Instruction manual Dräger EM200plus-E

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1. Reference Notes

1.1 Approvals

The Flue Gas Analyser MSI EM200plus is produced according the European Standards EN 50379 part 1, part 2 and part 3.

1.2 Information for Use

The EM200plus-E is an electronic multiple channel measuring instrument for analysing the exhaust gas concentrations of engines from mining machines (Trucks etc.). The EM200plus-E is unlicensed as a gas detection alarm or personal security equipment.

Any use of the EM200plus-E requires a full understanding and strict adherence to these instructions and to national and international standards.

The instrument has only to be used for the purposes specified in here. The display screens used in this Instruction Manual are only examples!

1.3 Service

To maintain accuracy and correct function the EM200plus-E should be checked and recalibrated by authorized service people once a year.

1.4 Specifications for Disposal according WEEE

As from 2005 EC specifications for disposal of electric and electronic equipment are valid. These are regulated in the 2002/96/EC directive and respective national law.
Essential content is the establishment of special collection and recycling facilities for private users. Since this device is not registered for private users, it is not allowed to dispose it in this way.
For disposal you can send it back to your local Dräger Safety organisation and if requested, get further information concerning this matter from Dräger MSI GmbH.

2. The Instrument

The EM200plus-E is an electronic multiple channel measuring instrument, analysing the exhaust gas concentrations for engineers, service, etc..

All measurements and checks may be documented by printing or data storage.

Gas Conditioner

Graphic Display

Function Keys "F, ▲, ▼, H"
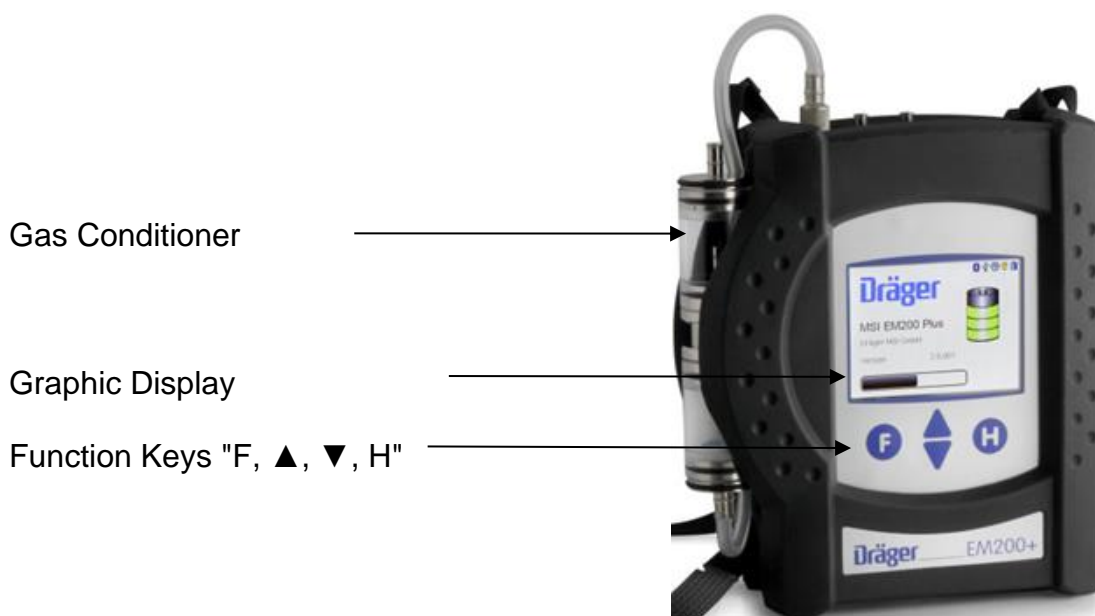
1 = Gas Conditioner
2 = Gas inlet
3 = LED and infrared transmitter
4 = Multiple function interface
5 = USB - interface
6 = Socket for charger
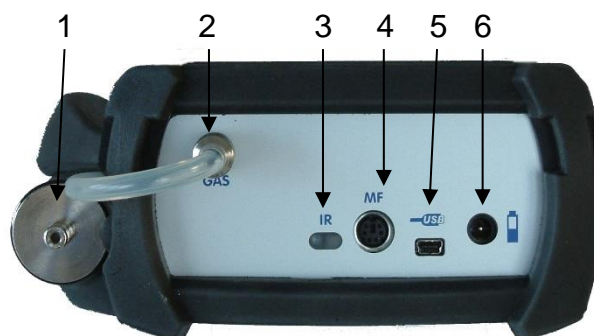
3. On / Off Switching of the EM200plus-E

3.1 Preparing the Instrument

Make sure that all components are in good condition e.g.:

− no condensate in the gas conditioner
− the filter fleece and the filter disks are clean
− the gas hoses are in good condition
− the probe is free from defects

Connect the gas conditioner with the gas inlet of the EM200plus-E. Never forget to use the gas conditioner to protect the instrument, otherwise pump and sensors could be damaged.

Verify that fresh air will be sucked through the gas conditioner before switching on, because the zero signals of the sensors are checked with fresh air.

3.2 Buttons

3.2.1 Switching on and Starting of the Check Function

Switch on the instrument by pushing for a second the buttons "F" and "H" together.
If the annual Service has to be done, a month earlier the EM200plus-E displays a re-minder to you with the following display screen:

Direct after switching on the display will read:

