MRU AIRfair since 1984 ®
EMISSION MONITORING SYSTEMS

DELTA*smart FFZ*

USER MANUAL

6902EN-FFZ

Manufacturer:

MRU · Messgeräte für Rauchgase und Umweltschutz GmbH
Fuchshalde 8 + 12
74172 Neckarsulm-Obereisesheim
Fon 07132 99620 · Fax 07132 996220
info@mru.de · www.mru.eu

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Table of Content

1 Information for product and safety

1.1. Safety precautions

The used categories of safety precautions are here explained once more.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

Describes a possible danger that can cause risk of injury.

ATTENTION

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

NOTE

Gives user hints and other important information.

The explanation of safety notices:

⚠ CAUTION

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

Physical harm and property damage can be caused.

► Cool down the probe tube.

1.2. Ensure safety

- Use the device only for its intended use and within the parameters specified in the technical data.
- Do not use any violence.
- Avoid dropping.
- Do not operate the device if there is any damage to the housing, power supply unit or supply cables.
- Do not store the unit together with solvents and do not use desiccants.
- Only carry out maintenance and servicing work on this device that is described in the documentation. Observe the described steps.
- Only operate the device in closed, dry rooms and protect the device from rain and moisture.
- Only operate the unit with the supplied battery charger.
- Never use the probe tube and other metal parts / accessories as electric conductors.
- The analyser may not be positioned near open fire or extreme heat.
- The defined temperature range of the extraction probe / probe tube may not be exceeded, the probe tube and/or the thermos-element can be destroyed.

1.3. Device details

- The device is not suitable for long term (continuous) measurements (this is a spot device).
- Before using the device verify the condition of the various parts of the device, such as the probe, the ambient air conditions, the condensate separator, star filter and the connectors for damage and/or blockages.
- When starting the device up it will take between 1 – 3 minutes to set to zero depending on the condition of the sensors and ambient conditions. (Zeroing).
- The minimum zeroing time of the device to achieve correct measurement values can be expected by 1.5 minutes.
- 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. O_2 - 2 years; CO - 2 - 3 years and NO - 3 years.
- The battery life is at least 500 charge-discharge cycles. With increasing number of charging cycles the battery capacity (indicated in operating hours) is reduced.

1.4. Lithium-Ion battery user guidelines

NOTE

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

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

- This rechargeable battery is only for this unit.
- Don't charge the device in extreme heat, don't store the battery in a hot environment and don't throw the battery into fire.
- Don't try to modify the battery, shortcut it or put any mechanical force to it.
- The battery may not be used in or under water.
- Avoid mechanical force and don't throw that battery.
- Don't cut or squeeze the battery cables.
- Don't carry or store the battery together with sharp objects.
- Not obeying the above instructions can cause heat, fire and explosion.

2 Introduction

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

2.1. Intended use

The device is intended for short-time measurements within the scope of emission control measurements and adjustment work on industrial trucks according to DGUV 79 § 37.2. The device records the measured values according to VDI4206 and EN50379 and stores them for further processing.

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

The device may only be used as indicated in this manual. Our devices are checked according to the following regulations: VDE 0411 (EN61010) and DIN VDE 0701 before they leave the factory.
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.
We assure that the device complies to the essential requirements of the legal regulations of the member states of the electro-magnetic compatibility (2014/30/EU).

2.2. The Company MRU GmbH

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

From left to right: Production - Sales, administration and development - Customer service

MRU GmbH
Fuchshalde 4 + 8 + 12
74172 Neckarsulm - Obereisesheim
GERMANY

Fon +49 71 32 99 62 0 (Zentrale)
Fon +49 71 32 99 62 61 (Kundendienst)
Fax +49 71 32 99 62 20
Email: info@mru.de
Internet: www.mru.eu

2.3. Packaging

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

2.4. Return of hazardous material

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

2.5. Return of electronic equipment

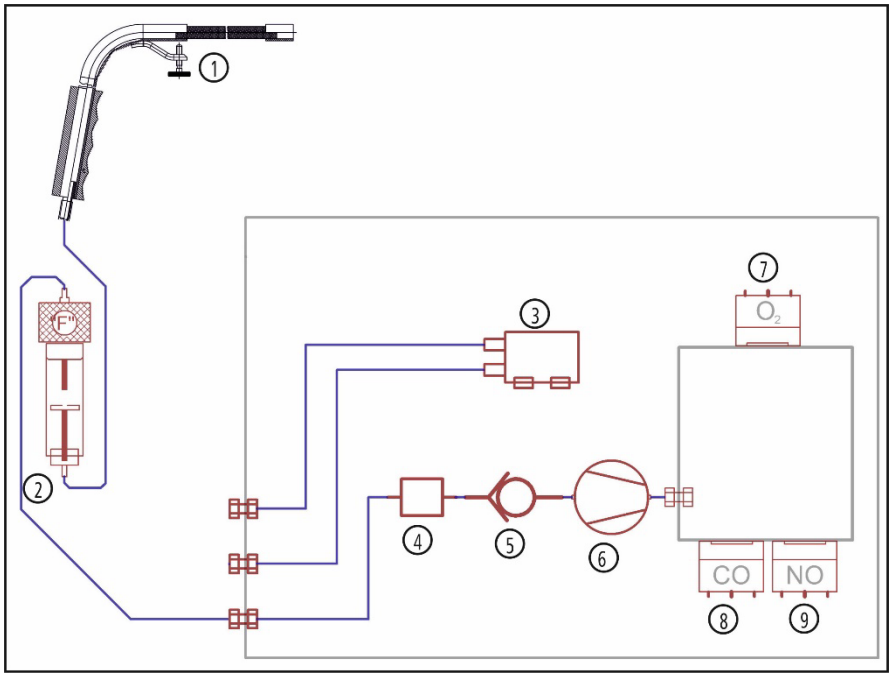
MRU GmbH is required to accept the return, for proper disposal, of all devices delivered after 13th of August 2005.
Devices must be returned to MRU prepaid.

3 Description

The main task of the device is to support the following applications:
Fast and reliable CO measurement on industrial trucks with liquid gas combustion engines.

3.1. Schematic gas flow diagram

In combination with the gas sampling probe, the device extracts a partial volume of the exhaust gas from the combustion duct and analyses it for its components using electrochemical sensors.



