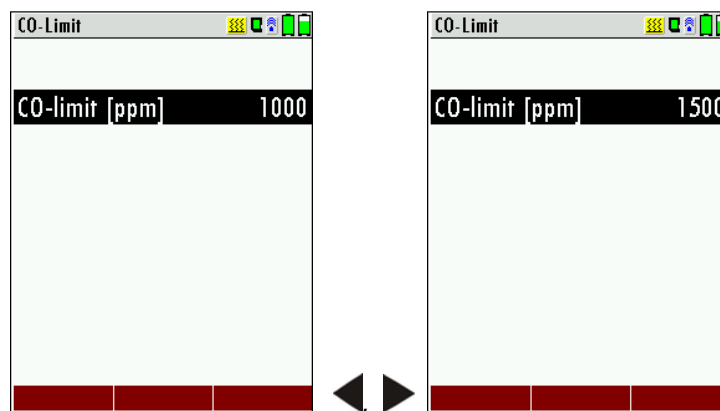
The following programs have a pre configured:


- „Flue gas measurement“ with CO – limit of 2000 ppm

„Test program“ indented for use at instrument maintenance and calibration, without fuel selection

### 9.4.1 Setting the CO ppm limit values

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.

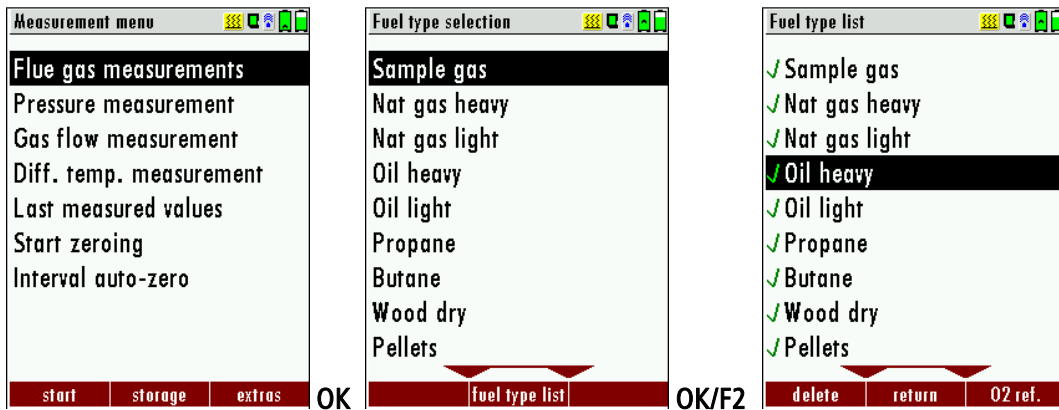



	The CO-ppm limit value can be adjusted in 100 ppm steps between 300 ppm and 4.000 ppm / 10.000 ppm
OK or ESC	Return to the measurement window

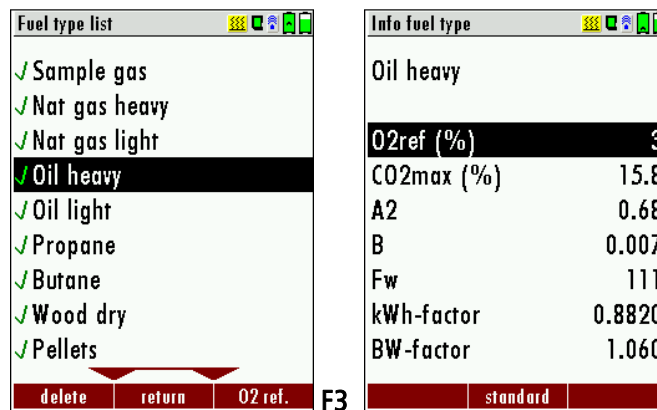
### 9.4.2 Fuel type selection and O<sub>2</sub> reference


*The fuel type selection and the user defined fuel types are only available if the combustion analysis is activated. EXTRAS/Analyser settings/measurement (chapter 9.2.1)*

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



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



F1	Add / remove a fuel type
F2	Exit the fuel type list
F3	Input O <sub>2</sub> -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.



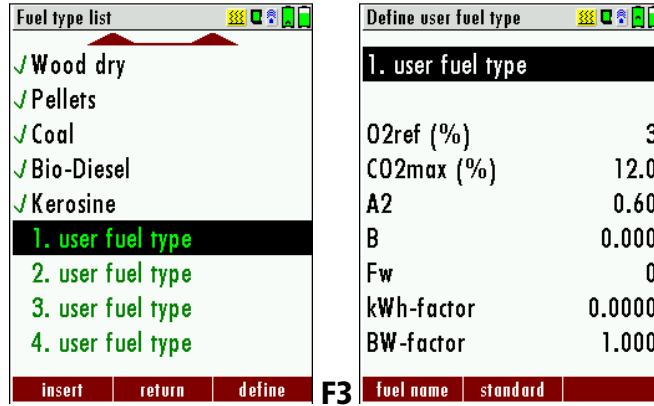


### 9.4.3 User definable fuel types

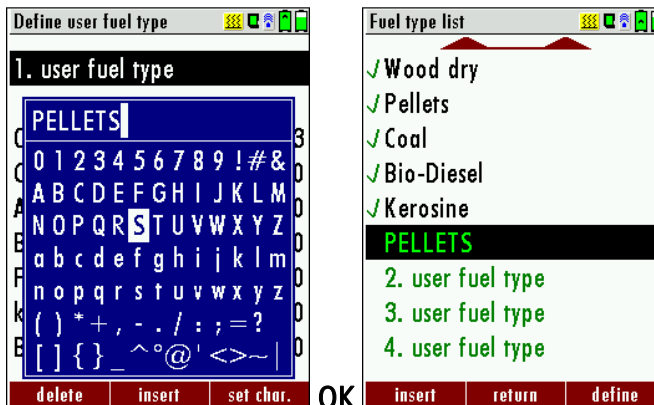
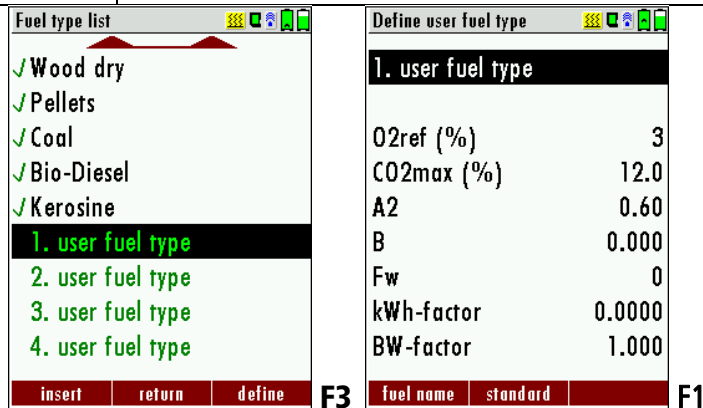
Here, four fuels are adjusted individually. The names as well as the parameters are adjustable. As the other fuel types, they can be pre-selected or left out.

**Note:**

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




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

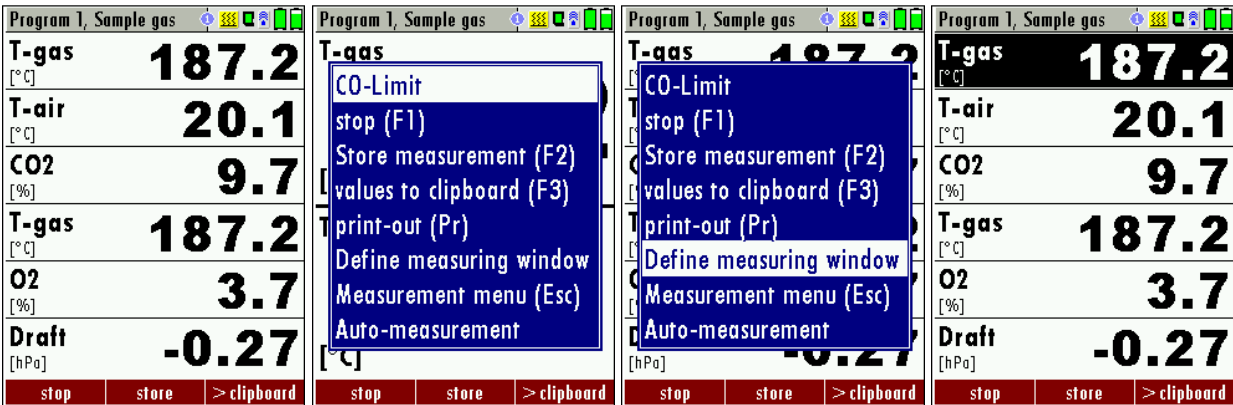


F3	Modify fuel type parameters
F2	Modify fuel type name Text input see chapter 16.1
OK	Save the new fuel type name



### 9.4.4 Configuration of the measurement window (display content)

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



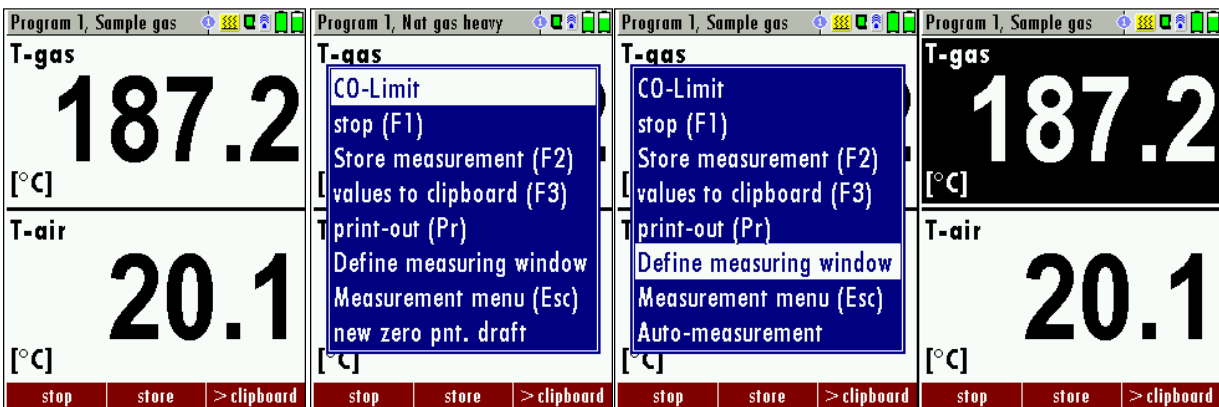
Now you select “define measuring window” and press the OK key. The top value will now be marked black – this black bar can be moved up and down. Move it to the position that you would like to change or to the position where you want to add a measuring value. Once you have reached the position you can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

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




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

### 9.4.5 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

### 9.4.6 Change measurement program names

In the “Fuel type selection” window you can edit the marked program name with the F3 key and then change the program name.

(See chapter 16.1)

## 9.5 Select core flow search

*The core flow search selection is only available if the combustion analysis is activated.  
EXTRAS/Analyser settings/measurement (chapter 9.2.1)*

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 9.2

## 10 MAINTENANCE AND CLEANING

### 10.1 Cleaning

The RASI 800 MCERTS 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 RASI 800 MCERTS, so that the hose can dry
- after longer disuse load battery first and afterwards approx. all 4 weeks

### 10.2 Service and Maintenance

- An annual service check and if necessary adjustment of the sensors at an EIUK service department are recommended for the preservation of value.

### 10.3 Service-Maintenance Plan

A check of RASI 800 MCERTS at our Service Department is necessary:

- after **1000 working hours** or

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



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

A complete service at a EIUK service station contains the function control and calibration and/or cleaning of the following components:

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

## 11 PREPARATION FOR EACH MEASUREMENT

### 11.1 Power supply

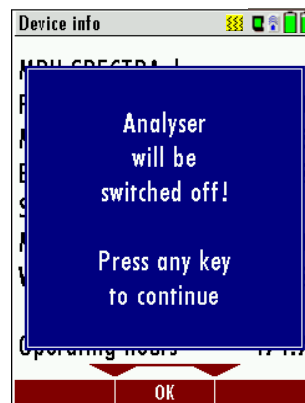
The analyzer can be used with:

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

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

### 11.2 Auto Off

The instrument is automatically switched off after 60 minutes.

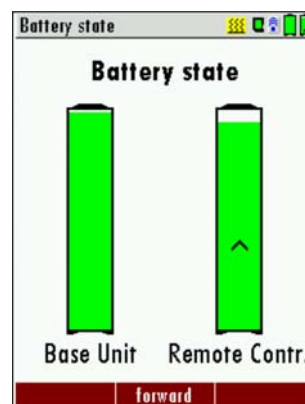


During a measurement or a battery charging cycle the auto off is deactivated.

### 11.3 Measurement with battery charger/battery charging

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

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



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

### 11.4 Measurement with battery (Battery monitoring)

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

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

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

### 11.5 Operation temperature

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

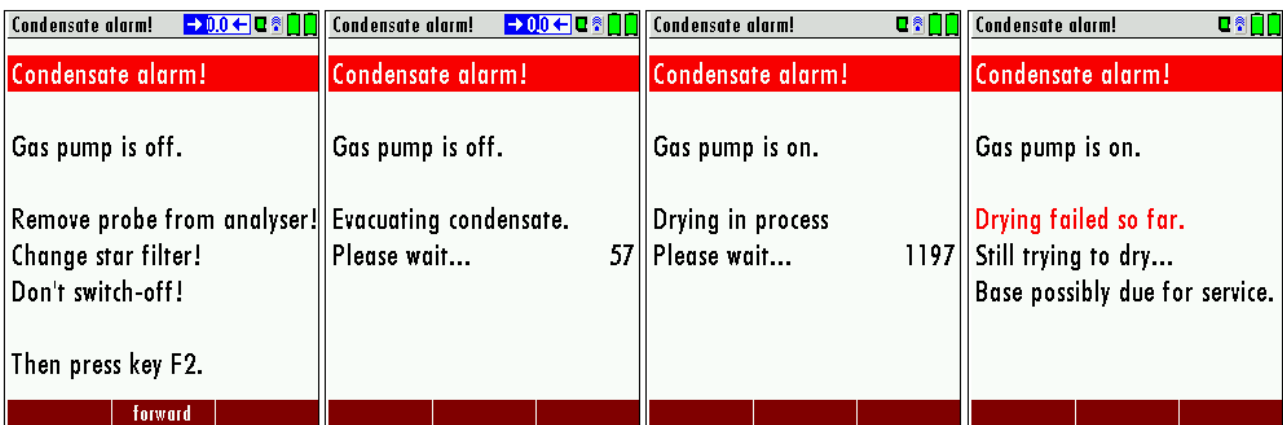
If the temperature is out of its operation range, you will see the following messages on the display.