Battery symbol

Pump is working
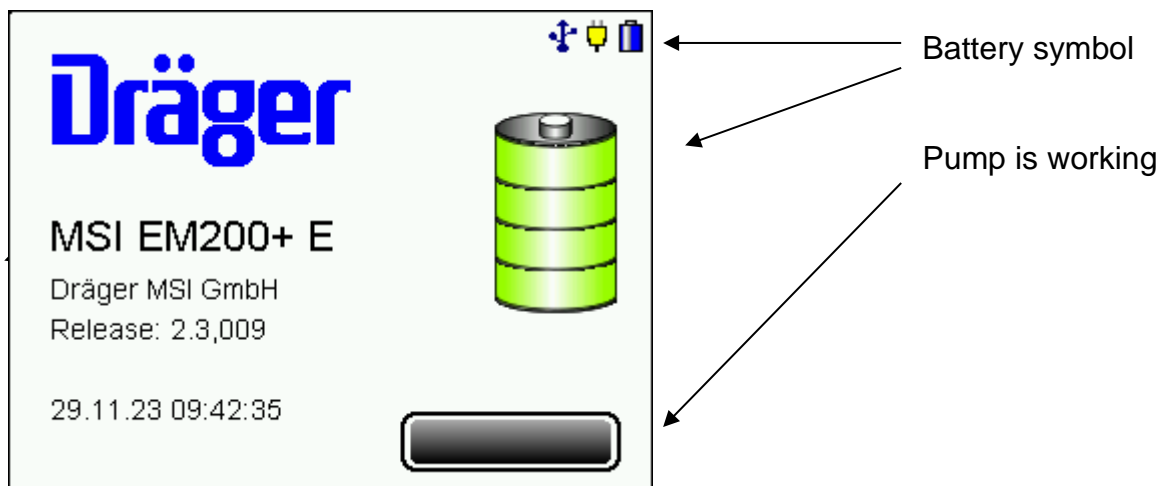
The time and the software version is shown and the battery symbols show the batteries capacity. The bar represents the progress of the run in of the el.-chem. sensors and the progress of the check function.
The system check including zero-point calibration lasts 30 seconds.

The MSI EM200plus-E can be switched off by pressing the "F" key for a long time (> 3 seconds) or by using the "Power off" function in the "Selection of Functional Areas" menu.

3.2.2 Functions of the control buttons

The assignment of the control buttons is shown in the last line of the display.

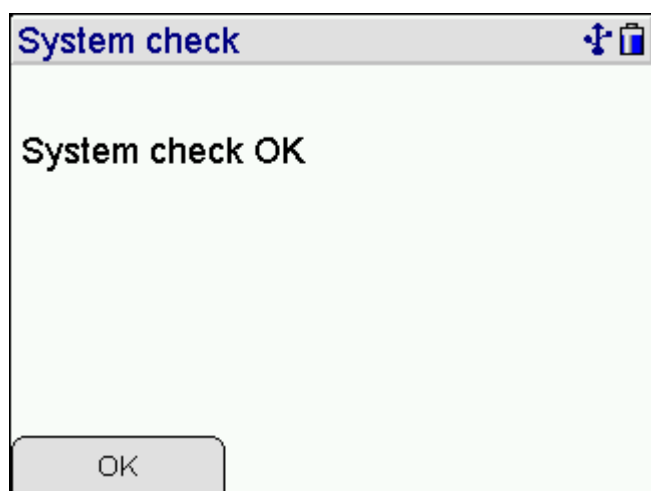"H" is used to mark the "Switch off" function, to cancel a measurement or to jump back a function level.

"F" executes a selected function or adopts a set value.

"▲" or "▼" is used to select a function or set a value.

3.3 Check Function of the EM200plus-E
Electronic, measuring system and all sensors are tested.

If all checks have proved to be error free, then the display will read:

With "F" (OK) you affirm the result and call the menu "Selection of Functions" (see 4.).

If errors have been detected, error messages (see 12.) will be generated and displayed.

After pushing "F" (CONTINUE) the menu "Selection of Functions" (see 4.) is shown.
In the case of devices without gas flow control, only an indirect test is possible with simple means: close the gas inlet of the device. If the gas path is fine, the pump now has to produce a higher power. The pump noise changes accordingly. If there is no change, the gas path must be checked with a gas flow meter.

3.4 Terminating Measurement

After the measurement remove the probe from the exhaust gas and allow fresh ambient air to be sucked in for 1 to 2 minutes.

After this, switch off the instrument by using the switch off function in the menu "Selection of Functions" (see 4.) or by pushing "F" until the display reads "Switch off" (approx. > 3 sec).
Empty and clean the gas conditioner. Check the filter fleece and the filter disks and re-place them if they are visibly dirty. For pushing out the filter disks use a small screw driver or a paper clip.

Gas conditioner:
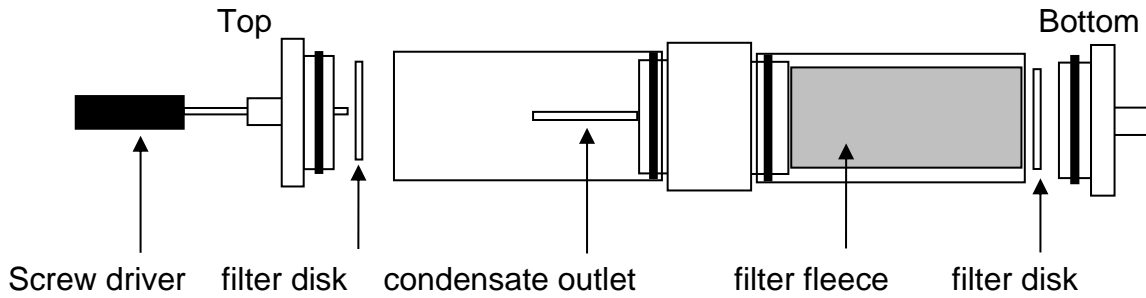
4. Selection of Functions

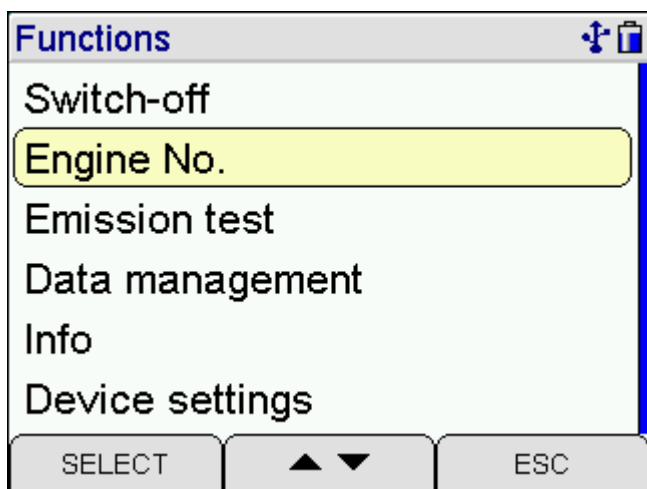If "Selection of Functions" has been selected, the display reads:

In every display screen the first line shows the actual function or menu name and the last line informs about the functions of the keys.

If you push "H" (ESC) the EM200plus-E marks "Switch off".

With pushing "▲ or ▼" (▲▼) you may mark the wanted function or menu.

With "F" (START) you may call the marked menu or function.