1	Gas sampling probe
2	Condensate seperator (water trap)
3	Draft/pressure sensor
4	Internal filter
5	Non return filter
6	Gas pump
7	O_2 Sensor
8	CO-Sensor
9	NO-Sensor

3.2. The Analyser

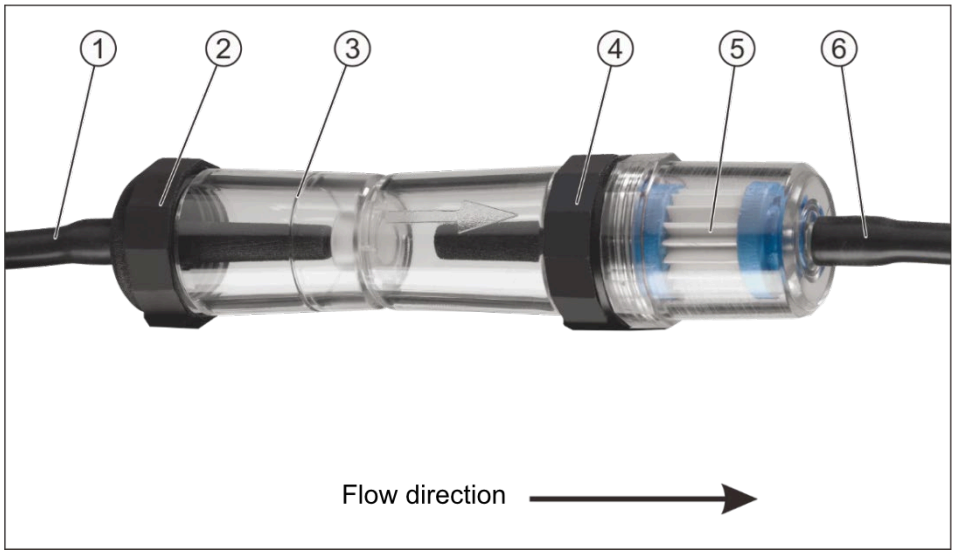
The compact analyzer is made from a fiber re-enforced plastic material with all measurement related connections at the bottom of the analyzer. The analyzer is operated exclusively using the touch screen display.

1	Touch screen display
2	Connection port P2 for draft measurement
3	Temperature port T2 for gas temperature
4	Connection port P1 (only for differential pressure measurement)
5	Temperature port T1 for ambient air temperature
6	Connection port flue gas entrance
7	Gas exit (may not be covered during operation)
8	Mini USB port for battery charging and data transfer
9	Reset button
10	IR interface for external IR printer
11	Micro-SD-card slot

3.3. The condensate separator (water trap)

During a measurement condensate is being collected in the condensate separator. The maximum water level is marked with a ring on the bottom part of the show glass.
Empty the condensate separator frequently to avoid water getting into the device.

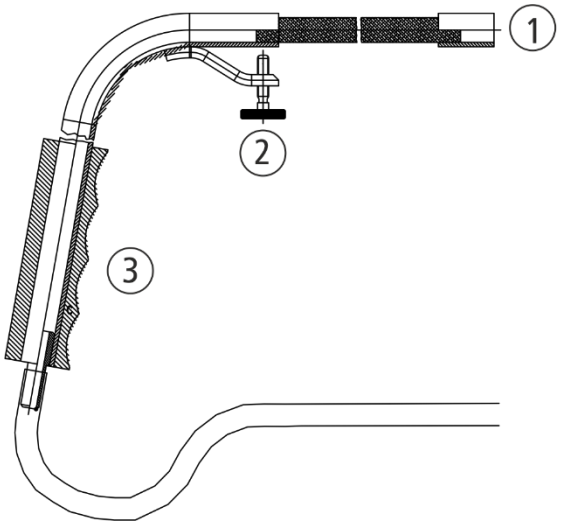
See also Chapter 6.6 Controlling condensate separator (water trap), page 24.



1	Hose connection from probe sampling line
2	Bottom hose connector
3	Condensate show glass with max fill indicator
4	Screw connection top
5	Star filter and filter housing
6	Hose connection to device

3.4. Probe

Probe with 400 mm immersion depth and 2 metre Viton tubing



1	Probe tip
2	Probe clamp
3	Probe handle

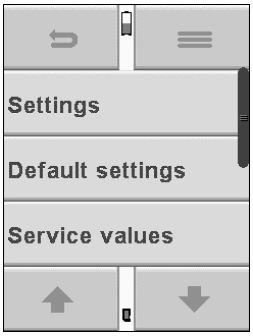
4 First usage

Once the device is ready for operation, you can make some customised adjustments during the first commissioning.
All settings can be changed at any time later.

4.1. Preparatory steps

- Unpack the device.
- Read the user manual in its entirety.
- The device has left the manufacturer completely assembled and ready to use. Check if everything indicated has been delivered and that there are no visible damages.
- Charge the battery for at least 8 hours.
- Check and modify date and time if needed.

4.2. Device settings



In the main menu **Extras** you can make in the submenu **Settings** the following adjustments:

- LCD brightness
- Language
- Country for country specific fuel types and measuring
- Helping hints (on/off)
- Keyboard beep (on/off)
- Temperature units

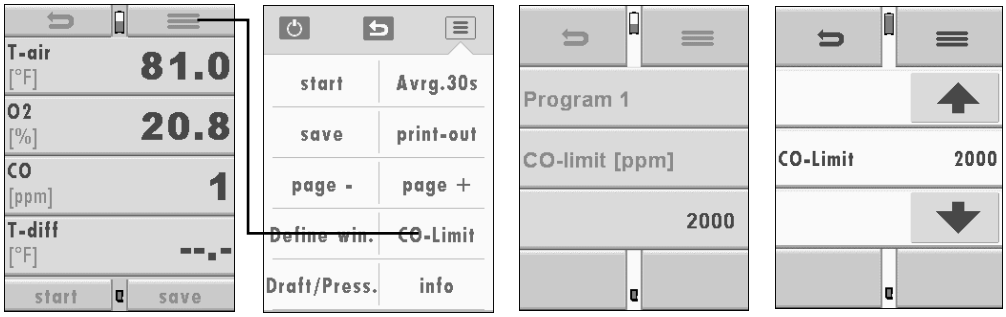
Country	Option	By changing the country, the O2 reference values will be lost. The fuel type lists are reset. Country specific parameters will be activated. Please check if all the country specific parameters are correct, to assure that the device meets the regulations for the country that you are using this device
Language	Option	Select the device language
LCD brightness	5 – 100 %	The display-contrast is dependent on ambient temperatures as well as the user's perspective, at 20°C +/- 50% is normal
Keyboard beep	ON / OFF	Turn on / off the keyboard beep
Helping Hints	ON / OFF	Turn on / off helping hints
Temperature units	°C or °F	Select temperature unit
CO-display in %	ON / OFF	Selection of the measurand of CO
Fuel list	ON / OFF	Fuel list selectable
Logo	ON/ OFF	Logo selectable
Printer type	MRU / HP	Printer selection
BLUEGAZsmart	ON / OFF	Large display control
Bluetooth	Andr./IOS	Selection Android / IOS

4.3. Setting time and date

In the main menu **Extras** and sub menu **Date & time** date and time can be viewed and modified. The analyzer changes the time automatically between standard time and daylight savings time.
The time and date must be modified in case the battery has been discharged completely.