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

### 11.6 Condensate alarme

When an upcoming condensate alarm, please follow the instructions of the display.



If the drying by means of the gas pump within 20 minutes fails please contact the service EIUK.

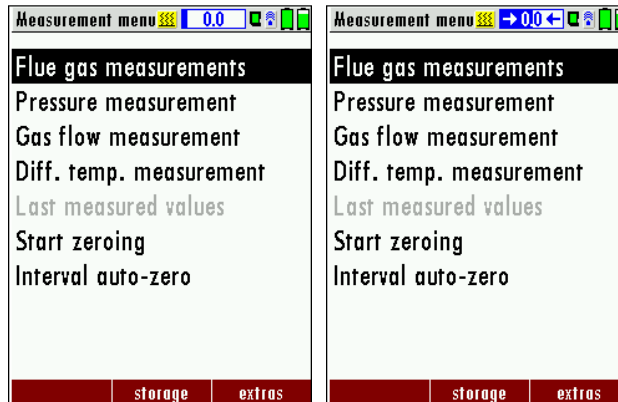
### 11.7 Connectors and leak tightness

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


The RASI 800 MCERTS provides an automatic test to check the probe and internal system for leaks (see chapter 14.5)

### 11.8 Power ON and zeroing

Press the ON key at the base unit.

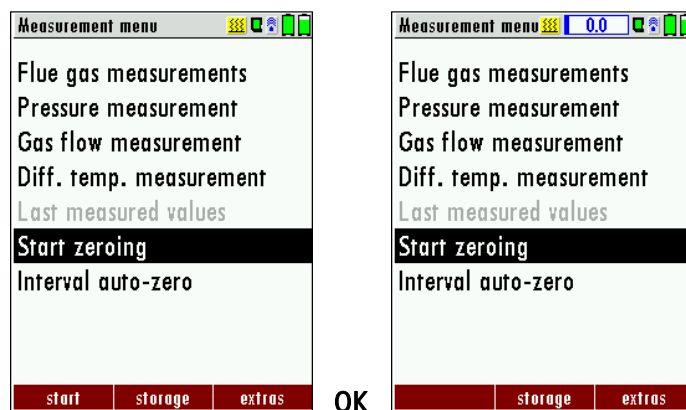



While zeroing the fresh air is drawn from the fresh air connector.

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

### 11.9 Repeating the zeroing

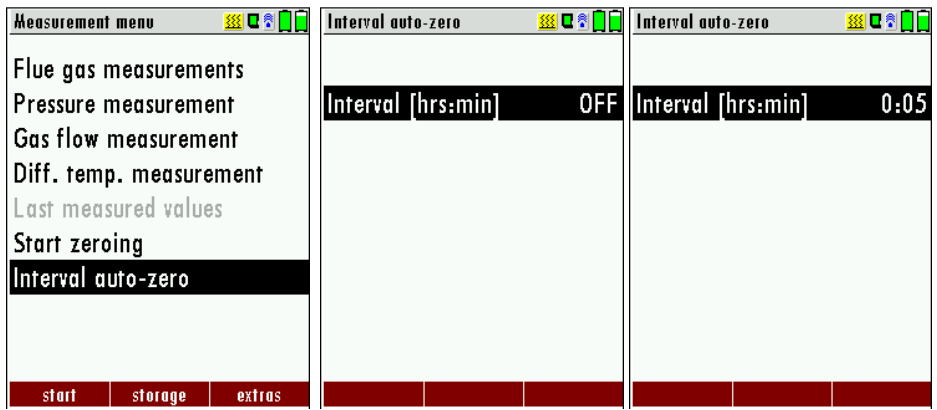
The zeroing can be repeated at any time as long as the probe is not inside the stack. In the main menu you select "Zeroing", and after the displayed message press the OK key.



	Zeroing
OK	Start zeroing

### 11.10 Intervall auto - zero

The time until the next "automatic zeroing" is adjustable from 5 minutes - 24 hours.



## 12 HOW TO TAKE A MEASUREMENT

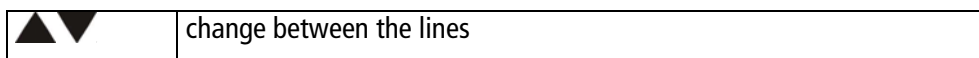
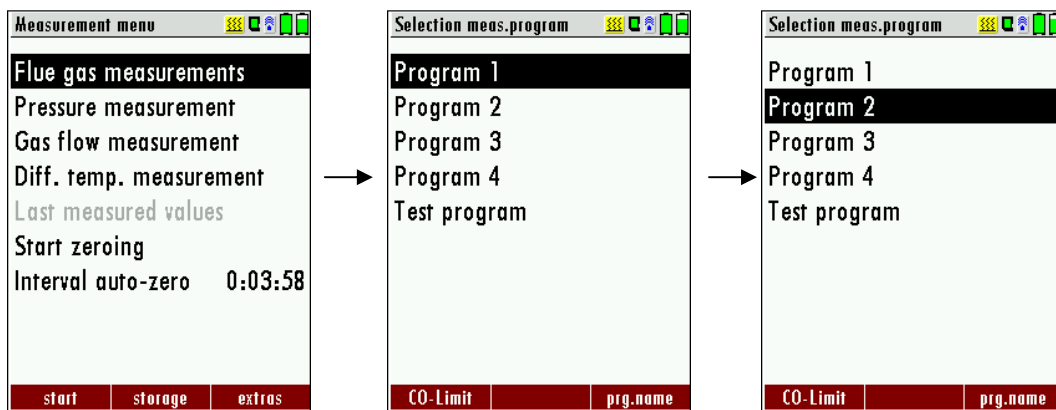
Every RASI 800 MCERTS is capable of making a complete flue gas measurement. How to perform this is described below.

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

### 12.1 Selection of the measurement program

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

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

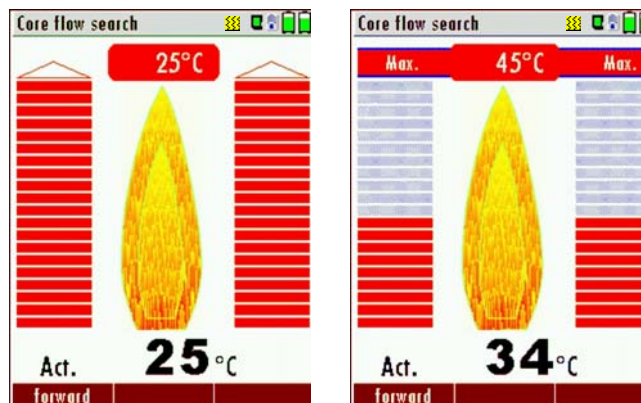


### 12.2 Core flow search

*The core flow search selection is only available if the combustion analysis is activated.  
EXTRAS/Analyzer settings/measurement (chapter 9.2.1)*

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

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



Temperature rising

Approaching the maximal flue gas temperature



Positioning the probe in the core flow:

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

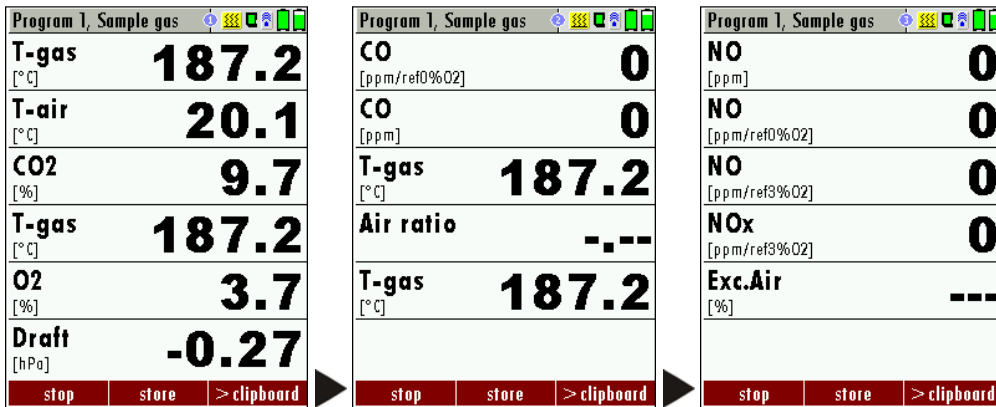
Maximum temperature has been reached when the arrows (left picture) disappear, max. (right picture) appears in place of the arrow, and the beeper signal stops. Moving away from the max. temperature will result in the bars moving away from the max. temperature (1 bar is equivalent to 1°C). Once the right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

**12.3 Measured Value Display**

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

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

The order of the display is operator settable. (see chap. 9.4.4).



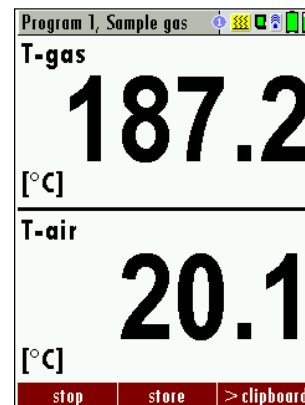
There are direct measured values available such as Oxygen and Temperature as well as calculated values such as dew point, efficiency and CO<sub>2</sub>. You will also find the same measurement value in different calculated values such as CO in ppm or CO in mg/kWh.

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" (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.



## 12.4 CO purging

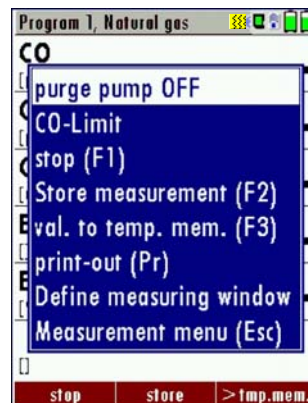
If the CO ppm limit is reached the analyzer will start the CO purging pump to protect the CO sensor from getting saturated with CO. Other values will not be affected while the CO sensor is being purged.

If the CO ppm limit is reached the CO purging symbol will be displayed.

Programm 1		CO-Messung, Erdgas BlmSch	
T-Gas [°C]	<b>70.0</b>	T-Gas [°C]	<b>70.0</b>
T-Luft [°C]	<b>23.0</b>	T-Luft [°C]	<b>23.0</b>
O2 [%]	<b>5.26</b>	O2 [%]	<b>5.26</b>
CO [ppm]	<b>---</b>	CO [ppm]	<b>---</b>
NO [ppm]	<b>4</b>	NO [ppm]	<b>4</b>
Zug [hPa]	<b>-.-</b>	Zug [hPa]	<b>-.-</b>
Stop		Stop	

The CO sensor will be purged. The displaying of a measuring value does not occur any more. The „>“ symbol shows, that the CO limit value is exceeded.

The purging does not stop automatically; it must be turned off by the user. Press the “Folder” menu key and select “purge pump off” to cancel the CO purging function as soon as the CO value fall below the CO limit.

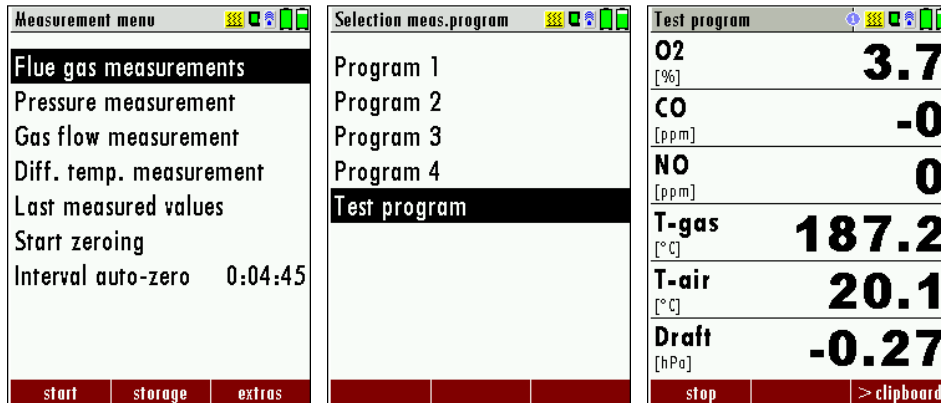


The actual CO value will then be displayed again.

## 12.5 Specific measurement applications

### 12.5.1 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.



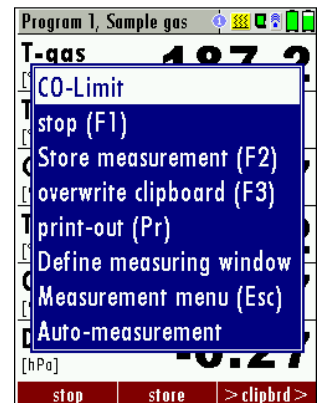
## 12.6 Clipboard

The RASI 800 MCERTS gives the possibility to set the momentary values into a clipboard during effecting and continuing the measurement. Later on, the values can be brought back from the clipboard to the measuring window in order to print them out or / and to save them.