Selectable functions are:

Switch-off   = Switches off the EM200plus-E
Engine No.   = Calls function "Selection or Input of Engine No."
Emission test   = Starts Emission Measurement
Memory   = Calls menu "Data memory"
Info   = Calls menu "Info"
Settings   = Calls menu "Settings"

5. Emission Measurement

5.1 Ambient Pressure Screen and Select of Condition

If "Emission Test" has been started, the display reads:

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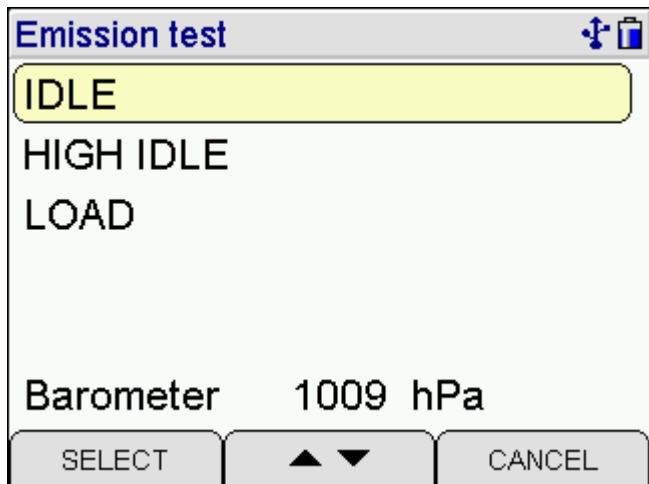
"Barometer" is the absolute ambient pressure, not calculated regarding to any reference (sea level etc.), like it is done for meteorological values. The altitude of the level in a mine, where the MSI EM200 E is used, influences the absolute pressure of the ambient air.

Because the el.-chem. sensor signals depend not only on the specific gas concentration, but also on the ambient pressure, a correction regarding to this pressure or to the altitude has to be done.

If you push "H" (ESC) the EM200plus-E skips back to "Selection of Functions" (see 4.).

With pushing "▲ or ▼" (▲▼) you may mark the wanted condition.

With "F" (CONTINUE) you may call the marked condition.

Selectable exhaust gas measurements are:

IDLE   = measurement will be done during the engine is working at idle

HIGH IDLE   = measurement will be done during the engine is working at high idle

LOAD   = measurement will be done during the engine is working with full power

The measured gas concentrations from one up to three conditions may be memorised in the Gas Screen. A mark behind a condition indicates that a measurement for this condition is already been done.

5.2 Gas Measurement

Insert probe into exhaust gas pipe and secure with fixing element. Adjust probe position so, that the probe tip is situated in the exhaust stream.

If the test condition has been selected, the display reads:

IDLE		
CO	84 ppm	
NO	53 ppm	
NOx	65 ppm	
NO2	12 ppm	
Speed	rpm	
START		ESC

If you push "H" (ESC) the EM200plus-E skips back to "Emission Test".

With "F" (CONTINUE) the measurement values for the actual selected condition are locked, you select the engine speed input and the display reads:

IDLE		
CO	84 ppm	84 ppm
NO	53 ppm	53 ppm
NOx	65 ppm	65 ppm
NO2	12 ppm	12 ppm
Speed	600 rpm	
CONTINUE	+/-	ESC

With "▲ or ▼" (▲▼) you may vary the value of the engine speed.

With "F" (CONTINUE) the shown value for the actual selected condition is accepted.

If an engine number with reference values is selected before the measurement, you will see the reference values during the measurement.

IDLE		⇕🔋
CO	84 ppm	84 ppm
NO	53 ppm	53 ppm
NOx	65 ppm	65 ppm
NO2	12 ppm	12 ppm
Speed	600 rpm	
CONTINUE	+/-	ESC

Engine numbers with reference values may be stored in the instrument with the pc software "Dexas_200_E".

6. Special Functions

6.1 Automatic Switch Off

In order to increase the battery life time the instrument is provided with a Standby Mode.
In case no key has been touched for 30 minutes and the instrument is not in a measuring mode the display back light and the gas pump will be switched off. If any key is touched the EM200plus-E automatically switches on again.
The information "Standby" is shown in the display. After 30 minutes of standby time the instrument will be switched off completely.

6.2 Protection of the CO-Sensor

The instrument is equipped with a special function protecting the sensors from getting harmed by too high CO-concentrations.
During the first contact with the exhaust gas the EM200plus-E automatically assesses how fast the concentration rises and recognises if the measuring range (8,000 ppm) will be exceeded.
The pump is switched off and the display demands to draw in fresh air.
With pushing a button you may start the pump again. If the concentration has been very high, it is possible that the concentration at the sensor is still > 8,000 ppm. In this case the CO value is replaced by dashes.
Wait until the concentration is < 1,000 ppm before you start measuring again.

6.3 Online Data Transfer

The EM200plus-E possesses an online data transfer feature. If "Emission Test" is activated, all measured data are transferred to the USB interface of the instrument.

With the PC program DERAS from Dräger MSI all measured values may be shown online (numeric or graphic) on a PCs monitor. The PC program allows additional storing of the values in a chosen interval. The stored data may be printed in numeric or graphic charts.

With the PC program DEXAS 200 E from Dräger MSI all stored values may be transferred to Ex-cel.

7. Documentation Menu
If the "Documentation Menu" is selected, the display reads:
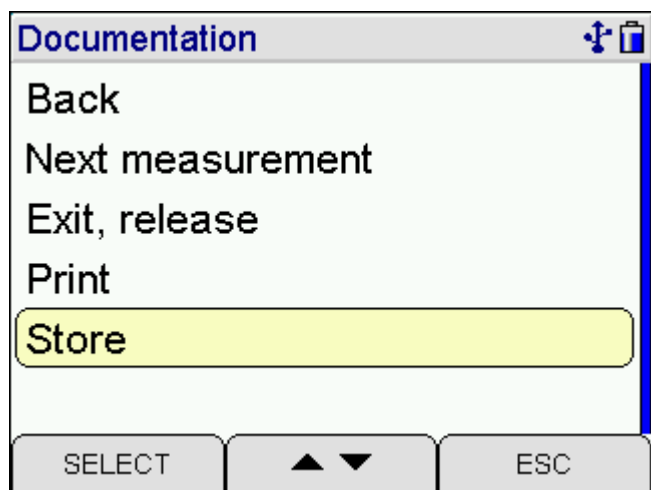
With pushing "▲ or ▼" (▲ ▼) you may mark the wanted function.