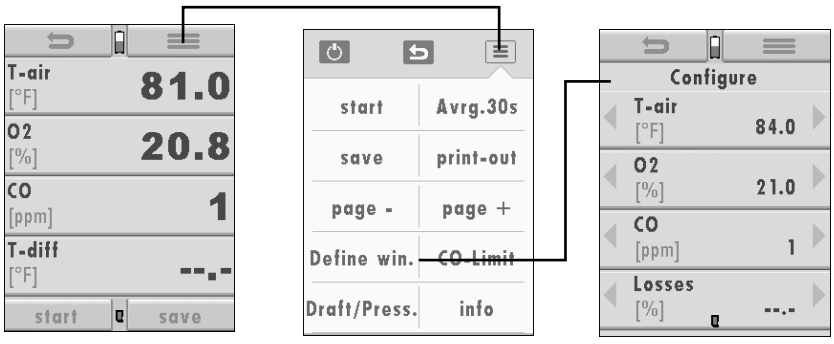
4.4. Setting CO limit

High CO concentrations in the gas stream can shorten the life span of your CO sensor. The device can warn the user if the analyzer exceeds a pre-defined CO limit. There will be both an acoustic and visual signal, the device has no active CO overload protection. In case the pre-defined CO limit is active you will have to remove the probe from the stack or you take actions to lower the CO values.
The CO limit can be defined for each of the 4 measurement programs. Using during the measuring the context menu and you can press the CO limit key – the CO limit can be changed in 100 ppm steps.



4.5. Define the measuring window

The device can display 20 measurement values – 4 values on 5 pages. The user can define in what order he wants to see the available measurement values.
Please select **MEASURING WINDOW– CONTEXT MENU – DEFINE WINDOW**. You will then select the line that needs to be modified and with left and/or right you can view and select available parameters. This procedure will be done for each line.



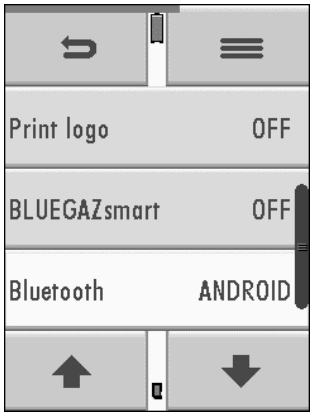
When completed you will exit this window using the  button.

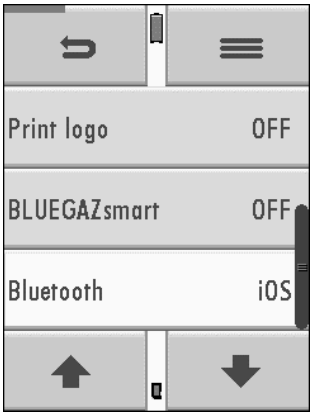
4.6. Select and modify Bluetooth parameters

Depending on the equipment, the analyser can be used to exchange measurement data with external devices via Bluetooth:

- With MRU4u (App for Android and iOS smartphones)
- With MRU4Win
- With MRU Bluetooth printer

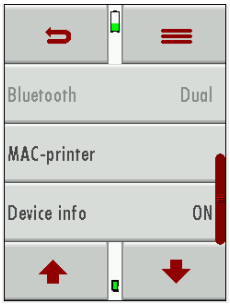
Depending on the software version of the analyser and the technical specification of the Bluetooth interface, settings for data transmission may be required. Please check in the following menu:





Adjustments can be made in the main menu **EXTRAS** / sub menu **Settings** / sub menu **Bluetooth**.

If the settings window appears as shown above, please select whether you are connected to an Android or iOS smartphone You realise a connection to the Bluetooth printer or to MRU4WIn with the setting "ANDROID".
The Bluetooth-Passkey (connecting code) is: 1234



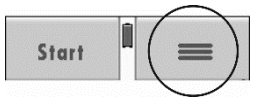
If "DUAL" appears in the settings window instead of the selection ANDROID and iOS, the Bluetooth module supports all applications without further settings.

Operation

4.7. Power on and power down

The device is powered on using the display.
Press and hold the display, then press the green power button. The device will start up..

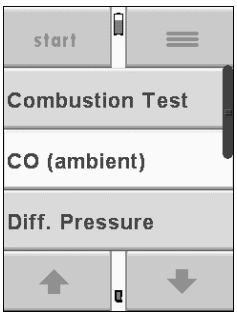
Use the context menu button to power on the device down.



After pressing the button with the switch-off symbol the unit is switched off.

Once the analyzer has been started it will make a self-test and then perform the zeroing of the analyzer. It is important that at this point the analyzer is operated at ambient air and that the pressure ports are without pressure.

4.8. Function keys



In all operation windows there are pre-defined function keys at the top and the bottom of the screen.
At the top of the screen these are mostly the **return** key and the **context menu** key.
At the bottom of the screen these are mostly the **page up** and **page down** keys.
Dependent on the page that you are currently on, the function keys can have different functions to allow faster access.

4.9. Context menu

The **context menu**-button offers additional functions. When pressing the **context** key, you will see a variety of functions related to the window that you are currently in.
There are also general functions like: switch off a, exit window, close context menu without action.

1	Power analyzer down
2	Return – exit window
3	exit context menu window without action

4.10. Combustion test

⚠ DANGER

Poisonous gas be present

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

► Only operate the device in well ventilated rooms

NOTE

Wrong measuring results

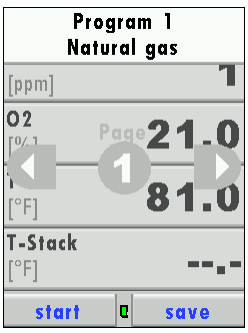
The extracted flue gas must be able to evacuate the analyzer without obstruction.