### 12.6.1 Set values into clipboard

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

- the function „val. to clipboard“ of the menu (accessible about the menu button)
- or, provided that offered, the function key F3 with the text **> clipboard**



### 12.6.2 To bring values back from the clipboard

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

- the function „>clipbrd>“ of the menu (accessible about the menu button), or
- the function key F3 with the text **> clipbrd >**

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

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

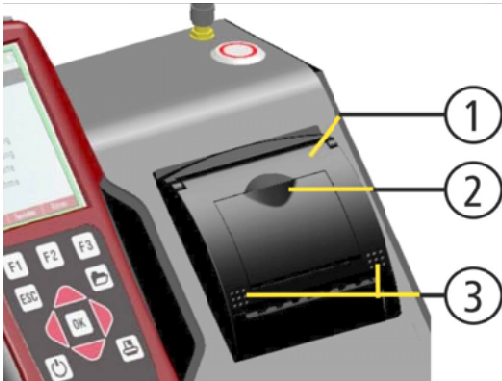
Now it is possible to print and save as usual one of both measurements.

### 12.7 Storage the measuring results

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

### 12.8 Printing the measurement results

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



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

### 12.9 End of measurement

A current emission measurement can be stopped at any time with the F1 key. The display will change its colour and the measurement will be frozen. At the time you stop the measurement all measured values are still available and can be viewed at a later time (see chap. 12.10).

Return to the measurement menu by pressing the ESC key.

### 12.10 Last measurement results

Measurement menu	
Flue gas measurements	
Pressure measurement	
Gas flow measurement	
Diff. temp. measurement	
<b>Last measured values</b>	
Start zeroing	
Interval auto-zero	0:04:28
start	storage
OK	F1
start	store

Program 1, Sample gas	
T-gas [°C]	<b>187.2</b>
T-air [°C]	<b>20.1</b>
CO2 [%]	<b>9.7</b>
T-gas [°C]	<b>187.2</b>
O2 [%]	<b>3.7</b>
Draft [hPa]	<b>-0.27</b>
start	store

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.

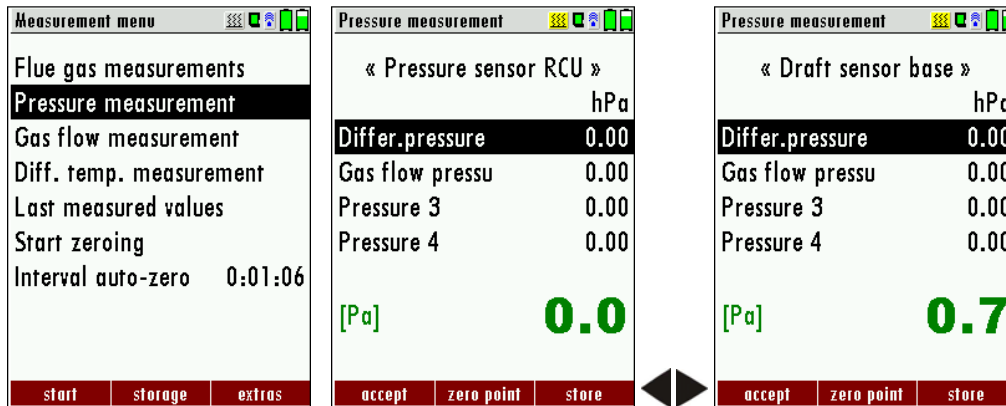
Above the F1 key "Start" instead of "Stop" is displayed. Pressing this key will continue the measurement.

### 12.11 Pressure measurement

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

Rearrangement of the differential pressure sensors:

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



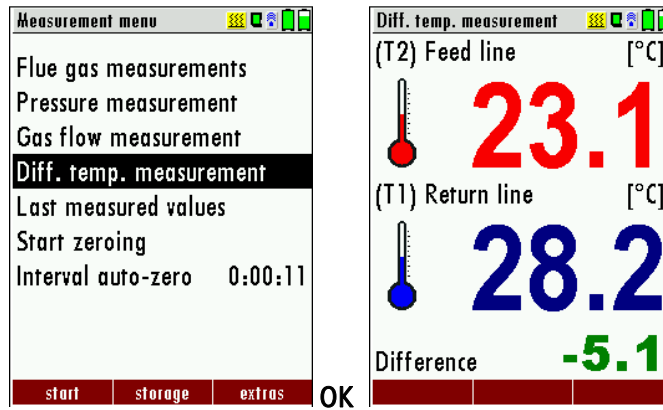
▲, ▼	Select the measurement name 1-4
F1	Save the measured value to one of the measurement name
F2	Zeroing the pressure sensor
F3	Change the name of the measurement category
ESC	Return to the measurement menu

Note:

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

### 12.12 Differential temperature measurement

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



**Note:**

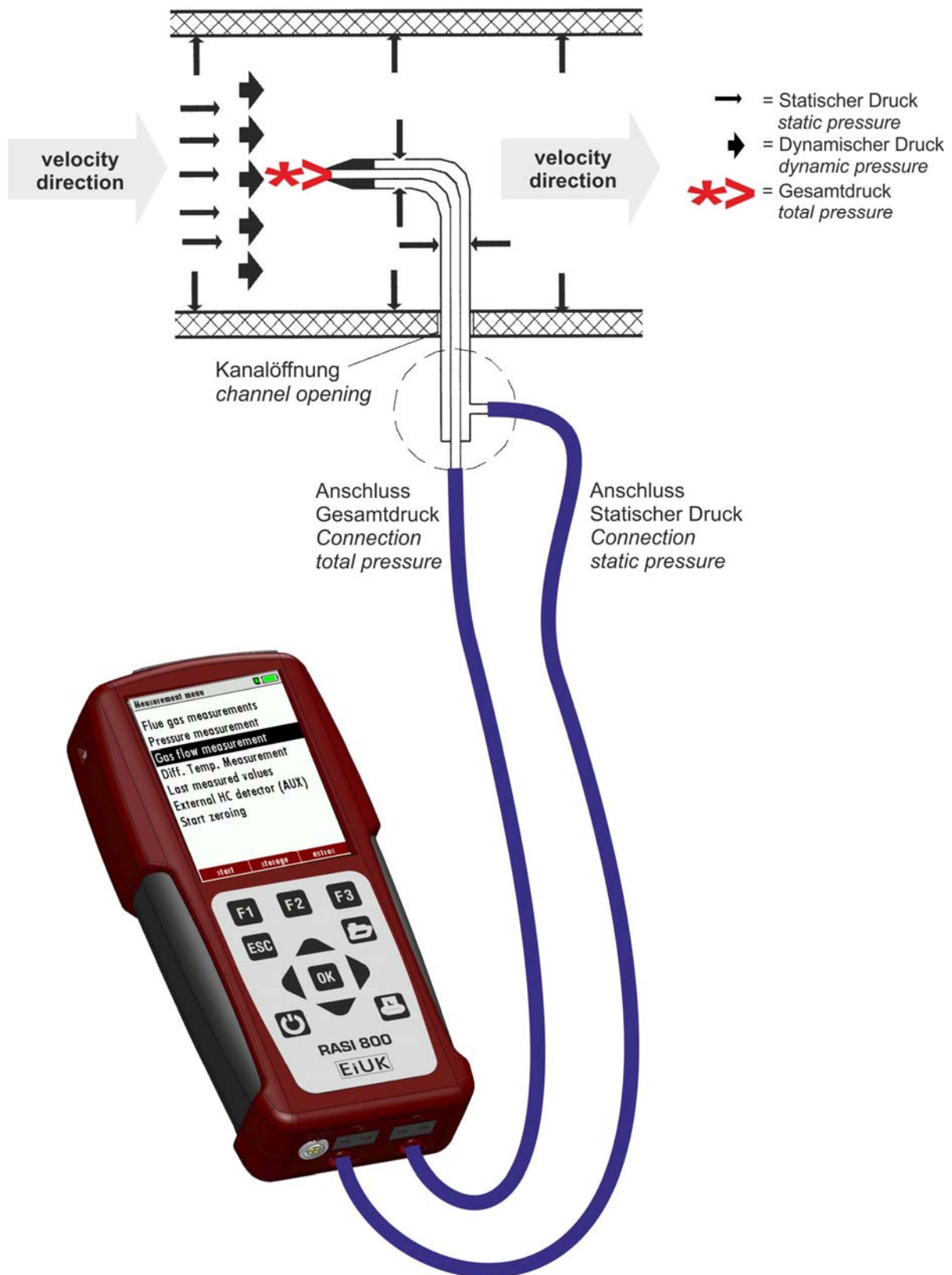
The accuracy of the difference temperature measurement is guaranteed only on use of the EiUK temperature sensors.

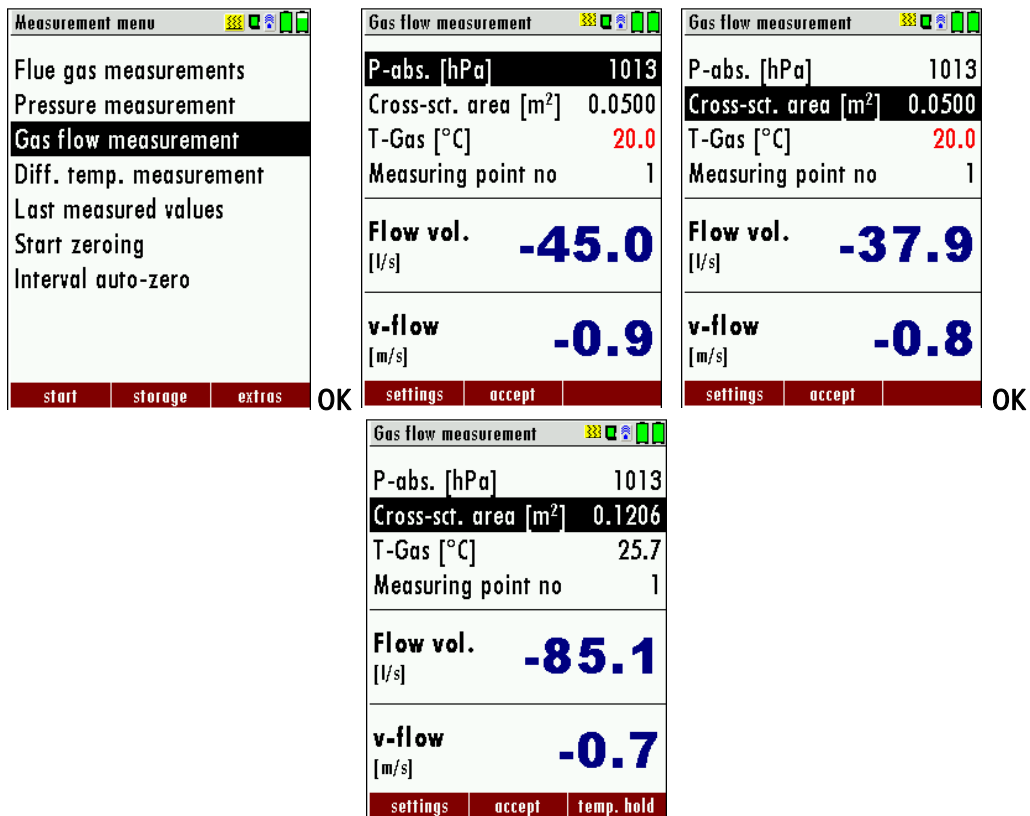
### 12.13 Flow measurement with Pitot tube

This option enables the measurement of the gas flow velocity in the flue gas duct or stack.

The display shows flow rate [m/s].


#### Connection of Pitot tube for flow velocity measurement (only with remote control unit (RCU) comfort)





A gas temperature of 20°C (68°F) will be displayed in RED numbers if there is no temperature probe connected to T-Gas 2. Once you connect a temperature probe the correct temperature value will be displayed in BLACK numbers.

The measured flow rate and flow velocity will be displayed in ORANGE numbers if the hoses coming from the Pitot tube are cross connected at P1 and P2 (Comfort RCU). The values will change to BLUE numbers once the hoses are switched.

	change barometric pressure / area
F2	change units
F1	measurement START / STOP
F3	Take over the measured T-Gas value (in case the T-Gas probe has to be removed before making a differential pressure measurement)
Printerkey	print-out actual windows display
OK oder ESC	back to measurement

The Pitot tube shaft is introduced perpendicularly in to the duct, by holes made in the surface, at selected positions.(see illustration).



The RASI 800 MCERTS will then indicate the dynamic pressure often called the velocity pressure. The dynamic pressure corresponds to the difference between the total pressure and the static pressure.

**P dyn. = P tot. + P stat.**

The calculation of the gas flow velocity occurs by following formula:

$$v = 1,291 \sqrt{\frac{1000}{P_{\text{baro}} + P_{\text{stat}}} \times \frac{273,15 + T}{289} \times P_{\text{dyn}}}$$

Where :

P stat << P baro

v = Gas velocity [m/s]

P baro = barometric pressure [mbar]

T = Temperature gas [°C]

P stat = static pressure [Pa]

P dyn. = dynamic pressure [Pa]

## 12.14 Automatic measurements

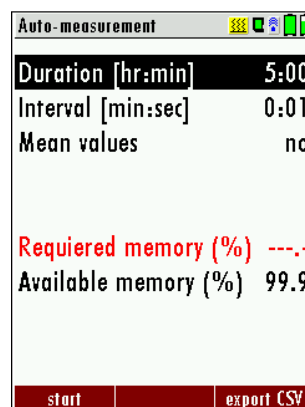
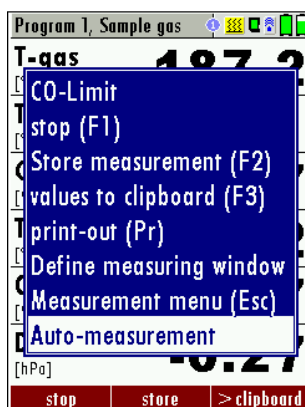
### 12.14.1 Automatic measurement feature including data logging

Using this feature RASI 800 MCERTS will enable you to perform long-term measurements and store the results automatically. The user may adapt several configuration parameters according to his needs. Data results will be stored using the standard RASI 800 MCERTS data storage and can eventually be exported to SD card for further analysis on Windows PC.