With "F" (SELECT) you may start the marked function.

Selectable functions are:

Back = You call the last display screen of actual measurement. Here you can start a new measurement and the results of the actual measurement will be overwritten.

Next Measurement = The EM200plus-E skips back to "Emission test". A mark behind a condition indicates, that the measurement for this condition has already been done.

Exit, release = End of measurement, the results are released and the menu, from which the measurement has been started, is called again.
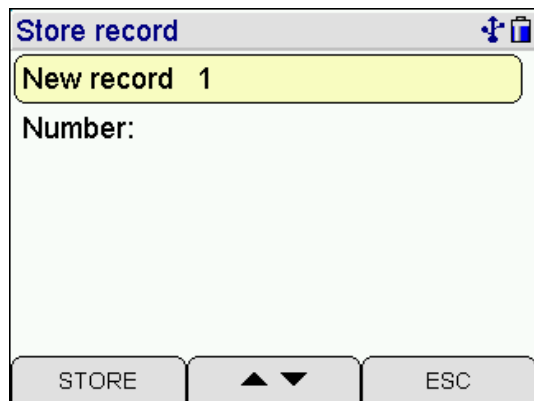
Print = The result is printed on a IR-printer. For this there has to be an intervisibility between printer and IR-transmitter of EM200plus-E

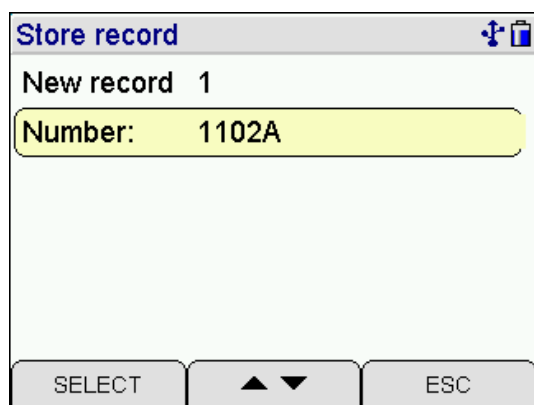Store = Calls menu "Store Data" (see 8.1)

8. Data Processing

8.1 Store Data

If "Store" has been selected, the display reads e.g.:

With pushing "▼" (▲▼) you may mark "Number" (engine number), the display now reads:


With "F" (SELECT) you may call "Selection and Input of Engine Number" (see 10.). This function makes it possible, to alter the displayed engine number, to select another exist-ing number or to create a new engine number. After this the former display screen is called.

With pushing "▲" or "▼" (▲▼) you may mark the wanted data record (a new or an exist-ing one). The records may be displayed with Date or engine number (see 8.6).

With "F" (STORE) you may store all values, together with date and time.

If an existing data record is selected, the display reads e.g.:
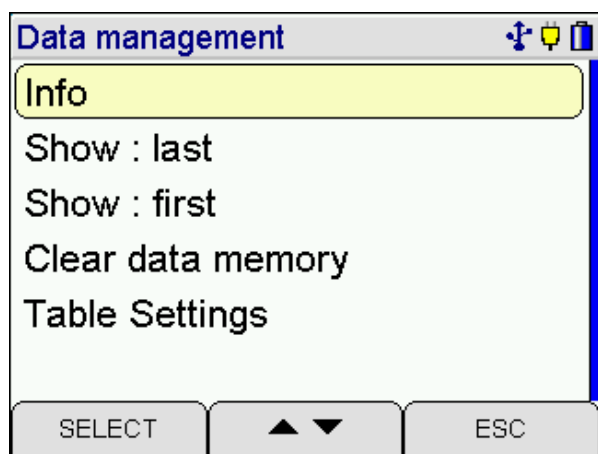
Instruction manual Dräger EM200plus-E
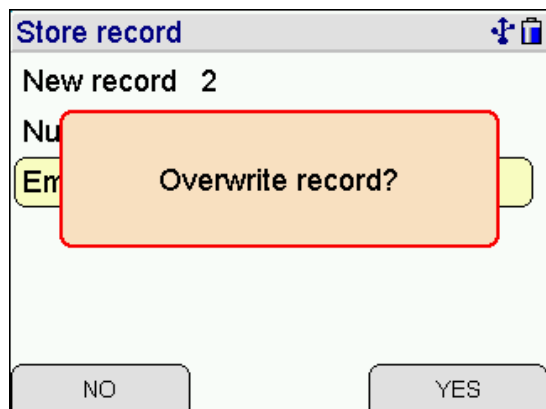
With pushing "H" (YES) the selected data record is overwritten.
With "F" (NO) you skip back to the former display screen.
After storing is complete or after pushing "H" (ESC) the EM200plus-E returns to that display screen, from where this function has been called.

8.2 Data Menu

If "Memory" has been selected, the display reads:

With pushing "H" (ESC) you may skip back to "Selection of Functions" (see 4.).

With pushing "▲ or ▼" (▲▼) you may mark the wanted function.

With "F" (START) you may call the marked function.

Selectable functions are:

Info   = Calls info function of the data menu (see 8.3)

Show: last   = Show last stored data record (see 8.4)

Show: first   = Show first stored data record (see 8.4)

Clear data memory   = Deletes all stored data records (see 8.5)

Table settings   = Selection of table type (see 8.6)

8.3 Info Function of Data Menu

If "Info" has been selected, the display reads e.g.:

| Memory info	⚓ 🔌 🔋
Engines	1 / 512
Measurements	2 / 512
First:	18.12.23 10:58
Last:	18.12.23 10:58
	END

The display informs about the number of possible data records, the number of stored engine and measurement records and the date and time of the first and the last storing.

With "H" (END) you finish the "Info Function" and skip back to "Data Menu" (see 8.2).

8.4 Show data

If "Show: first" or "Show: last" has been called, the stored data records are displayed. In the first case the first data record is marked, in the other case the last one is marked.