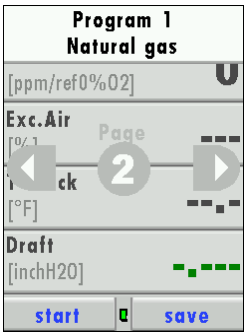
► The exhaust outlet at the rear of the analyzer may never be covered during a measurement

Start: Starts flue gas measurement with currently selected fuel.

The measurements window has in total 20 measurement parameters, 4 parameters each on 5 pages. There are 2 ways to move from page to page:

- Press the context key and then select page + or page -,
- Or simply touch the left or right border of the display to jump to the next or previous page

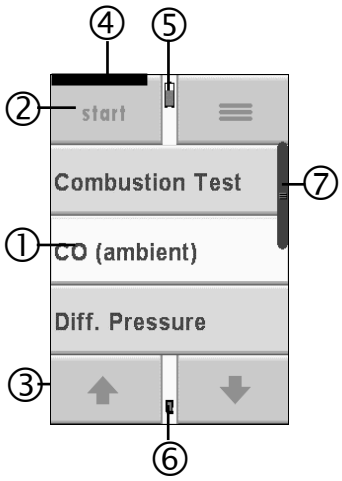




1	Info (Program / Fuel type)
2	Page 2

4.11. Display

All information needed to operate the device are displayed on the screen:

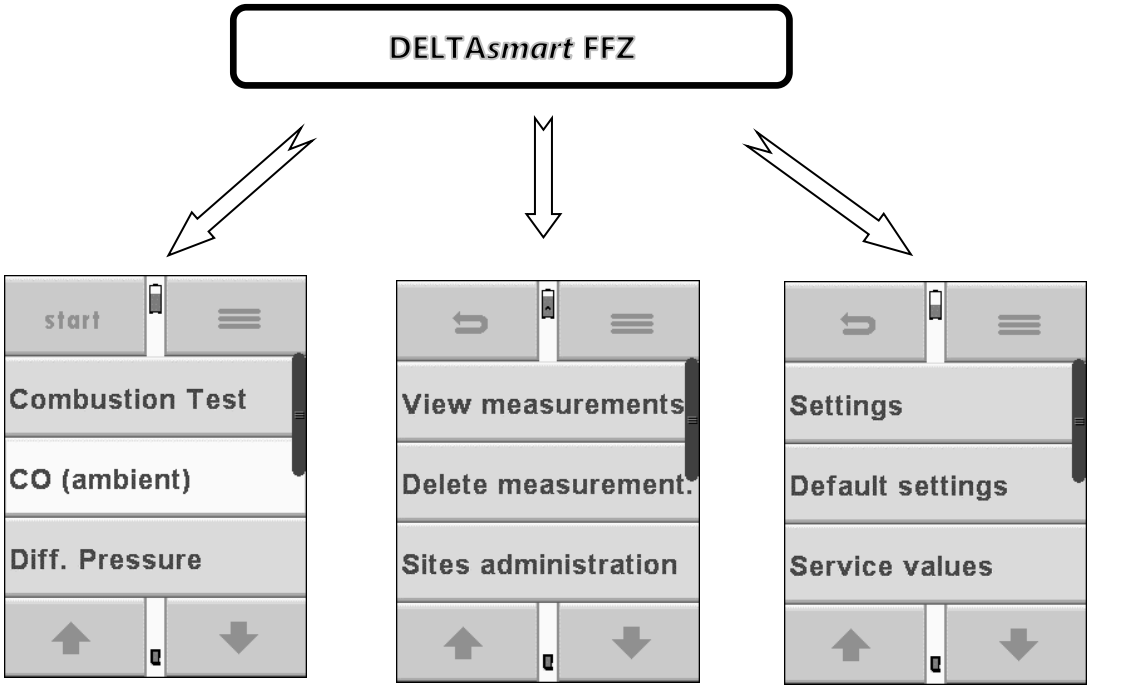


1	Main menu lines
2	Function keys
3	Function keys e.g. page up/down
4	Zeroing status bar
5	Charging status of the battery
6	SD-card in the SD card slot Indication green - Read and write access Indication yellow - only Read access (SD-Card write protected)
7	Scroll bar for main menu lines

4.12. Menu structure

The device has all available functions available in 3 main menus: Measurement, Storage and Extras.
From each of the above-mentioned menus one can switch over to the next or previous menu by using the context key and then select the menu you want to go to

Measurement menu:	Here are all measurement related functions available. All installed and available measurement options can be selected here.
Storage menu:	Here all storage related functions are available like site administration, data memory, data transfer and so on.
Extras menu:	Here all administration related functions available. Device settings, date and time, service menu, device info and others.



The measurement menu is described in Chapter 7 Performing measurement, page 26

The storage menu is described in Chapter 8 Data Storage, page 30.

The Extras menu is described in Chapter 9 Extras, page35

5 Preparing measurement

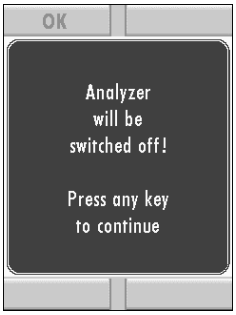
5.1. Ensure Power supply

The device can either be used with:

- Internal battery (included with device delivery)
- Battery charger (included with device delivery)

Connect external accessories only when the analyzer is switched off.

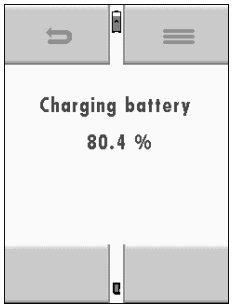
5.2. Automatic power down function (AUTO-off)



The analyzer switches off automatically if is in one of the 3 main menus and no key has been pushed for 60 minutes.

During measurement and analyzer charging (USB port) the Auto-off function is deactivated.
Before shutting down, the analyzer will display the intention of shutting down, which you can prevent by pressing any key on the display.

5.3. Measuring with connected charger / Battery charging



The device will be charged when you connect the external USB charger 90..260 V / 50/ 60Hz.

During battery charging the analyzer can be operated and be used for measurements.