Main parameters to be configured are total duration of the recording and the time interval between two measurements.

The size of the internal data storage poses some restrictions on those two parameters. RASI 800 MCERTS displays the required memory as well as the size of the available memory. The user is requested to adjust the total time and interval parameters so that the required memory is available. The user might wish to delete other measurements from the data storage to increase the size of the available memory.

At the time of starting a certain flue gas measurement, the auto-measurement feature is disabled by default. It has to be enable by using the menu key and selecting "Auto-measurement"



The user is asked to configure:

- Total duration of data recording (1 minute – 24 hours)
- Interval between two measurements (1 second – 2 hours)
- Mean value
  - YES: RASI 800 MCERTS calculates the mean during each interval and stores this value
  - NO: RASI 800 MCERTS stores the values being measured at the end of the interval

The auto-measurement can be started by F1 key.

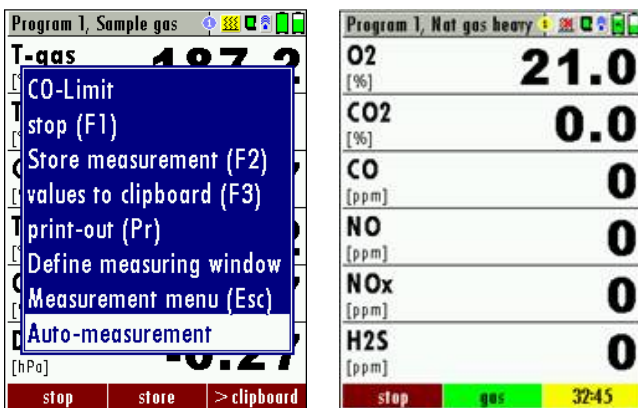
- Using F3 key the data storage will be exported to SD card.

### 12.14.2 SEMI CONTINUOUS AUTOMATIC MEASUREMENT feature including data logging

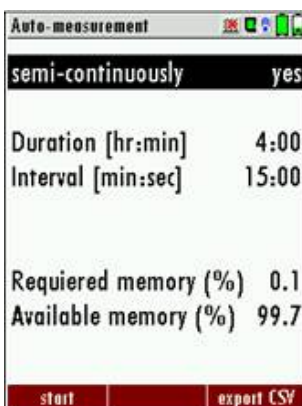
Condition for the semi-continuous automatic measurement is the option:

#### Automatic zeroing and calibration of the device

In the measurement can be started via the menu button, the automatic measurement menu.



In the semi-continuous mode, the minimum interval is 10 minutes. Mean values are not possible.



If the semi-continuous automatic measurement is started, the following procedure begins:

purge / wait / gas-sucking / measure

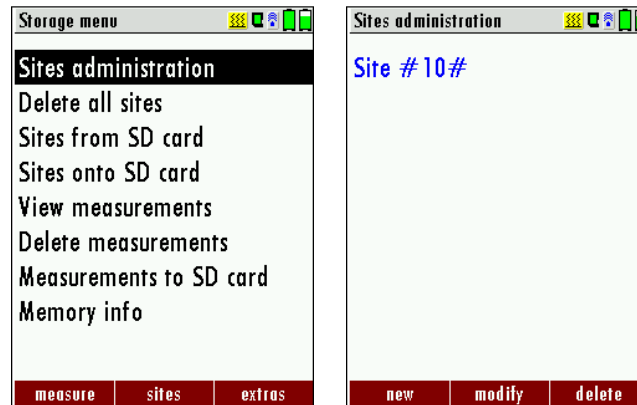
The purge phase lasts for 2 minutes. The "suck in gas phase" at least 3 minutes. The waiting period depends on the length of the zeroing.

The first entry is assumed that a duration of the zeroing of 2 minutes. In the second Zero point acquisition time is measured how long the zeroing runs. This is considered in the next phase of waiting.

For protection of the EC sensors only during the "suck in gas / measurement" phase the valve will be switched to the gas way.

### 12.14.3 Note on data storage

The data logging records the data using the standard RASI 800 MCERTS data storage implementation. All data are recorded internally and assigned to the site which is currently selected. Therefore select the intended site using the data storage menu before the auto-measurement is started. Using the site administration from the storage menu the user might switch to the next site by e.g. using the LEFT / RIGHT keys (cf. chapter data storage)



#### Note:

As RASI 800 MCERTS is intended for short-term measurement only, special care has to be taken if this instrument is being applied for long-term measurements:

- Zeroing of the instrument might be necessary at regular intervals. Zeroing has to be started manually with the instrument while providing ambient air to it. Otherwise the measured value will show a certain drift which decreases the accuracy. The relevance of this effect depends on ambient and gas conditions and on the accuracy requirement the user needs to meet.

Filters needs to be controlled at regular intervals.

## 13 DATA STORAGE

### 13.1 Organisation of the data memory

Basis of the data memory of the RASI 800 MCERTS is a set of sites stored in the device. Every site exists of an unique site number and 8 freely usable text lines which can have, e.g., the address, customer name etc.

The device can store up to 4000 different sites.

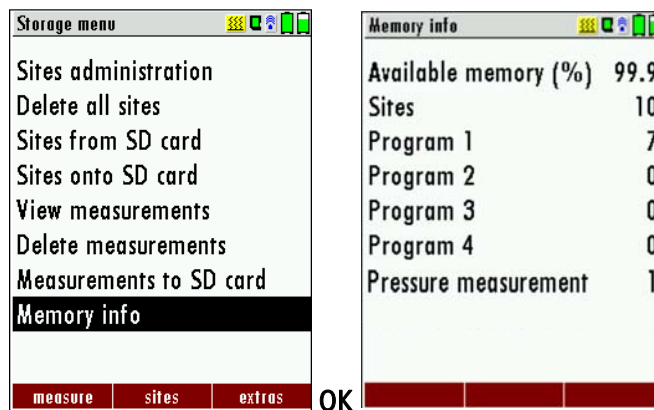
Sites can be created in the device and be changed, or could be imported from a PC program.

Attention: sites created in the device and site data changed in the device will not be updated towards the PC. The device does only transmit to the PC the measurement values, but no information about site data.

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

### 13.2 Information about the data memory

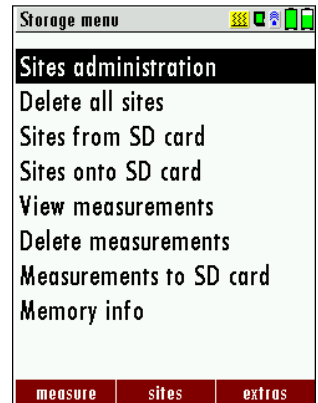
In the menu item "storage" you select „memory info“ to get information about the actual memory volume. The part of free memory, the total number of the stored sites and the number of the measurements stored all together, split in the kind of the measurement is listed.



### 13.3 Site administration

In the menu item "Sites administration" you are able

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



Attention:

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

#### 13.3.1 View and search sites

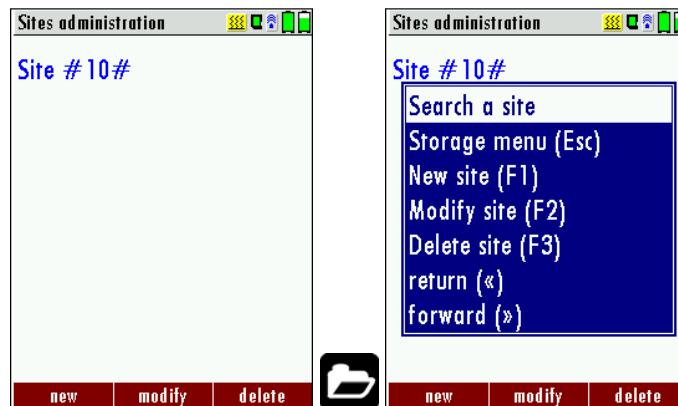
If the menu item "Site administration" will be selected for every stored site will be displayed with:

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

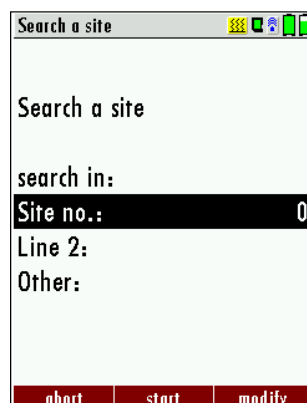
With the arrow keys on the left / on the right you scroll by all sites.

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

- Select with the menu key "Search a site"



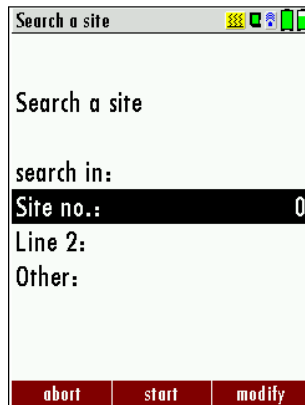
- Now you can enter the text to be searched for the first line, i.e. the site number, or for the second line, or for the rest of the text lines.





- Select the line for searching (site no. No., line 2, or rests) and select F3 "modify"
- Now in the indicated text input field you can enter a combination of letter, character and figures for whose occurrence is searched in the selected text field. Press then "OK".



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



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

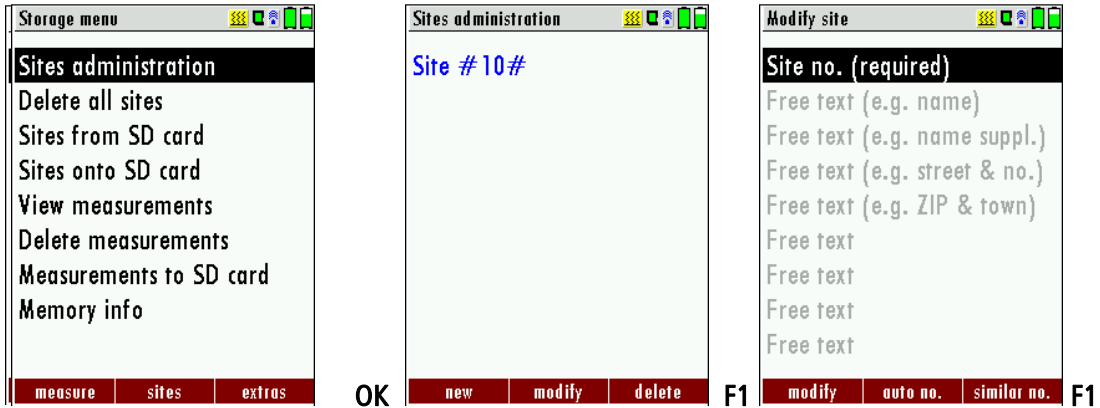
	Page through the sites
	Menu key: Search site ▲, ▼: Selection of the input field F3: Input mask, see chap. 16.1 F2: Start search ◀▶: According to the search criteria found sites page through. If no saved site with the search criteria agrees occurred the Medung: „Search unsuccessfully“
ESC	Back to storage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

### 13.3.2 New entry and change of sites

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

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

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

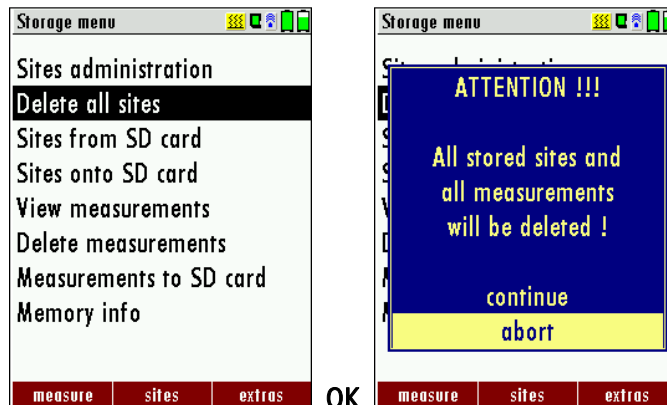


In the new site or an existing site you can change the data while you select the too change line, F1 = "modify" select and use the text input field for editing of the text. Conclude the text input field with "OK" and store the updates with F3 = "store".



### 13.3.3 Delete sites

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



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

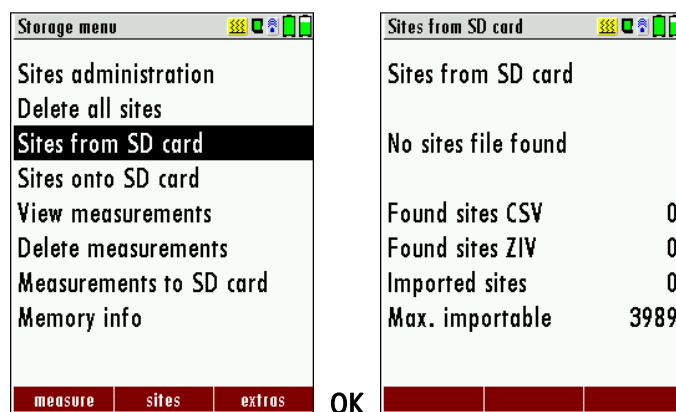
## 13.4 Data transfer via SD Card (Option)

The data exchange format is CSV. A character-separated values (CSV) file is a simple text format for a database table. Each record in the table is one line of the text file. Each field value of a record is separated from the next by a character. RASI 800 MCERTS uses a semi-colon ';' as value separator (other implementations use sometimes a comma). Implementations of CSV can often handle field values with embedded line breaks or separator characters by using quotation marks or escape sequences. CSV is a simple file format that is widely supported, so it is often used to move tabular data between different computer programs, for example Microsoft Excel™ or Access™, that support the format. Also other computer programs offer this type of interface because it is widely spread and easy to use.