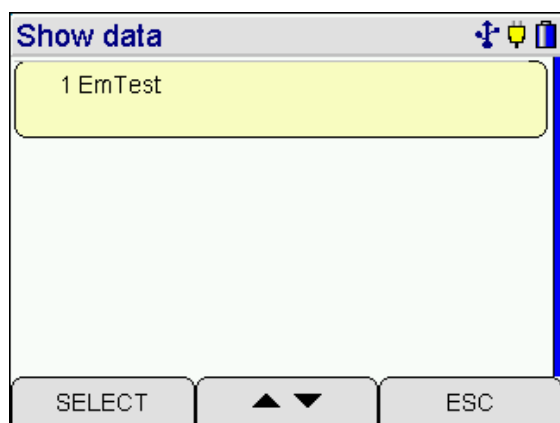Are records stored the display reads e.g.:
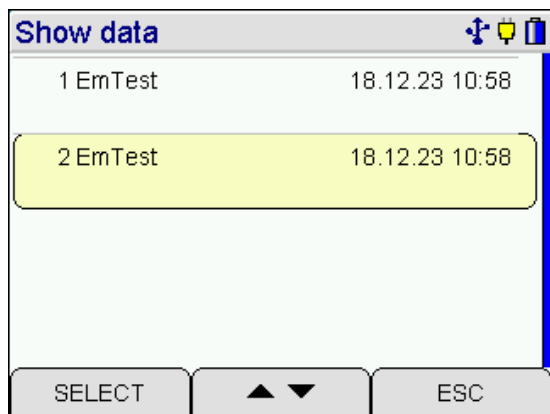
The head line informs you about the number of the marked record and the number of stored records. The table informs you about the type of measurement and the engine number or date and time of storing (see 8.6).

With "H" (ESC) you may cancel this function and skip back to "Data Menu" (see 8.2.).

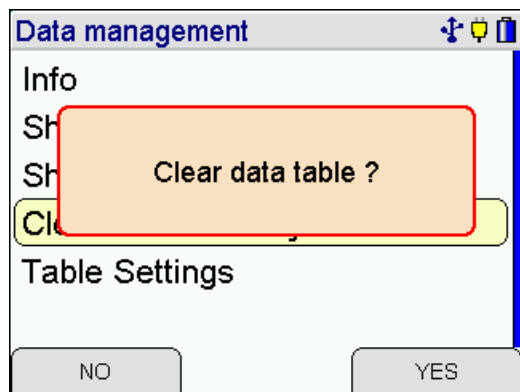With pushing "▲ or ▼" (▲▼) you may mark the wanted measurement.

With "F" (SHOW) you may display the result screen of this measurement.

8.5 Clear Data Memory

After selecting this function the display reads:
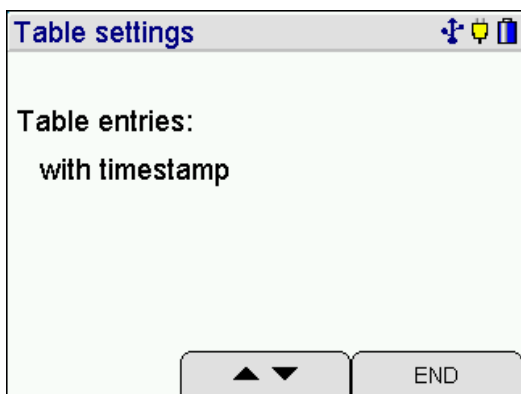
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With "F" (NO) the EM200plus-E calls "Data Menu" (see 8.2) without deleting data.

With "H" (YES) all stored data records are deleted and "Data Menu" (see 8.2) is shown.

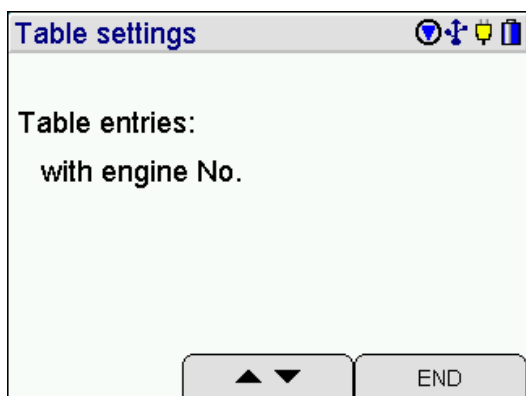8.6 Selection of Table Type

With this function you may select if the table of data records (see 8.1 and 8.4) containing date and time or engine number.

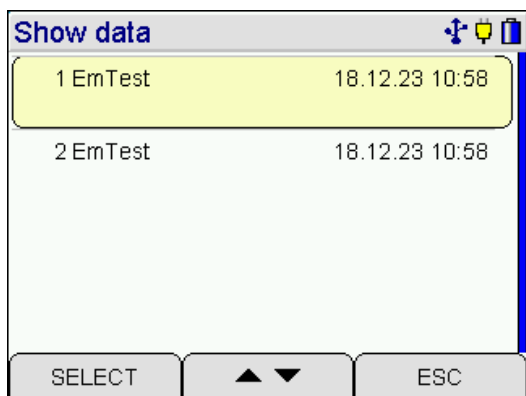After selecting "Table settings" the display reads e.g.:

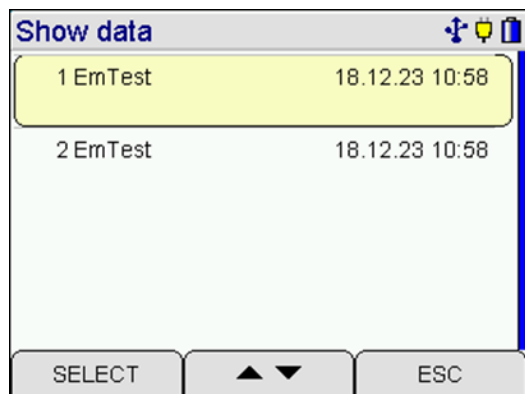For displaying data records with date and time push "▼" (▲▼). The display reads:

With "H" (END) this table type is accepted.