Once the battery is fully charged, the analyzer will switch to trickle charge mode.

5.4. Battery charge condition

The battery symbol on the display indicates the remaining capacity of the battery. About 15 minutes (dependent on analyzer configuration) the battery symbol will flash red in 1 second intervals. When the battery is almost drained, and the analyzers is not connected to the external charger, the analyzer will power off to prevent damage to the battery.

5.5. Operating temperature

In case the analyzer has been stored under cold or very cold conditions, you must give the analyzer time to adjust to the warmer environment before switching it on, to prevent condensation inside the analyzer! The analyzer will display a message in case it is outside of its operation range.
In this case the device is not operational and will send an acoustic signal while warming up.

5.6. Controlling condensate separator (water trap)

The condensate separator must be emptied before and after each measurement, you will get a reminder to do that when switching off the device.
The condensate separator must be checked before, during and after each measurement.
Check if the condensate separator is **empty** and if the pleated filter is white (clean).

⚠ VORSICHT

Condensate is acidic

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

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

Here is how to empty the condensate separator:

- Move the hoses from the upper bracket to the side.
- Unscrew upper plug (counter clock wise) then lift it.
- Empty the container with caution.
- The condensate separator can easily be disassembled / assembled to remove the filter and to let the condensate separator dry.
- Both plugs have gaskets, which must be present, undamaged and in the correct position when you assemble the condensate separator again.

5.7. Connection and tightness

- Check if all connections are connected properly.
- Check the complete probe, sampling line and condensate separator for leaks / leak tightness.

5.8. Automatic zero-point setting

Touch the display the press the green ON button. The analyzer will perform a self-check and start zeroing.

During zeroing the probe must be in ambient air (not in the stack)!

During zeroing there is a blue zeroing bar (top of display) visible.
Once zeroing is completed, the blue bar will disappear and the device is ready for measurement.
The analyzer will display a defect sensor if any of the installed sensors is not ready after zeroing.

Repeating the zeroing
Zeroing can be repeated at any time as long as the probe is not inside the stack and at ambient air. In the main menu „Measurement" you select the „zeroing" button.

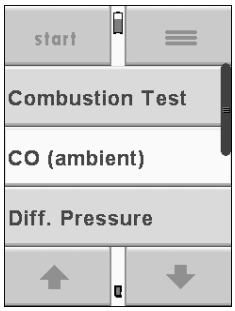
6 Performing measurement

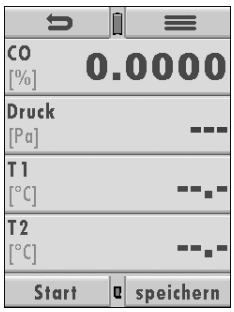
⚠ WARNING

Corrosive Liquid

Cauterisation of the hands

► Before commissioning, check whether any liquid is visible on the housing.
► Remove the liquid
► If the liquid comes out of the inside of the appliance, do not operate the appliance. Contact your MRU service centre.





In the base configuration the device has the capability to perform a combustion test. Here is a complete description how to perform a combustion test.
Once powered up the device is in the measurement menu.

6.1. Measurement window

The measurement values are on 5 pages with 4 values on each page as described in chapter 4.5 Define the measuring window, page 16.

Measurement values are available as direct measured like O2 and temperature, as well as calculated values like CO2 and efficiency. Some values are available with different parameters like CO in ppm or CO in mg/kWh.

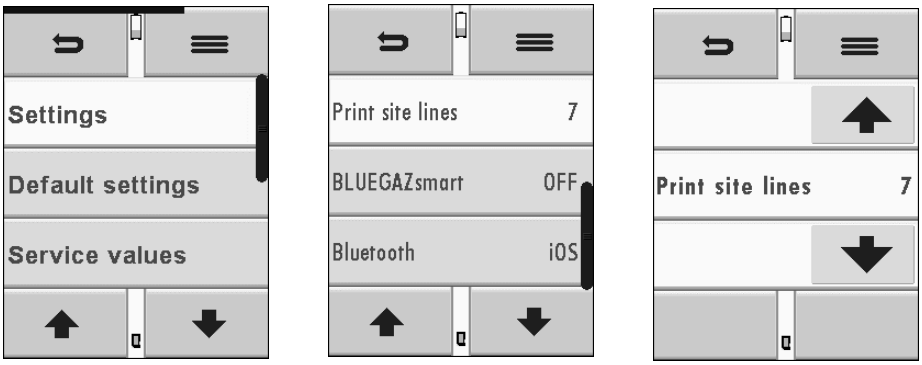
Not available values will be displayed with dashes. Reasons for not available values are:

- A sensor has been recognized as defect during zeroing.
- External temperature sensors are not connected.

6.2. Printing measurement results

The measuring results can be printed from each measuring program using the printer button in **MEASUREMENT SCREEN / CONTEXT MENU (print-out)**. The values will be printed the same way the screen is defined; double values will only be printed once.

In menu **Extras/Settings** you can define the number of site lines for printing



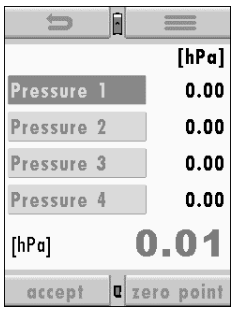
With the printout, you get the defined number of lines e.g. city, address etc.

6.3. End of Measurement

A measurement can be stopped at any time using the Stop-Button. The window changes its color and the values are frozen. All values that had been present when the measurement was stopped can still be viewed. With the Return button you return to the main menu „Measurement“.

6.4. Last measured value

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



6.5. Pressure measurement (Option)

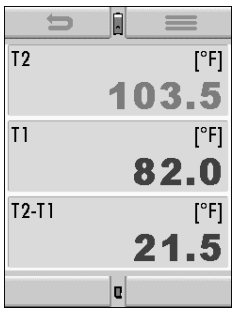
In the pressure measurement menu, 4 pressure values can be recorded. A measured value can be saved to dedicated place (e.g. Pressure 1) these adjustments are made in the context menu. For draft measurements you use the probe having the hose connected at + port of the device. For differential pressure a second hose will be connected to the Delta P- port of the device.

ATTENTION

Device can be damaged by faulty operation

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

► Check the pressure sensor range before app



6.6. Temperature/differential temperature measurement(Option)

In the menu temperature differential measurement 2 temperatures can be measured. Both measured values will be displayed (using port T1 and T2) as well as the difference of these values will be displayed.