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

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

### 13.4.1 Import of Sites



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

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

A1-F1;A1-F2;A1-F3;A1-F4;A1-F5;A1-F6;A1-F7;A1-F8;A1-F9

A2-F1;A2-F2;A2-F3;A2-F4

A3-F1;A3-F2;;A3-F4;

A4-F1;;;A4-F4

A5-F1

Beispielzeilen mit 3 ungültigen Anlagen: (Fehlergrund)

;A1-F2;A1-F3;A1-F4;A1-F5;A1-F6;A1-F7;A1-F8;A1-F9 (Semikolon am Anfang)

(Leerzeile)

;A3-F2;A3-F3;A3-F4;A3-F5;A3-F6;A3-F7 (Semikolon am Anfang)

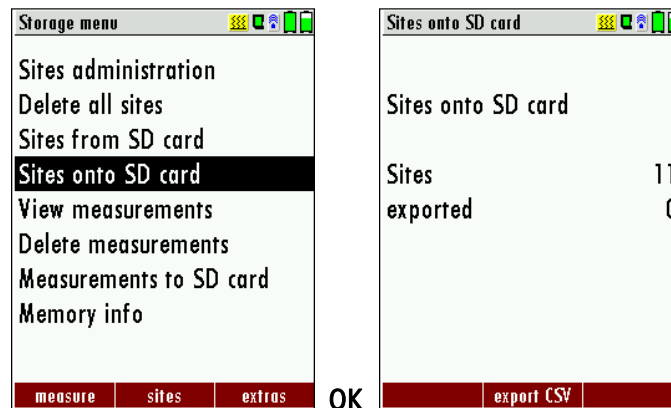
#### Important:

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



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

### 13.4.2 Export of Sites



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

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

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

### 13.4.3 Export of Flue Gas Measurements

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

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

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

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

Example:

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

### 13.4.4 Export of Differential Pressure Measurements

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

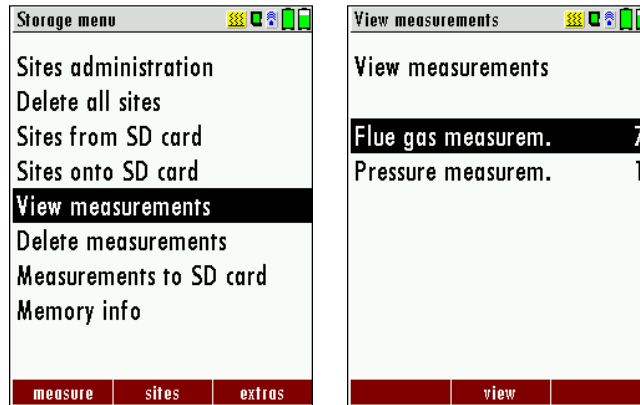
The created file has the file name „DDMxxxx.csv“, in which the xxxx are continuing 5 digit numbers with leading zeros.

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

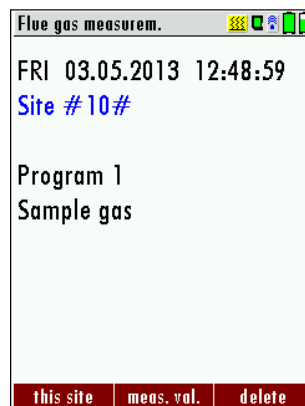
### 13.5 Measurements in the data memory

#### 13.5.1 View measurements

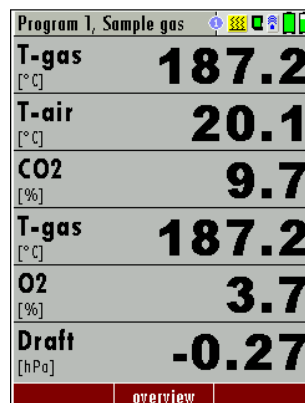
In the menu item „View measurements“ you can inspect the stored measurements. After selection of this item you receive first an overview of the number of the stored measurements according to measuring type.



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



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



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

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

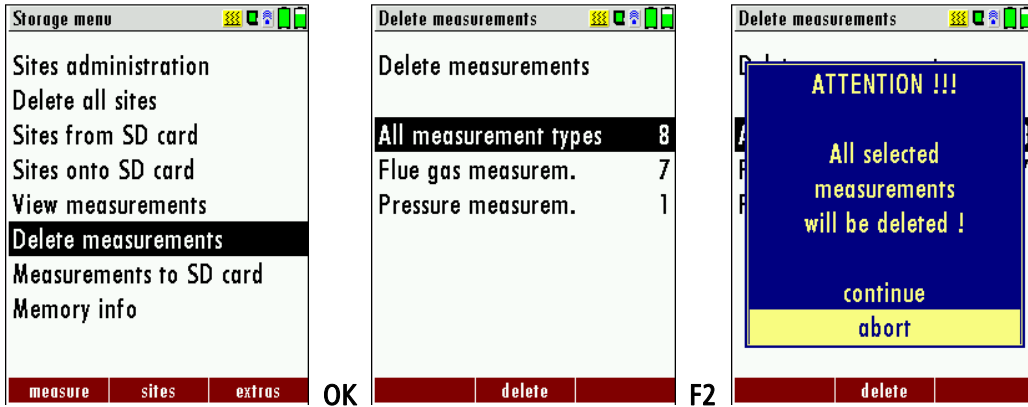
- either F1 = „this site“ , while a measurement of the desired site is displayed. With F1 = „all sites“ you cancel this filter again.

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

### 13.5.2 Delete measurements

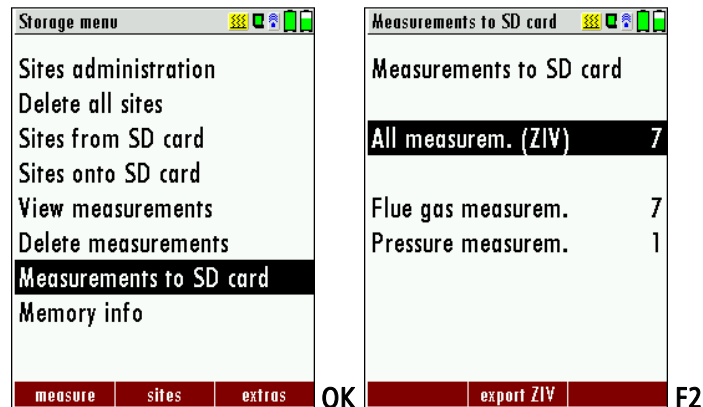
You are able to

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



### 13.5.3 Export measurements to a SD card (optional)

The RASI 800 MCERTS offers the possibility to export all stored measurements to a SD card.



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

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

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

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

## 14 EXTRAS / ADJUSTMENTS

The RASI 800 MCERTS is delivered in a standard software configuration which should cover most needs. However, there are many ways to tailor the settings to your individual needs if required. The possibilities are highly flexible and individual adaptable.

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

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

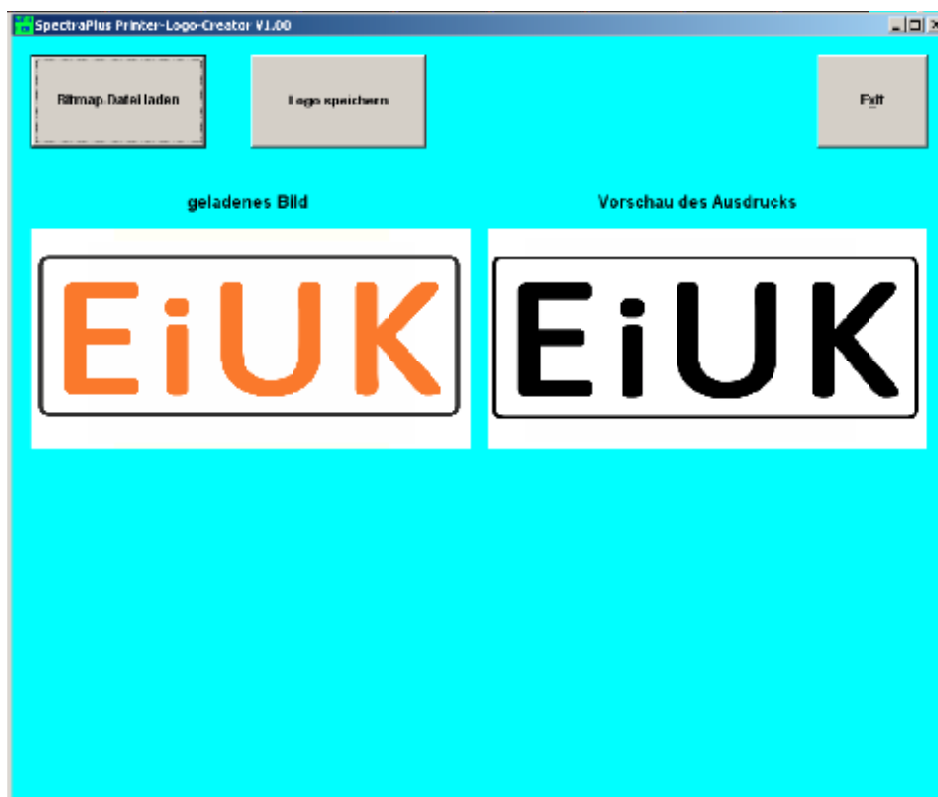
### 14.1 User definable Logo print out

Overview:

The Logo file can be created out of a Bitmap using the program "RASI 800PrnLogoCreator.exe" which comes with the analyzer CD. The generated file will be transferred from your computer to the analyzer using the SD card (only once). Once transferred the Logo can either be printed above or below the customer address or you can choose not to print the logo at all.

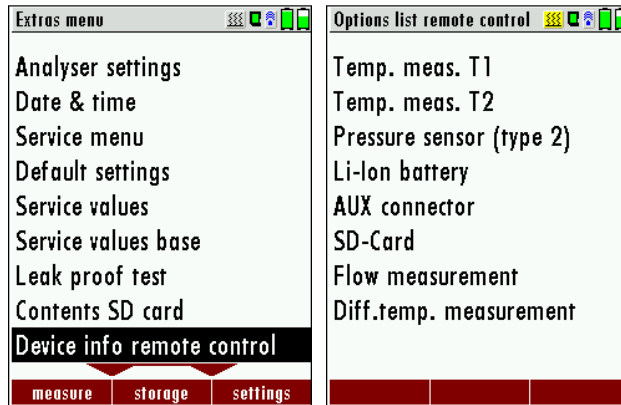
Converting a Bitmap into a Logo file:

Use the enclosed Windows-Program "RASI 800PrnLogoCreator.exe"  
(EiUK Product CD / Software / RASI 800PrnLogoCreator).



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

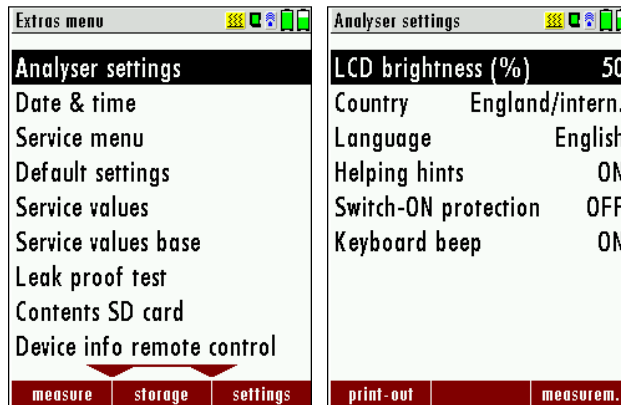
The vertical resolution of the Bitmap must be a multiple of 24, where 24 is the minimum and the maximum is 480 pixels. If necessary the Bitmap can be adjusted using a picture editing program (not included on the CD).



Transferring the Logo file per SD card to the analyzer:

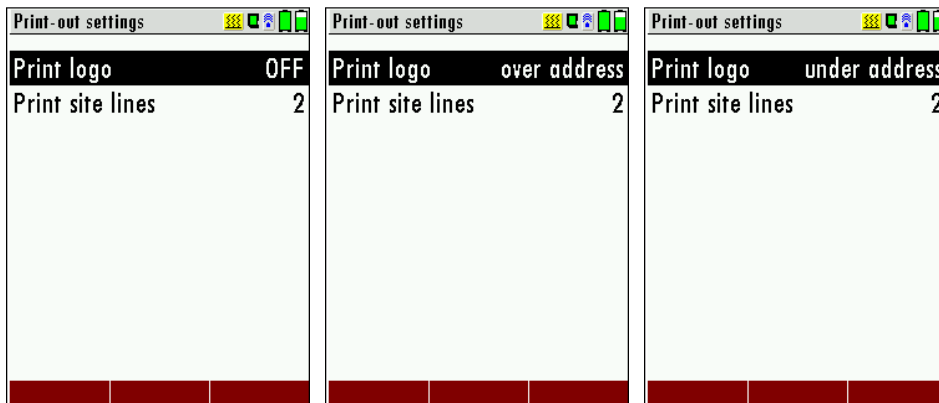
Copy the created file "lg\_print.EiUK" onto the SD card (root).