In this case the data record listing is displayed like this:

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Displayed with timesatmp:

Displayed with engine No.:
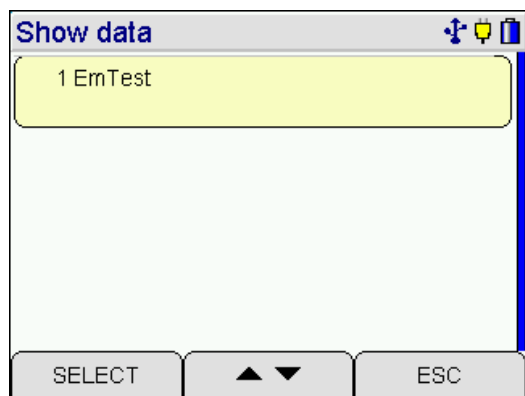
9. Info Function

After selecting "Info" the display reads:
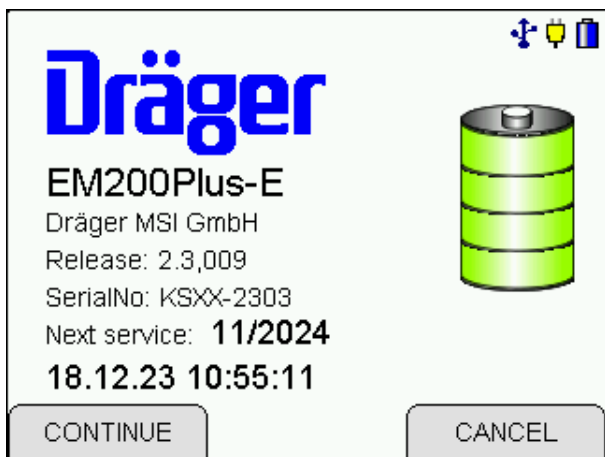
You are informed about the analyser (EM200plus-E), the manufacturer (Dräger MSI GmbH), the date and time when Info Function was called, the version of the firmware (2.3,009), the date of next service (11/2024) and the serial number of the analyser (KSXX-2303).

With "H" (ESC) you may cancel "Info Function" and call "Selection of Functions" (see 4.).

After pushing "F" (CONTINUE) you will be informed about all existing warnings and error messages (see 12.). The display reads e.g.:
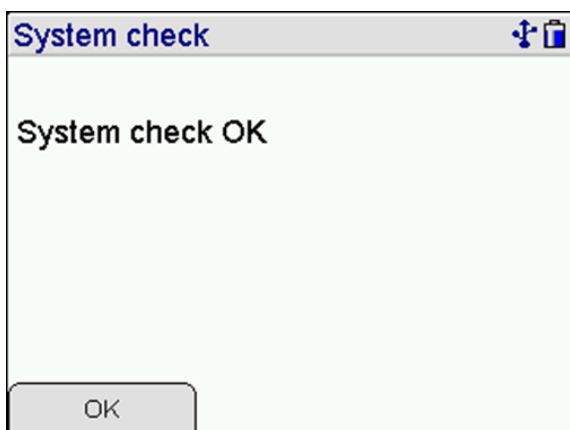
After pushing "F" (CONTINUE) the display reads e.g.:

Instruction manual Dräger EM200plus-E
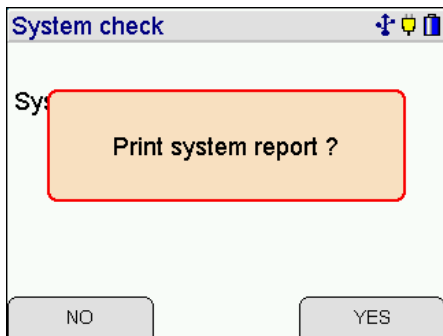
With pushing "F" (NO) the first display screen of "Info Function" is called again.

With pushing "H" (YES) the EM200plus-E sends a complete system report to the IR-Printer, which contains all active warning and error messages together with all actual settings of the instrument.

By means of this report, skilled service technician are able to find out easily, if malfunctions of the EM200plus-E exist.

10. Input of Engine No.

With this function you may create new engine numbers, or if numbers are stored in the EM200plus-E you may select one of them or alter it. If "Engine No." has been called the display reads e.g.:
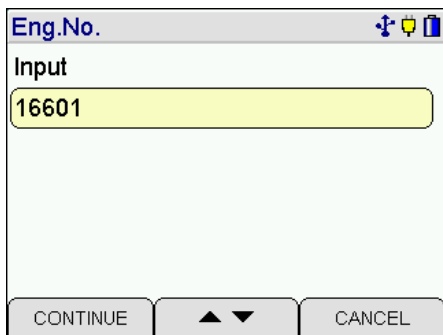
With "H" (CANCEL) you may skip back to the function from where "Selection or Input of Engine No." has been called.

With pushing "▲ or ▼" (▲▼) you mark the needed engine number.

With pushing "F" (CONTINUE) you may call "Input of Engine No." (see 10.1) if "Input" is marked or if "Input" is not marked you may call "Select or Modify Engine No." (see 11.2).

10.1 Input of Engine No.

If "Input of Engine No." is selected, the display will read e.g.:
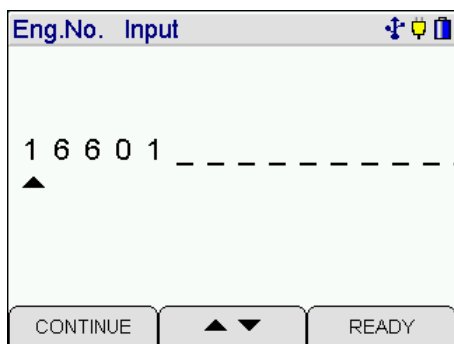
With pushing "▲ or ▼" (+ / -) you modify the character which is marked by "▲". Selectable characters are letters (A-Z), numbers (0 - 9) and 4 additional characters (_ . - /). The sign "_" means no character.

With pushing "F" (►) the next position on the right is marked with "▲".

With "H" (READY) the shown engine number is stored, selected and you skip back to the function, from where "Selection or Input of Engine No." has been called.

The selected engine number is used for all measurements, until the instrument is switched off or a new engine number is selected.

10.2 Select or Modify Engine Number

If "Select or Modify Engine No." is selected, the display reads e.g.:
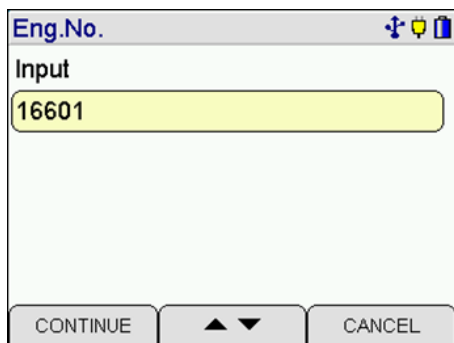
The display informs about engine number.

With pushing "H" (Back) "Selection or Input of Engine No." (see 10.) is called again.

With "F" (OK) the engine no. is selected and you skip back to the function from where "Selection or Input of Engine No." has been called.

The selected engine number is used for all measurements, until the instrument is switched off or a new engine number is selected.