NOTE

The accuracy of this measurement can only be warranted when MRU temperature sensors are used.

6.7. After the measurement

When the measurement is complete, remove the gas sampling probe from the flue pipe.

⚠ CAUTION

HOT – danger of burns and fire hazards from gas sampling probe

Physical harm and property damage can be caused.

► Cool down the gas sampling probe

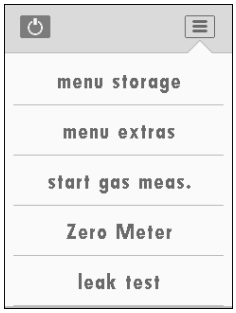
ATTENTION

Thermo-element can be damaged

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

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

7 Data Storage

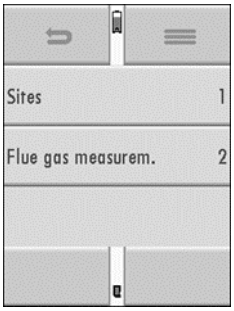


7.1. Organizing data storage

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

The unit can store up to 1,000 different sites.

New sites can be added in the analyzer. Modifications can be done using an external PC program e.g. MRU Win.



Attention: New sites created in the analyzer will NOT be transferred back to the computer program. When transferring data from the analyzer to the computer only measurement data will be transferred, identified by the site number that has been assigned to the measurement, when the measurement was saved.

7.2. Organizing data storage

In the menu **storage** and sub menu **Memory info** the number of stored data can be viewed. Sites (max. 1,000) and Flue gas measurements (max. 3,000).

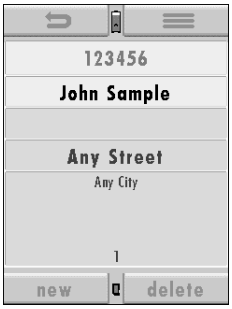
7.3. Site administration

In the sub menu **Site adminstration ,** you can:

- View all saved sites
- Add new sites
- Delete sites

	NOTE
	Changes made in the will not be transferred to a PC program. New sites created in the unit will not be transferred to a PC program.

View sites



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

- The distinct site number in the first line, because of its significance this number is displayed in a different colour.
- Plus 8 additional free text lines.

With the arrow buttons left and right you can page from site to site.

Create a new site

In the sub menu **Sites administration** new sites can be created and existing sites can be modified.
Select **new** to create a new site. The following will be displayed:

- The first line, which must contain a unique vehicle number to identify the installation. The unit automatically assigns a free vehicle number.
- All other free text lines for e.g. name and address.
  (These lines can only be filled using an external PC program like the MRU Win)

Delete sites

You can:

- In the sub menu Sites administration single sites can be deleted using the delete button.
- Or you can delete all sites at once

The pop-up window will ask you to confirm the deletion of the site (sites).

7.4. Data transfer using the SD card

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

The following functions are available:

- Import of vehicles
- Export of vehicles
- Export of combustion tests

Import of vehicles

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 commas) and the first field in the line will be the site number. All data will be imported as long a site number is available. Per field a maximum of 24 characters will be imported, too long words will be cut off.

Example for vehicles

Site	Spelling
9 fields	A1-F1;A1-F2;A1-F3;A1-F4;A1-F5;A1-F6;A1-F7;A1-F8;A1-F9
2 fields (1 and 4)	A4-F1;;;A4-F4
1 field	A5-F1

Reasons for invalid vehicles:

- Semicolon at the beginning
- Blank line

NOTE

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

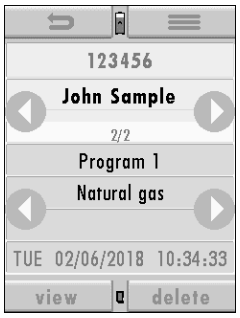
Export of vehicles

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 is the same as described above „Import of Sites“. Only the file name is different, the file name will be ‚ANLxxxxx.csv', in which the xxxxx are continuing 5-digit numbers with leading zeros. If the file must be imported into another analyzer, the file must first be renamed into “anlagen.csv”.

Export of Combustion Tests

With this function, the device can make its stored exhaust gas measurements available to a PC.
Attention! This function is not suitable for back up or for the transfer to another analyzer because the exported file cannot be imported again!
The created file has the name ‚EMIxxxxx.csv', in which the xxxxx are continuing 5-digit numbers with leading zeros.
The created file has a column header with the following information: Vehicle number, Date/Time, measuring program name, Fuel type, , and all measured values that the device can measure

7.5. Measurements in the Data storage



View measurements

In the sub menu **view measurements** saved measurements can be viewed. When selected. First the number of saved measurements is displayed categorized by measurement types:

- Select gas measurement or any other available measurement.
- The basic information about saved measurements is being displayed, use the arrows to navigate between the saved measurements.
- Select view to view the saved measurement values. Measurements are saved the way the measurement screen has been set up.

Press **return** to return to the measurement basic information.

Delete a measurement

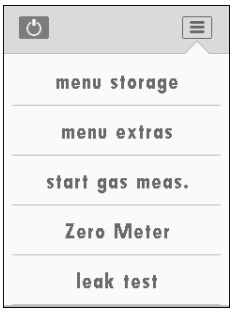
You can:

- Delete single measurements by pressing the delete button when viewing the measurement.
- or delete all measurements in the main menu storage and the sub menu Delete measurement.

Transfer measurements to the SD card

The device offers the possibility to export all stored measurements to a SD card.
Insert SD card and select the main menu **storage** and sub menu **export CSV (SD)**, then select **Flue gas measurements** to transfer the measurements to the SD card.
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 device will confirm with: Data was exported.
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.

8 Extras



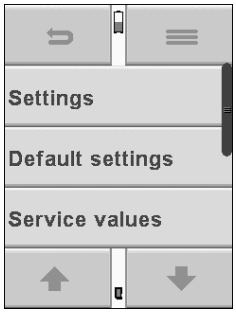
8.1. Settings

The device is delivered with a pre-configured firmware which covers most of the needed applications. This unit can however be individually configured to meet anyone's needs.

8.2. Service calibration menu

The service and calibration menu is pin code protected to assure the miss-use of unauthorized personnel.
When entering a wrong pin code, you will automatically be returned the extras menu.
Contact MRU or a MRU authorized dealer to get the pin code (www.mru.eu).