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



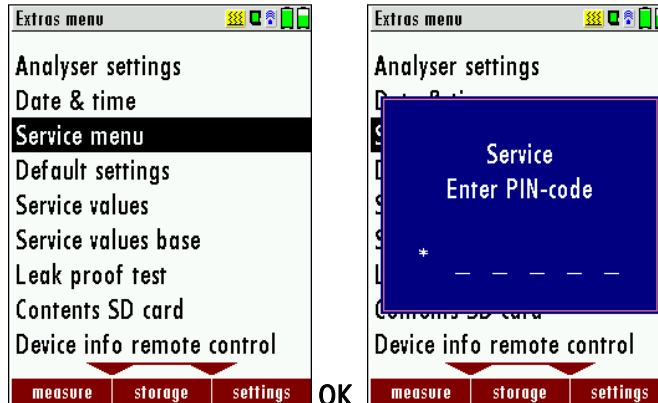
Printer Logo setting:

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



## 14.2 Maintenance adjustment menu

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

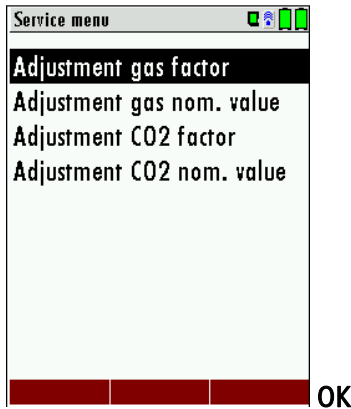


Please contact EiUK if you need the Pin Code for your analyzer.

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

### 14.2.1 1 point adjustment EC-sensors and NDIR-CO2

**Before adjustment:** wait for finish zeroing



#### Adjustment gas factor

Adjustment gas factor		
O2	9.32 %	0.01
CO	-0.1 ppm	1.000
CO/H2		1.000
NO	-1.2 ppm	1.000
NO2	0.0 ppm	1.000
NO2/NO		0.115
SO2	-0.1 ppm	1.000
Auto Span		

In the middle column, the current measured value is displayed.

The right column contains the calibration factor.

Strike up the instrument with calibration gas. By changing the adjustment factor to achieve a correction of the measured value.

O2 sensor: 2 factors have to be adjusted. "Zero-offset and O2 linearising offset".

The factors change automatically based on the current measured value. If the O2 value <1.5% as the zero-offset factor is displayed.

From 1.5% (and higher) values of the O2 linearising offset is displayed.

In the line NO2/NO may specifically the cross sensitivity of NO2 to NO sensor are compared.



### Adjustment gas nominal value

Adjustment gas nom. value		
O2	9.32 %	10.0
<b>CO</b>	<b>516.7 ppm</b>	<b>500.0</b>
CO/H2		0.0
NO	-1.1 ppm	80.4
NO2	-0.0 ppm	50.0
NO2/NO		500.0
SO2	-0.2 ppm	

In the middle column, the current measured value is displayed. The right column contains the reference.

Strike up the instrument with calibration gas. Set the desired value of the test gas in the right column. With the F2 key, the setpoint can be saved .. The instrument is now corrected the current measurement value (measured value = set value).

### Adjustment NDIR CO2 with factor

NDIR CO2	
CO2[%]	-0.07
<b>CO2 factor</b>	<b>1.025</b>

An adjustment NDIR CO2 with factor is possible

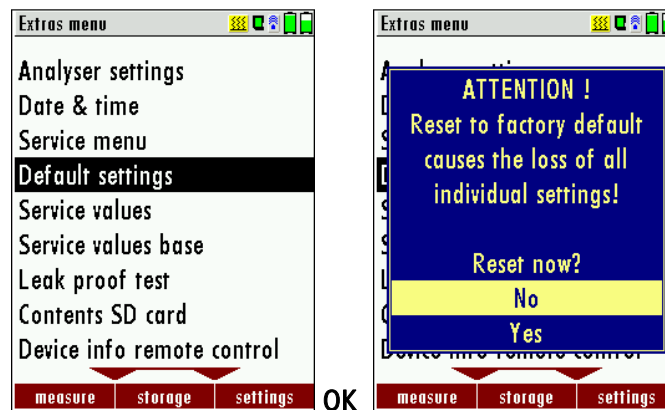
### Adjustment NDIR CO2 with cylinder

Adjustment CO2 nom. value	
CO2[%]	-0.05
<b>Cylinder</b>	<b>20.00</b>
CO2 factor	1.025

A comparison with reference value is possible. If the current value is within the valid range, can be accepted by pressing the F2 of the set value.



### 14.3 Manufacturer default settings



The analyzer will be reset to original delivery settings.

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

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



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

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

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

Service values RCU:

<div style="border: 1px solid gray; padding: 5px;"> <p>Extras menu</p> <p>Analyser settings</p> <p>Date &amp; time</p> <p>Service menu</p> <p>Default settings</p> <p><b>Service values</b></p> <p>Service values base</p> <p>Leak proof test</p> <p>Contents SD card</p> <p>Device info remote control</p> <p>measure storage settings</p> </div>	<div style="border: 1px solid gray; padding: 5px;"> <p>Service values</p> <p>Press. 1 [mV] 0.010</p> <p>PT-Aux [kR] 2086.582</p> <p>TC-Aux [mV] 585.000</p> <p>PT-ref 1/2 [kR] 1.076</p> <p>TC-1 [mV] 585.000</p> <p>TC-2 [mV] 585.000</p> <p>U-Batt [V] 3.806</p> <p>I-Batt [A] -0.189</p> <p>T-Batt [V] 1.818</p> <p>Events &gt; SD</p> </div>	<div style="border: 1px solid gray; padding: 5px;"> <p>Service values</p> <p>PT-Aux [kR] 2086.634</p> <p>TC-Aux [mV] 585.000</p> <p>PT-ref 1/2 [kR] 1.077</p> <p>TC-1 [mV] 585.000</p> <p>TC-2 [mV] 585.000</p> <p>U-Batt [V] 3.809</p> <p>I-Batt [A] -0.193</p> <p>T-Batt [V] 1.814</p> <p>VDD [V] 3.248</p> <p>Events &gt; SD</p> </div>
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▲, ▼	Jump between the lines
F2	Export of service values to SD card
ESC	return

Service values base unit:

<div style="border: 1px solid gray; padding: 5px;"> <p>Extras menu</p> <p>Analyser settings</p> <p>Date &amp; time</p> <p>Service menu</p> <p>Default settings</p> <p>Service values</p> <p><b>Service values base</b></p> <p>Leak proof test</p> <p>Contents SD card</p> <p>Device info remote control</p> <p>measure storage settings</p> </div>	<div style="border: 1px solid gray; padding: 5px;"> <p>Service values base</p> <p>O2 LL [mV] 13.331</p> <p>CO (type 1) [mV] 0.002</p> <p>H2 (type 1) [mV] 0.001</p> <p>NO (type 1) [mV] 0.001</p> <p>T-ECS Sensor [V] 0.771</p> <p>Draft (type 2) [mV] -0.008</p> <p>T-Press. sensor [V] 0.785</p> <p>TC-Gas [mV] 0.005</p> <p>PT-Gas [kR] 2.161</p> <p>Gas pump</p> </div>	<div style="border: 1px solid gray; padding: 5px;"> <p>Service values base</p> <p>CO (type 1) [mV] 0.002</p> <p>H2 (type 1) [mV] 0.001</p> <p>NO (type 1) [mV] 0.001</p> <p>T-ECS Sensor [V] 0.771</p> <p>Draft (type 2) [mV] -0.004</p> <p>T-Press. sensor [V] 0.785</p> <p>TC-Gas [mV] 0.006</p> <p>PT-Gas [kR] 2.161</p> <p>TC-Air [mV] -0.004</p> <p>Gas pump</p> </div>
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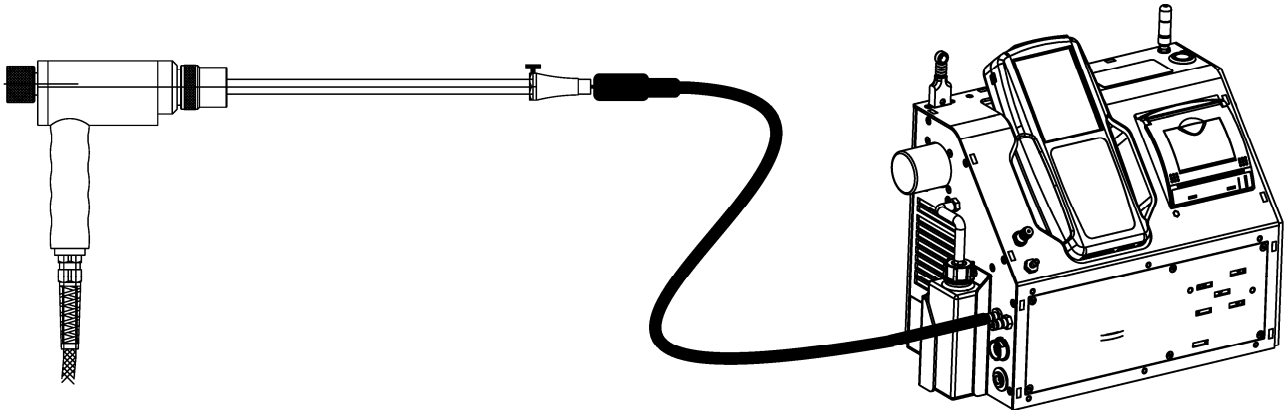
▲, ▼	Jump between the lines
F1	Function test gas pump (on / off -> only with service PIN code!)
F2	Function test purge pump (on / off -> only with service PIN code!)
ESC	return

### 14.5 Leak proof test

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

Operation:

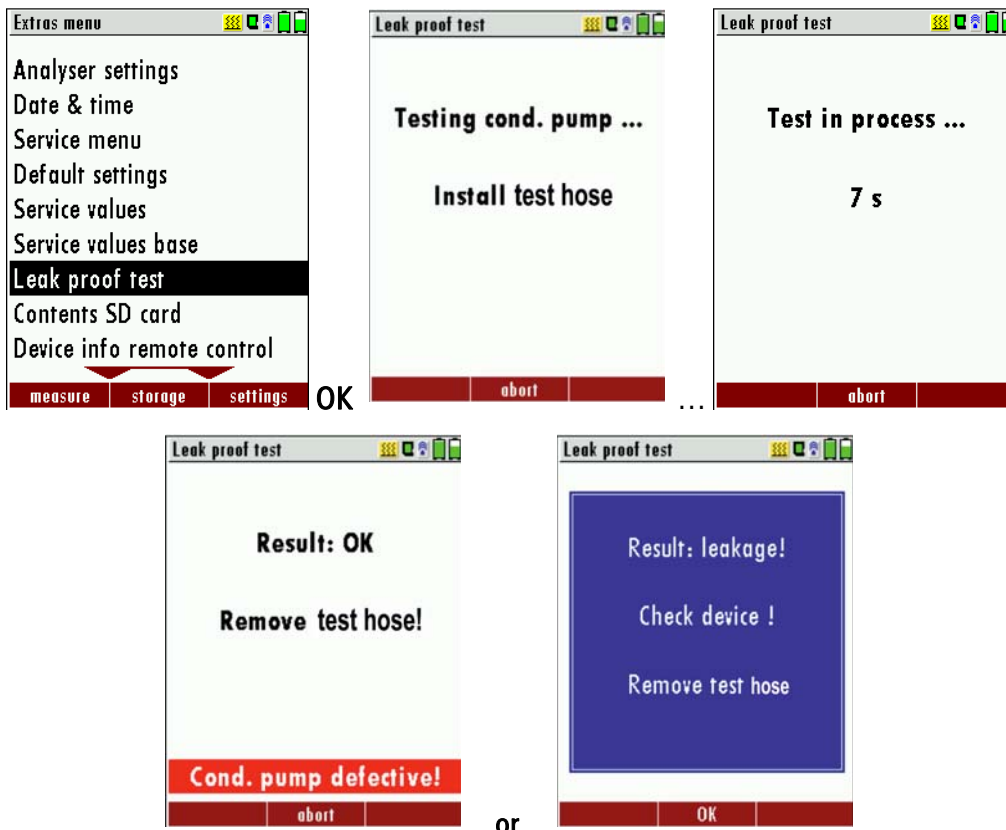
- The hose must be put on on the probe spike and on the pressure connector



**ATTENTION:**

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

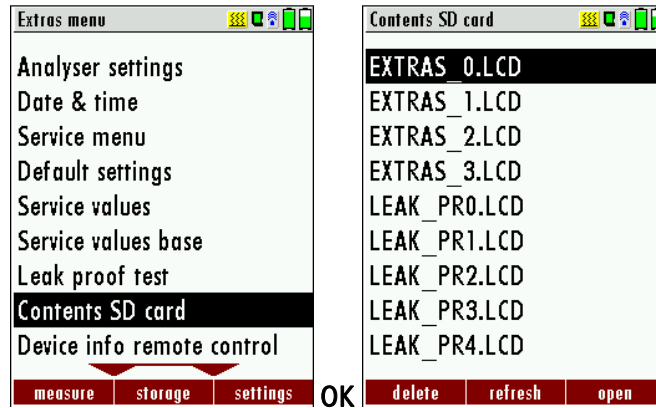
- Launch under "extras" the leak proof test on which the following window will pop up:



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

If no undensity is ascertained in these external parts the RASI 800 MCERTS has to be checked in a service department (worldwide service departments see [www.EiUK.eu](http://www.EiUK.eu)).