11. Settings

After selecting "Settings" the display reads:

With pushing "H" (ESC) you may stop the "Settings" and skip back to the menu "Selection of Functions".
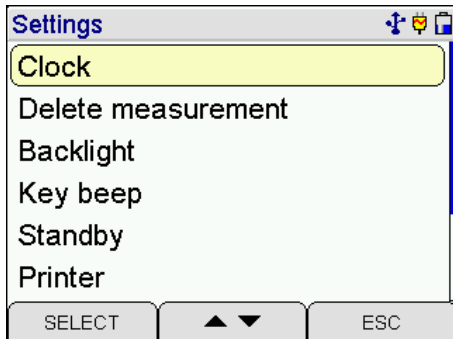
With pushing "▲ or ▼ " (▲▼) you may mark the wanted function.

With "F" (START) you may call the marked function.

Selectable functions are:

Clock   = Adjust date and time
Delete measurement   = Delete measurement
Backlight   = Adjust backlight
Key beep   = Switch on / off the key beep
Standby   = Standby
Printer   = Select HP or MSI printer protocol
Contrast   = Adjust display contrast.
Factory settings   = Restore factory setting.
Language   = Select language of display text.

11.1 Date and Time Adjust
If "Clock" has been selected, the display will read e.g.:
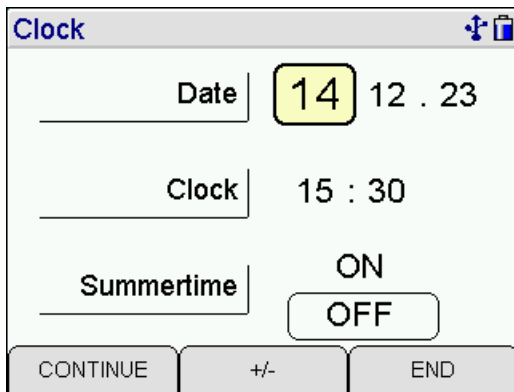
With pushing "▲ or ▼" (+/-) you may modify the position marked with +/- .

With pushing "F" (CONTINUE) you may mark the next position.

With pushing "H" (END) the displayed date and time is accepted and you skip back to "Set-tings" (see 11.).

11.2 Backlight Adjust

If "Adjust Backlight" has been selected, the display reads:
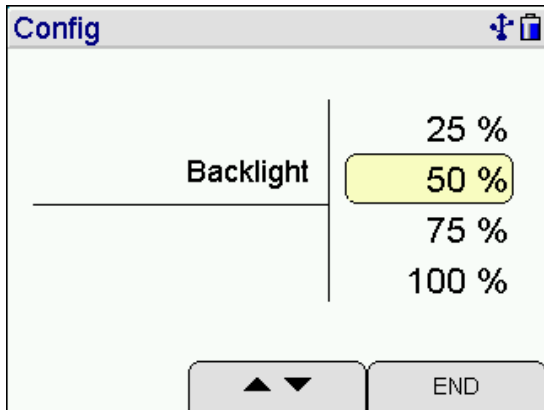
With pushing "▲ or ▼" (+/-) you may change the intensity of the backlight.

Selectable intensity levels are: 0 %, 25 %, 50 %, 75 % and 100 %

With pushing "H" (END) the shown intensity level is accepted and the menu "Settings" (see 11.) is shown again.

The selected intensity level remains held even after switch off.

11.3 Key Beep Switch on / off
After selecting "Key Beep" the display reads:
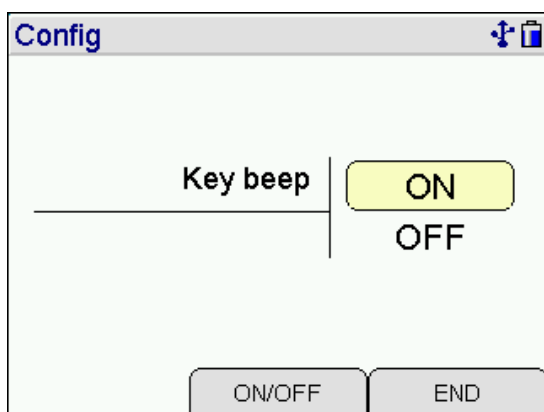
With pushing "▲ or ▼" (ON / OFF) you may select "Key beep ON" or "Key Beep OFF".

With pushing "H" (END) the shown function is accepted and the menu "Settings" (see 11.) is shown again.

The selected function remains held even after switch off.

11.4 Standby
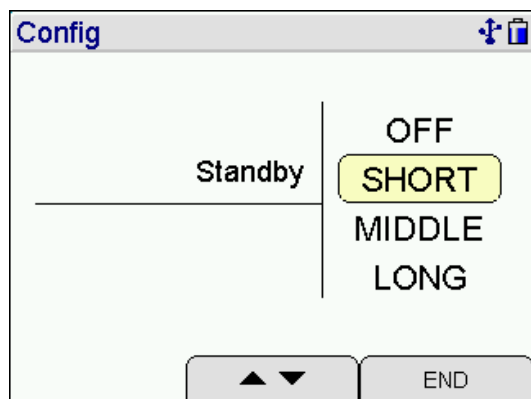
Selection of the time until the device goes into standby mode.

off = standby function switched off
short = reduction of the display illumination after 30 s,
Switch off after 30 min
medium = reduction of the display illumination after 60 s,
Switch off after 60 min
long = reduction of the display illumination after 10 min,
Switch off after 180 min

11.5 Printer
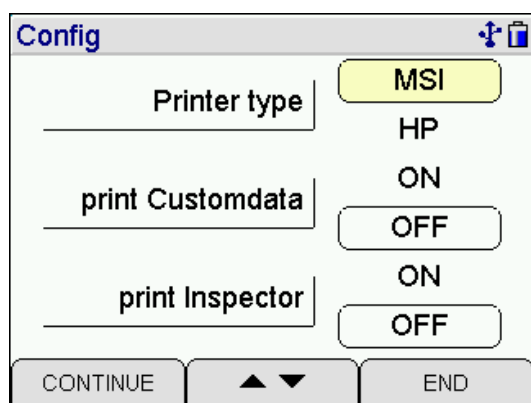
(▲▼) selects the MSI printer or the HP printer.
MSI printers: Data transfer is optimized for Dräger MSI printers and printing is now faster than with HP protocol compatible printers.
HP printer: The data transfer corresponds to the HP protocol and is suitable for all HP protocol compatible printers, of course also for the Dräger MSI IR printer.