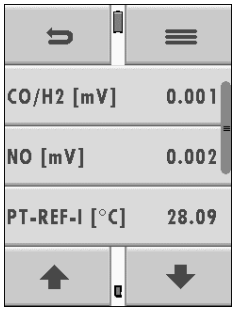
8.3. Factory settings



All parameters will be reset to factory settings:
Parameters for measurement that have been modified by the user will be set to factory settings again.

Settings:
LCD brightness (%)50
Helping hints ON
Keyboard beep ON
All changes that have been made by the user (Combustion test) screen settings will be re-set to factory settings

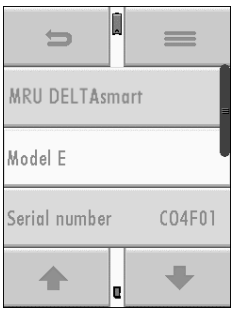
8.4. Servicewerte

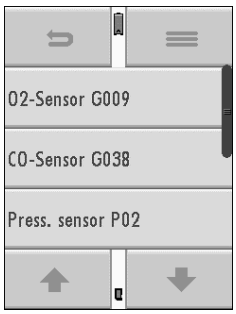


In case of a defect sensor, which will be displayed after zeroing, the service values of all installed sensors and other parameters can be viewed in this menu.
When you experience a defect of a sensor you will most likely call in at MRU and they will ask you for these service values to identify the defect sensor or other defect parts. Each sensor will display a service value as well as other parts installed inside the device.

8.5. Device information, Warranty-management and device identification number

The analyzer information can be viewed in the main menu **extras** and the sub menu **Device info** (use context key).


MRU DELTAsmart
Model E
Serial number
C04F01


O2-Sensor G009
CO-Sensor G038
Press. sensor P02

9 Maintenance

NOTE

Please note that correct operation of the device is only ensured if the sensors are adjusted regularly.

► Depending on the intensity of use, the sensors have to be adjusted / calibrated 1-2 times a year.

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

9.1. Cleaning and care

Cleaning

⚠ CAUTION

Condensate is acidic

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

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

- After each measurement: removed the hoses of the sampling from the device and let them dry (condensate inside the hoses). Open and empty the condensate separator and let it dry.
- Occasionally: clean the sampling line.
- The pleated filter in the condensate separator can be washed 4 to 5 time (with your work clothes in the washing machine). The grade of contamination depends on the fuel types and the number of measurements performed. Replace the filter frequently when it looks dirty.

Care

- The internal battery has only a minor self-discharge effect. If the device is not being used over a period it is recommended to charge the battery before storing it and then recharge the battery every 8 weeks.

9.2. Annual service and calibration

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

10 Appendix

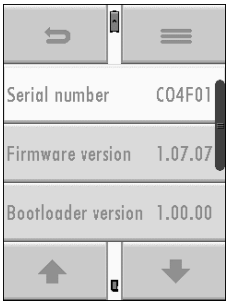
10.1. Technical data

General data	
Description	**Values**
Operation temperature	+5°C - +45 °C / 41° F… 113° F
Rel. Humidity when operating, not condensing	95%
Storage temperature	-20°C - +50°C / -4°F …122° F
Internal battery, operation hours	Li-Ion, > 10h
Power supply	100 - 240 V/ 5V DC / 500 mA
Weight w/ 2 sensors	ca 500g / 1.1 lbs
Size	160 x 82 x 44 mm 6.3 x 3.2 x 1.7 in
Housing material	PA6
IP degree of protection	IP30
Max suction range gas pump	150 hPa
gas flow typ.	20 l/h
Bluetooth frequency range and output power	2.402 GHz to 2.480 GHz
	BDR Power:1.5*dBm
	EDR (2M/3M) Power: -1* dBm
	LE Power: 0,5* dBm
	*typical values
Measurement values	
Electro-chemical sensor	**O_2**
Measurement range	0 - 21 %
Resolution	0,1 Vol. %
Accuracy abs.	± 0,2 Vol%
Reaction time T90	< 30s
Years expected lifetime (@air)	2
Elektrochemischer Sensor	**CO (#65929)**
no H_2 compensation	
Nom. Measuring Range	0 - 10000 ppm
Overload Range	< 20000 ppm
Resolution	1 ppm
Accuracy abs./reading	± 10 ppm
	5% (0 - 10000 ppm)
	10 % (> 20000 ppm)
Response Time T90	< 30s
Elektrochemischer Sensor	**NO**
Nom. Measuring Range	0 - 5000 ppm

Overload Range	< 10000 ppm
Resolution	1 ppm
Accuracy abs./reading	± 5ppm
	5% (0 - 1000 ppm)
	10% (> 1000 ppm)
Ansprechzeit T90	< 50s
Temperature measurement	**T1, T2**
Number of thermocouple type K input	2
Measuring Range	-40 °C - 1200 °C
Accuracy abs. / reading	±2°C oder 0,50%
Draft	
Measurement range	± 200 hPa
Accuracy abs. / reading	0,02 hPa oder 1%
Differential pressure	
Measurement range	± 200 hPa
Accuracy absolute / of measurement value	0,02 hPa oder 1%

10.2. Firmware updates

Check device firmware



- Power on the device then press the context button and then the extras menu and the sub menu device info.
- In the display the installed firmware version is displayed: in this example the firmware version is 1.07.07
- We will need the following analyzer information in case the update fails.
- Please make a note of the analyzer serial number and installed firmware version

Perform and check an update

Preparing the SD card

In case you have received the firmware by email, you might first have to extract it if it came in a ZIP file. The unzipped file "1107.fwb" must then be copied onto the SD card (root directory, which means not in a subfolder).

Perform an update

- copy the file 1107.fwb to the SD card (to the main directory, i.e. not to a folder).
- insert the SD card into the device's SD card slot and switch on the device.
  When inserting the SD card into the SD card reader slot, the connection contacts of the SD card must point upwards and the SD card must lock into place in the unit.To remove the SD card, gently press it into the unit to release the card lock.
- wait until the message "Found new firmware..." appears.

- Select install firmware.
- The update procedure will start.
- This procedure takes about 45 seconds.
- nach dem Update muss das Gerät eingeschaltet werden.
- Once completed you must restart the device.

How to check if the update was successful?

Press the **context** button and select **extras** and then the sub menu **Device info**. Here the installed firmware version is displayed.

What to do when the update has not been performed?

Repeat the steps above.

Where do I get help to resolve issues?

Contact your local service center for help.