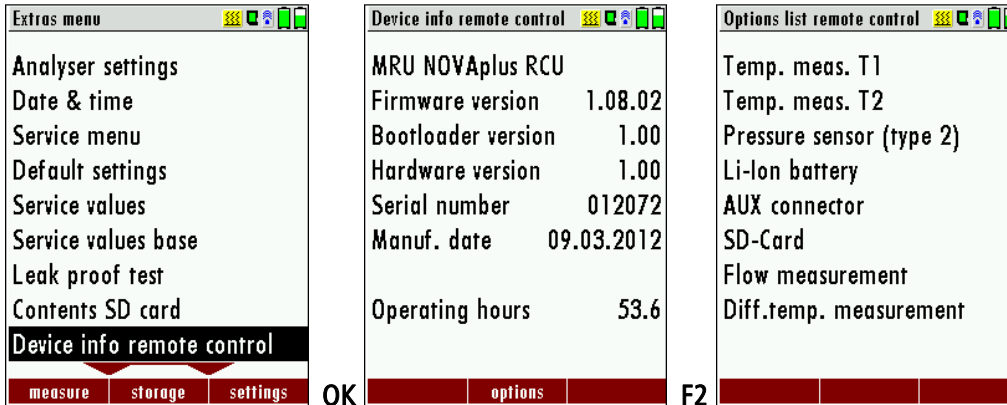
### 14.6 Contents SD card



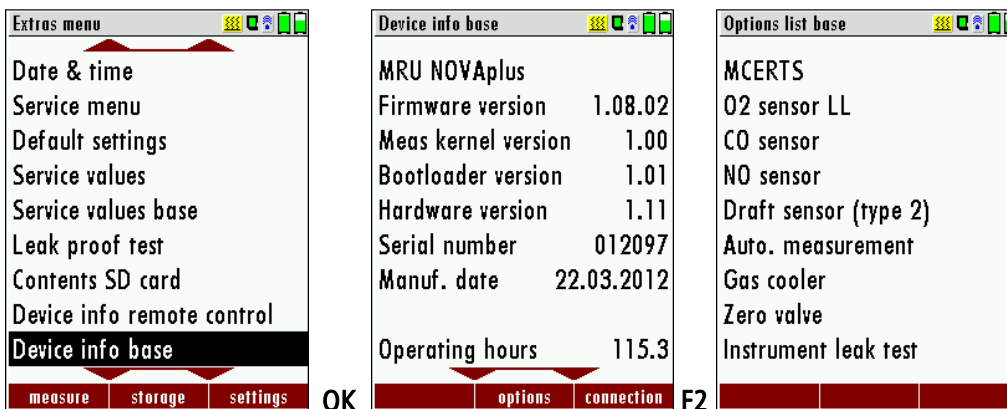
The contents of the SD card will be displayed. With F3 the selected file can be opened.

### 14.7 Analyzer info

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



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

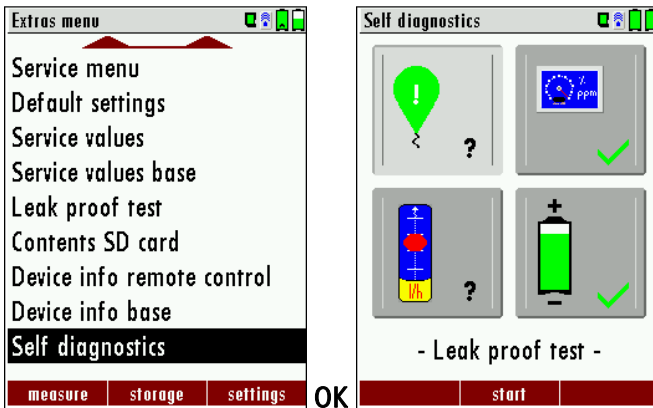


Use the F2 button to see the installed options of the base unit.

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

### 14.8 Self-Diagnostics

The analyzer starts Self diagnostics.



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

The self-diagnostics provides a quick overview of the status of the batteries and the sensors.

If the option "Flow control" exists, can appear the current flow rate [l/min].

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

## 15 TECHNICAL SPECIFICATIONS

### 15.1 General specifications

Deutsch	Angabe	English
Betriebstemperatur	+5°C ... +45 °C / 41 °F ... 113 °F	Operating temperature
Rel. Luftfeuchtigkeit bei Betrieb, nicht-kondensierend	95%	Rel. Humidity, non-condensing
Lagertemperatur	-20°C ... +50°C / -4°F ... 122°F	Storage Temperature
Fernsteuerung : Akku intern, Betriebszeit	Li-Ion: 20 h	Remote Control Unit: Internal Battery Pack, operating hours
Grundgerät: Akku intern, Betriebszeit	Li-Ion, 3 h	Base unit: internal Battery Pack, operating hours
Stromversorgung Grundgerät	100 - 240 V 12V DC / 5 A	Power supply base unit
Stromversorgung Fernsteuerung: - kontaktlos in der Ladeschale - oder ext. USB Netzteil	• USB 5V 1A	Power Supply Remote Control Unit RCU - wireless charging via base unit, - or USB power supply externally
Gewicht mit 2 Sensoren, Koffer, Sonde, Netzteil	ca. 8 kg	Weight w/ 2 sensors, case, probe, power supply
Maße inkl. Koffer (BxHxT)	470 x 314 x 235 mm <sup>3</sup>	Size incl Case (WxHxD)
Gehäusematerial Fernsteuerung	PA6 GF 30	Housing Material RCU
Gehäusematerial Grundgerät	Aluminium	Housing Material Base Unit
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.

### 15.2 Gas sampling and conditioning

Deutsch	Angabe	English
max. Unterdruckbereich der Gaspumpe	650 hPa	Max suction range gas pump
typischer Gasdurchfluss	90 l/h	gas flow typ.
<b>Gaskühler</b>		<b>Gas cooler</b>
Temperatur Peltierkühler (an Netz und Akku)	5 °C	Temperature Peltier cooler (during grid and battery operation)
Kondensatentsorgung aus dem Gaskühler	•	Condensate removal from gas cooler
Automat. Feuchtealarm	•	Humidity supervision and alarm
Interne Durchflussmessung	•	internal gas flow measurement

### 15.3 Measuring values

Deutsch	Angaben zur Messgenauigkeit	English
<b>Elektrochemischer Sensor</b>	<b>O2 (Long Life)</b>	<b>Electrochemical Sensor</b>
Messbereich	0 - 21 Vol%	Measuring Range
Auflösung		Resolution
Genauigkeit abs.	± 0,2 Vol%	Abs. Accuracy
Ansprechzeit T90	< 20s	Response Time T90
Jahre erwartete Lebensdauer an Luft	5	Years expected lifetime (@air)
<b>Elektrochemischer Sensor</b>	<b>CO</b>	<b>Electrochemical Sensor</b>
H2 - kompensiert		H2 compensated
Nominaler Messbereich	0 - 4000 ppm	Nom. Measuring Range
Überlastbereich	< 10000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit absolut / vom Messwert	± 10 ppm / 5% (0 .. 4000 ppm) 10% (> 4000 ppm)	Accuracy abs. / reading
Ansprechzeit T90	< 40s	Response Time T90
<b>Elektrochemischer Sensor</b>	<b>NO</b>	<b>Electrochemical Sensor</b>
Nominaler Messbereich	0 - 1000 ppm	Nom. Measuring Range
Überlastbereich	< 5000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 5ppm / 5% (0 ... 1000 ppm) 10% (> 1000 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 30s	Response Time T90
<b>Elektrochemischer Sensor</b>	<b>NO<sub>2</sub></b>	<b>Electrochemical Sensor</b>
Nominaler Messbereich	0 - 200 ppm	Nom. Measuring Range
Überlastbereich	< 1000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 5ppm / 5% (0 ... 200 ppm) 10% (> 200 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 40s	Response Time T90
<b>Elektrochemischer Sensor</b>	<b>SO<sub>2</sub></b>	<b>Electrochemical Sensor</b>
Nominaler Messbereich	0 - 2000 ppm	Nom. Measuring Range
Überlastbereich	< 5000 ppm	Overload Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 10ppm / 5% (0 ... 2000 ppm) 10% (> 2000 ppm)	Accuracy abs./reading
Ansprechzeit T90	< 40s	Response Time T90

<b>Nicht-dispersive Infrarotmessung (NDIR)</b>	<b>CO<sub>2</sub></b>	<b>Non-dispersive Infrared Measurement (NDIR)</b>
Nominaler Messbereich	0 - 40 Vol%	Nom. Measuring Range
Auflösung		Resolution
Genauigkeit abs. /vom Messwert	± 0,3 Vol% 5%	Accuracy abs./reading
Ansprechzeit T90	< 35 s	Response Time T90
<b>Abgastemperatur</b>	<b>T<sub>A</sub></b>	<b>Flue gas temperature</b>
Messbereich mit Gasentnahmerohr aus Edelstahl	0 - 650°C	Measuring Range with high grade steel probe pipe
Genauigkeit abs. / vom Messwert	±2°C / 1%	Accuracy abs. / reading
Anschluss an Basisgerät		To be connected to base unit
<b>Verbrennungslufttemperatur</b>	<b>T<sub>I</sub></b>	<b>Air temperature</b>
Messbereich	0 - 100°C	Measuring Range
Genauigkeit abs.	1 °C	Accuracy
Anschluss an Grundgerät oder optional an Fernsteuerung		To be connected to base unit or optional to remote control unit
<b>Differenzdruck Basis</b>		<b>Differential Pressure Base Unit</b>
Messbereich	± 125 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Anschluss an Grundgerät		To be connected to base unit
<b>Differenzdruck Fernsteuerung</b>		<b>Differential Pressure RCU</b>
Messbereich	± 125 hPa	Measuring Range
Genauigkeit abs. / vom Messwert	0,02 hPa / 1%	Accuracy abs. / reading
Anschluss an Fernbedieneinheit		To be connected to Remote Control Unit
<b>Temperaturmessung Fernsteuerung</b>		<b>Temperature Measurement RCU</b>
Messbereich	-50 ... 1100 °C	Measuring Range
Thermoelement	Typ K Mini	Thermocouple

## 15.4 Calculated values

<b>Deutsch</b>	<b>Angabe</b>	<b>English</b>
Taupunkt	°C	Dew point
Abgasverlust q <sub>A</sub>	0 - 99,9%	Losses q <sub>A</sub>
Wirkungsgrad	0 - 120%	Efficiency
Messwerte darstellbar als	mg/Nm <sup>3</sup> O <sub>2</sub> Ref mg/kWh NO <sub>x</sub> : mg/Nm <sub>3</sub> NO <sub>2</sub>	Measurement values available as
<b>Strömungsgeschwindigkeit</b>	<b>v</b>	<b>Velocity</b>





<i>basierend auf Differenzdruckmessung mit Prandtlrohr</i>		<i>based on differential pressure measurement with Pitot tube</i>
Messbereich typisch	3 m/s ... 100 m/s	typical measuring range
Genauigkeit bei 3 m/s	1 m/s	accuracy at 3m/s.
Genauigkeit > 12 m/s (vom Messwert)	± 1%	accuracy > 12 m/s (reading)
Auflösung	0,1 m/s	resolution
Absolutdruckmessung	•	absolute pressure measurement

<i>basierend auf Flügelradmessung</i>		<i>based on vane anemometer</i>
Messbereich (abhängig von Flügelrad-Typ)	0,25 - 35 m/s	measuring range (depending on actual vane type)

**15.5 Data communication**

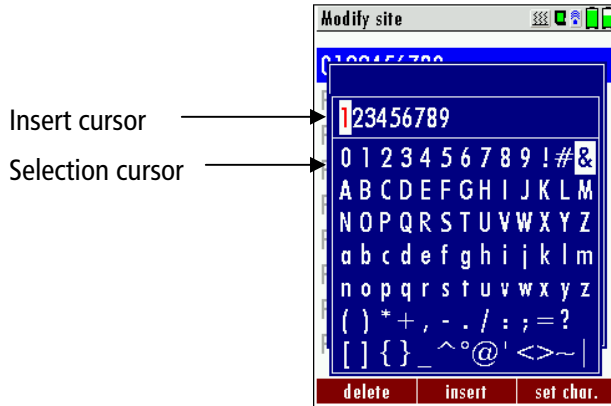
Deutsch	Angabe	English
USB Anschluss	via Fernsteuerung	USB interface
SD Karte für SW update, Datenaustausch, erweiterter Datenspeicher	>= 2GB, via Fernsteuerung	SD card for SW update, data exchange or extended data memory
Reichweite Funkverbindung Fernsteuerung - Basis freie Sicht typisch in Gebäuden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

## 16 APPENDIX

### 16.1 Text input

A numbers of texts and names can be changed to your own needs.  
 (for example: the names of the user defined fuel types, site names, the names of the measurement programs)

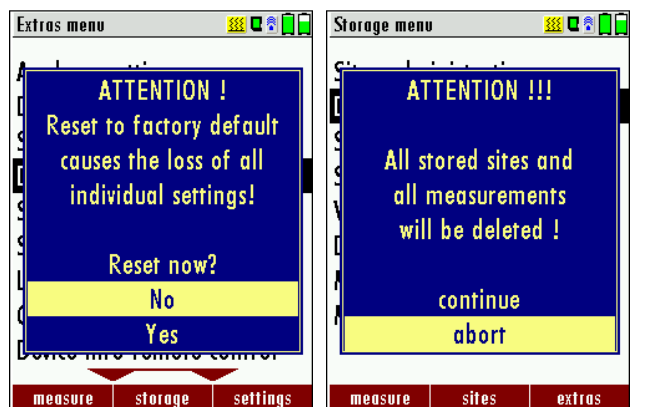
When you select the text input, the following window will pop up:



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

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

The RASI 800 MCERTS will ask you now and then to confirm the action that will be taken.

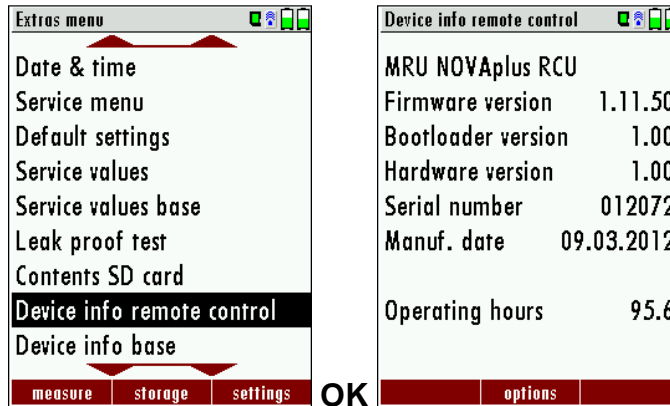


▲, ▼	Select a line
OK	Confirm the action
ESC	Abort the window, changes will NOT be saved

### 16.3 Firmwareupdate RASI 800 MCERTS

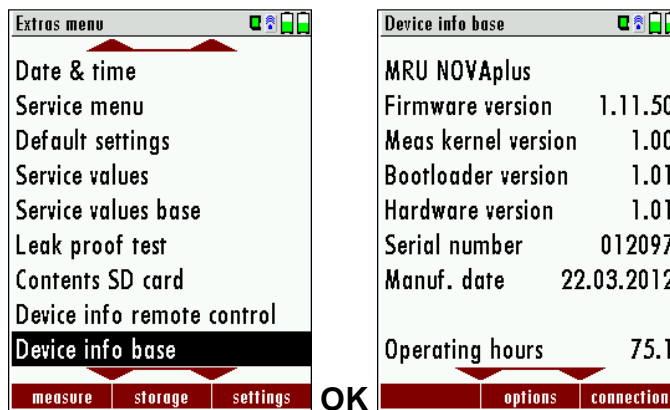
Switch OFF the device.

Select F3 settings/Device info remote control



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

Following select Device info base



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

**RCU:**

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

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

**Base unit:**

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

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

**Do the following steps in order to update the firmware:**

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

**Note:**

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

**Attention:**

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

## 16.4 Using the USB-Port

Your PC / Laptop will recognize the RASI 800 MCERTS as USB- HID (Human Interface Device).

Check list:

1. Switch on the RASI 800 MCERTS
2. Connect the USB cable to the RASI 800 MCERTS
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

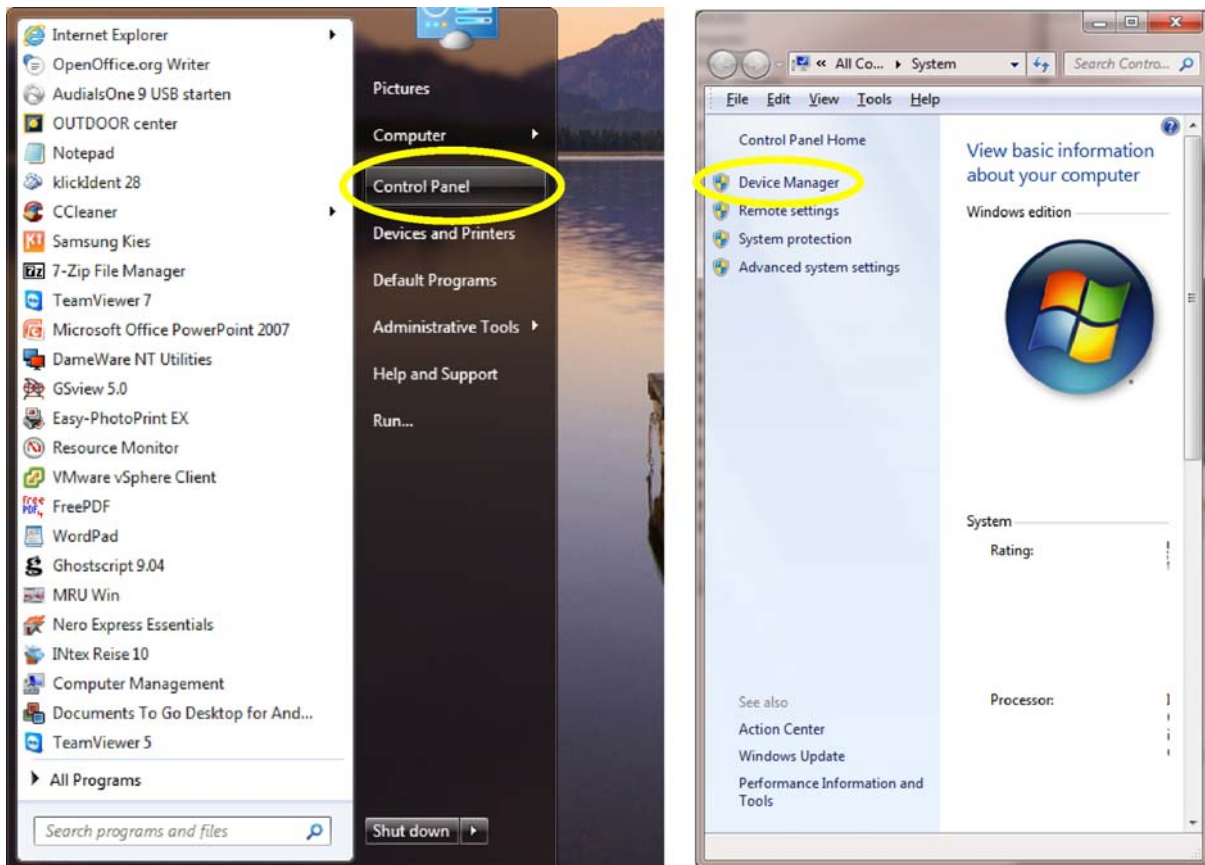
If this is not the case, then you have a problem with your USB-Connection of your PC/Laptop.

Check in your Device Manager if the analyzer is ready for operation.

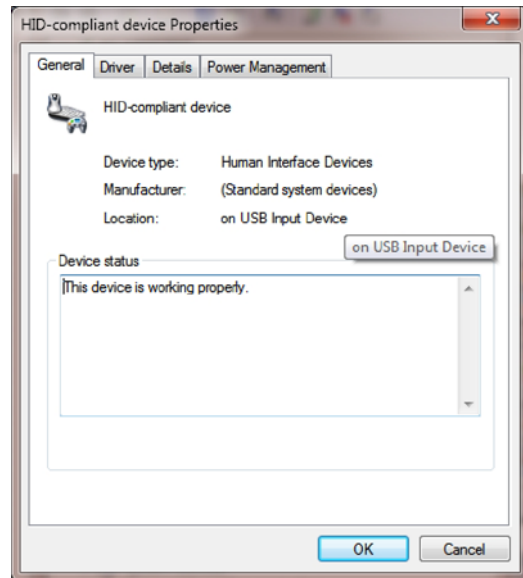
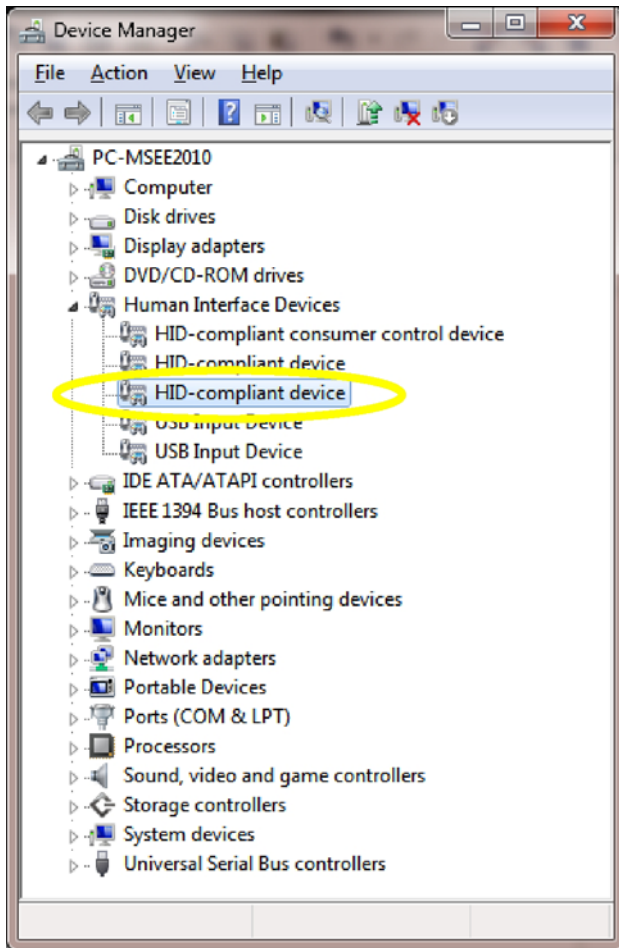
The RASI 800 MCERTS is as HID-conform unit registered.

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

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

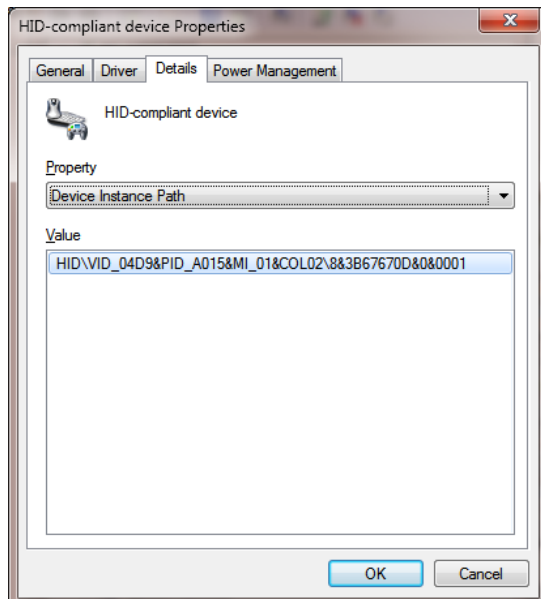


(The graphics may look different on your PC/Laptop as shown in this manual!)



The RASI 800 MCERTS is registered as HID-conform unit. In the General folder you can see if the unit is ready for operation.

In case the analyzer is not ready for operation, choose a different USB instrument to check the USB port on your computer, and/or connect the RASI 800 MCERTS to a different computer to locate the error.



## 16.5 Analysis and calculations

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

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

Continuously caculated values	Unit
CO <sub>2</sub>	[%]
Efficiency ETA	[%]
Efficiency condensed	[%]
Losses	[%]
Losses condensed	[%]
Lambda	-

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 EiUK.



## 16.6 Fuel types

*The fuel types are only available if the combustion analysis is activated.  
EXTRAS/Analyser settings/measurement (chapter 9.2.1)*

### 16.6.1 General information

$O_2 \text{ max} = 20.9\%$        $O_2$  content

$O_2$  = measured  $O_2$  value [%]

$O_2 \text{ bez}$  =  $O_2$ -reference value [%] (fuel specific)

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

$V_{AG \text{ min, tr}}$  = Flue gas volume, dry and  $O_2$ -free (fuel specific)

### 16.6.2 $CO_2$ , Lambda, losses, efficiency

$$CO_2 = CO_{2 \text{ max}} \cdot \left( 1 - \frac{O_2}{O_{2 \text{ max}}} \right)$$

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

$$\text{losses} = (T_{\text{fluegas}} - T_{\text{air}}) \cdot \left( \frac{A_2}{O_{2 \text{ max}} - O_2} + B \right) \quad (\text{temp. in } ^\circ\text{C, } A_2 \text{ and } B \text{ fuel specific})$$

$$\text{efficiency} = 100\% - \text{losses}$$

### 16.6.3 Dew point

(DIN 4705, part 1, page 17)

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

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

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

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

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

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



#### 16.6.4 CO- conversion of CO [ppm]

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

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

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

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

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

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

#### 16.6.5 NO-conversion of NO [ppm]

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

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

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

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

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

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

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

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

#### 16.6.6 NO2-conversion of NO2 [ppm]

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

### 16.6.7 NO<sub>x</sub>-conversion of NO [ppm] (possible also of NO<sub>2</sub> [ppm])

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

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

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

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

If NO<sub>x</sub> is specified in mg, it has to be considered, that all the NO in the atmosphere will become NO<sub>2</sub>. Therefore the conversion factor ppm => mg is factor of NO<sub>2</sub>.

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

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

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

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

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

## 16.7 Fuel type list

*The fuel type list is only available if the combustion analysis is activated.  
EXTRAS/Analyser settings/measurement (chapter 9.2.1)*

Deutschland		O2max	20,96	
Brennstoff	CO2max	A1	A2	B
Prüfgas	0,0	0,00	0,00	0,000
Erdgas (LL)	11,8	0,37	0,66	0,009
Erdgas (E) (*)	12,1	0,37	0,64	0,009
Heizöl EL	15,4	0,50	0,68	0,007
Heizöl S	15,9	0,50	0,66	0,007
Flüssiggas P/B	13,7	0,42	0,63	0,008
Propan	13,7	0,43	0,66	0,007
Butan	14,1	0,45	0,67	0,007
Bio-Diesel	15,7	0,46	0,62	0,005
Holz trocken	20,3	0,60	0,62	0,009
Pellets	20,3	0,74	0,77	0,000
Kohle	19,1	0,59	0,65	0,009
Braunkohle	19,4	0,39	0,42	0,009
Torf	19,8	0,66	0,70	0,010
Kokereigas	10,8	0,29	0,60	0,011
Stadtgas	11,7	0,35	0,63	0,011

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

Fuel lists for further countries receive you on requirement.

## 16.8 Errors

### 16.8.1 Error diagnosis regarding the measuring device

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



## 16.9 Declaration of conformity



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### Declaration of conformity

The company  
**Eurotron Instruments UK Ltd**  
 Unit 13 Riley Close  
 Royal Oak Industrial Estate  
 NN11 8QT – DAVENTRY-UK

herewith declares conformity of the product

Designation **RASI 800**

Mit folgenden einschlägigen Bestimmungen/ with applicable regulations below

EC directive **73/23/EWG**

**89/336/EWG**

Harmonized standards applied

a) low voltage directive: **2006/95/EG**

b) EMV-directive: **2004/108/EG**

National technical specifications applied

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Notified body, type test

Daventry – 25.09.2012

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 Eurotron Instruments (UK) Ltd Managing Director

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