10.3. Troubleshooting

Troubleshooting the device

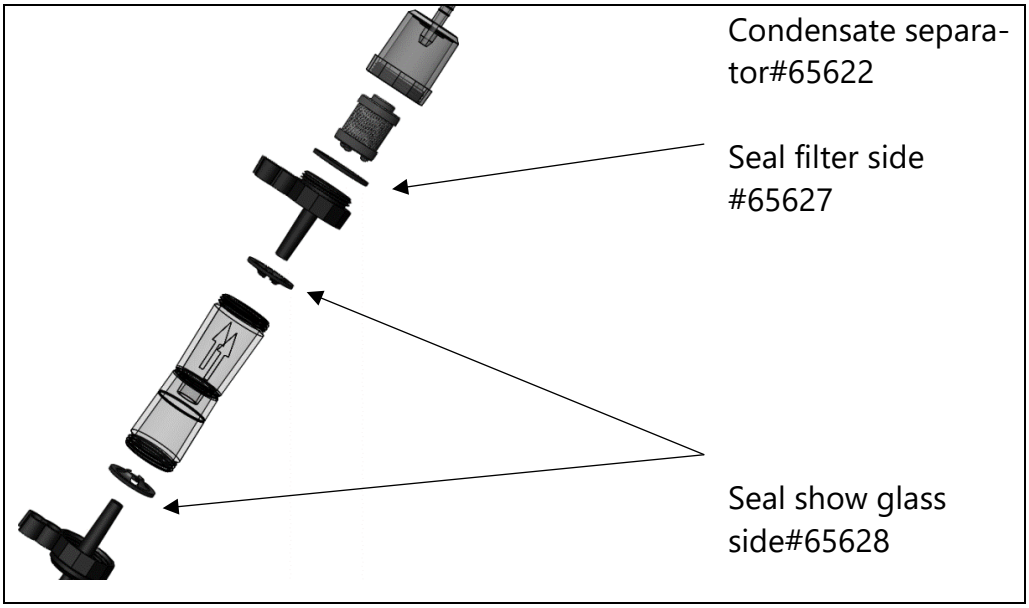
Effect	Fault	Reason	Solution
Analyzer shows no reaction		Analyzer shows no reaction when touching the screen	Make an analyzer reset (reset button)
Analyzer is too cold and can't be used.	Display – **analyzer too cold** or a beep every 5 seconds	e.g. analyzer was outside in winter or cold nights (days)	Take analyzer to a warm room and let it warm up
Measurement results are not ok	Faulty zeroing	Sensors were exposed to gas during zeroing	Purge analyzer with fresh air and re-zero
Analyzer can't be powered on		Battery empty	Connect the charger to the analyzer to charge the battery
No temperature values	Temperature display: - - - , - °F	Defect thermo-element, or a defect cable or plug not connected	Remove probe from stack and let it cool off. Call your service department if everything looks good but you still don't get any readings.
Wrong Combustion Test results	O_2-values are too high, CO- and CO_2-values are too low	Bad probe connection, leaking condensate separator or gas pump not working properly	Perform a leak test, check probe, sampling line and condensate separator for defects
Temperature values seem to be off	Gas temperature too high or jumping values	Defect thermo-element, or a defect cable or plug not connected / condensate on the thermos-element	Remove probe from stack and let it cool off. Check all components and remove condensate from thermos-element

Troubleshooting the condensate separator

Effect	Reason	Solution
Dirt and / or moisture inside the analyzer. Sensors have failed Gas pump has failed	Dirty or wet filter	Check and replace filters more frequently, Filter öfters überprüfen ggf. austauschen (white = O.K. Brown / black / wet = replace)
Wrong Combustion Test results	The connections of the condensate separator are not leak tight / missing seal	Perform a leak test every time the condensate separator had been opened or a filter had been replaced

10.4. O-Ring Set

65875 O-Ring Set



11 Declaration of conformity

EU-Konformitätserklärung
Declaration of conformity

CE

MRU Messgeräte für Rauchgase und Umweltschutz GmbH

Fuchshalde 4 / 8 / 12
74172 Neckarsulm-Obereisesheim
Deutschland / *Germany*
Tel.: +49 (0) 7132 - 99 62 0
Fax: +49 (0) 7132 - 99 62 20
E-Mail / *mail:* info@mru.de
Internet / *site:* www.mru.eu

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

Name / *name:*	Dierk Ahrends
Funktion / *function:*	QM-Beauftragter / *QM- Representative*
Firmenname / *company:*	Messgeräte für Rauchgase und Umweltschutz GmbH
Straße /Ort // *street / city:*	Fuchshalde 4 / 8/ 12, 74172 Neckarsulm
Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung /*designation:*	Gasanalysator / *Gas analyser*
Produktname / *name:*	DELTAsmart FFZ
Funktion / *function:*	Gasanalyse / *gas analysis*

Hiermit erklärt die MRU GmbH, dass der Funkanlagentyp „RN4678 BT Dual Mode Module" der Richtlinie 2014/53/EU entspricht. Das oben beschriebene Produkt entspricht allen einschlägigen Bestimmungen, es erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:

MRU GmbH hereby declares that the radio equipment type "RN4678 BT Dual Mode Module" is in compliance with directive 2014/53/EU. The product described above complies with all relevant regulations, it meets the requirements of the directives and standards mentioned below:

- EMV-Richtlinie / *EMV-directive* 2014/30/EU
- Niederspannungsrichtlinie / *low voltage directive* 2014/35/EU
- RoHS-Richtlinie / *RoHS directive* 2011/65/EU (RoHS II)
- DIN EN 50270: 2015-10
- EN 62311:2008-09 3.1
- EN 301 489-1 V2.2.0: 2017-03
- EN 301 489-17 V3.2.0: 2017-03 3.1
- ETSI EN 300 328 V2.2.2
- DIN EN 61010-031:2016-07
- DIN EN 61010-1:2020-03
- DIN EN 61000-6-1: 2007
- DIN EN 61000-6-3: 2007+ A1: 2011 + AC:2012

Neckarsulm, 12.04.2023

Erwin Hintz, Geschäftsführer / *Managing Director*

MRU · Messgeräte für Rauchgase und Umweltschutz GmbH
Fuchshalde 8 + 12
74172 Neckarsulm-Obereisesheim
Fon 07132 99620 · Fax 07132 996220
info@mru.de · www.mru.eu