11.6 Pre / Post
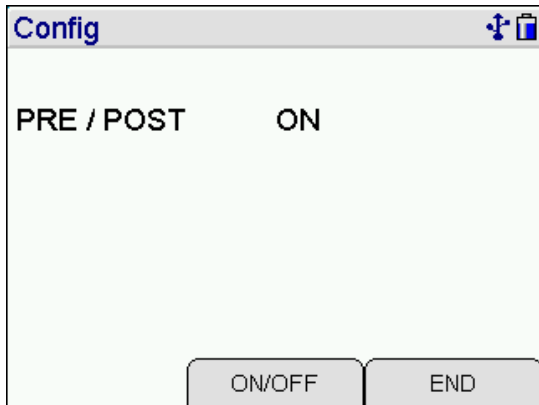
With "ON/OFF" the PRE/POST function can be switched on and off.

11.7 Touchpad

Calibration of the touchpad may be required to detect touches on the display in the correct places.

First, touch the center of point 1 with a sharp pen, then repeat in point 2.
The touchpad is now recalibrated and the touches on the display are detected in the right places.
Be careful not to hurt the display.

11.8 Factory settings

With this function, all selected settings can be reset, so that the original factory setting can be activated.
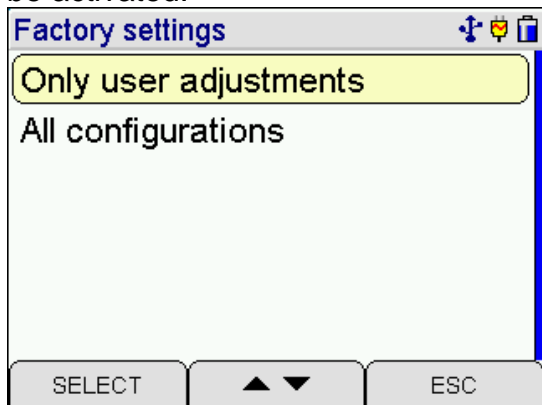
The "Settings Only" function restores all settings that have been changed as described in Chapter 11 to their original factory settings.
With "All Configurations" all functions configured with the program MSI EM-Tools (printer texts, display representations) are also reset.
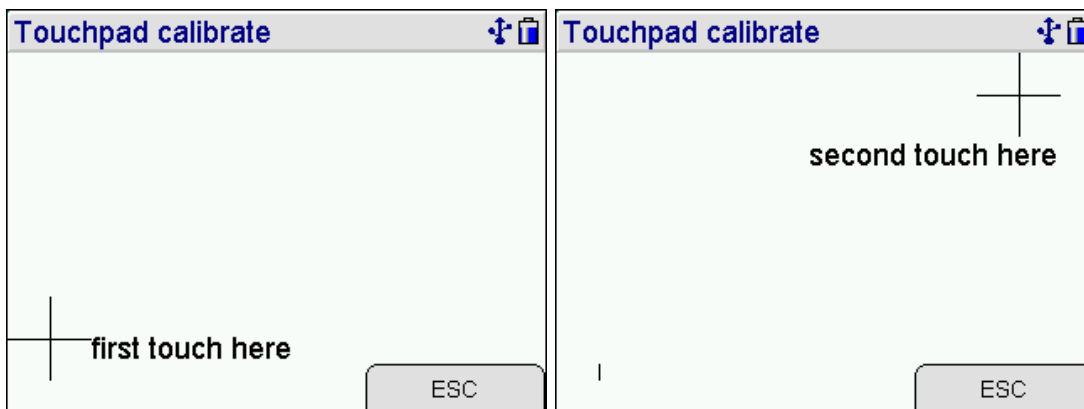
Mit (START) erfolgt eine Sicherheitsabfrage:
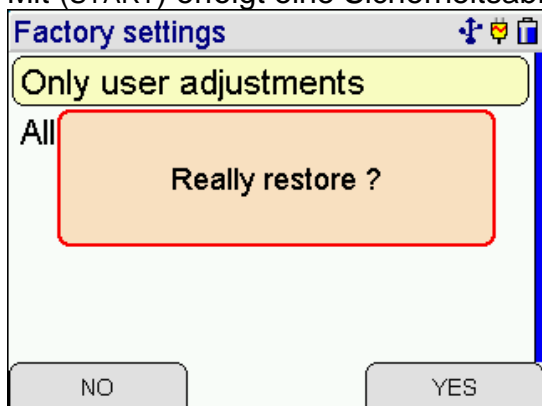
After the "Settings" function has been selected, (YES) replaces all the settings described in Chapter 13 with the original factory settings.

After the "All Configurations" function has been selected, (YES) deletes all settings and all functions configured with the MSI EM-Tools program (printer texts, display displays) and replaces them with the original factory settings.

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11.9 Display Language Selection

After selecting "Language" the display reads e.g.:

With pushing "▲ or ▼" (▲/▼) you may select the wanted language.

With "H" (END) the marked language is selected and the EM200plus-E shows the menu "Settings" (see 11.).

The selected language remains held after switch off.

The language "Deutsch" is not selectable in some versions.

12. Error Messages and Operation References

During the start-up phase and during measurement operation, the EM200plus-E checks the proper functioning of all measurement channels. Warnings and error messages are displayed after the startup phase or during normal operation.

12.1 Error Messages

12.1.1 Error Messages Regarding Sensors

Error Message	Error Cause	Remedy
CO-Sensor	Probe has been in flue during zero calibration Sensor defect	Calibrate again with fresh air Service
NO-Sensor	NO-Sensor has been without current Probe has been in flue during zero calibration Sensor defect	check function see CO-sensor
NO2-Sensor	Probe has been in flue during zero calibration Sensor defect	Calibrate again with fresh air Service
Pressure Sensor	Sensor defect	Service

12.1.2 General Error Messages

Error Message	Error Reason; Remedy
System temperature	operating temperature range exceeded; vary temperature, service
Battery temperature	operating temperature range exceeded; vary temperature, service
Battery voltage	voltage not between 4.4 V and 6.5 V; replace battery (service)
Battery current	battery current for charging or operating too high; service
Battery error	battery manager data error; charge battery
Set clock	clock lost data; charge battery, set clock
Options	data record options error; factory service
Settings	wrong settings; check and change settings
Calibration data	error in calibration data record; service
Data memory	error in memory data record; service
Next service	next service data error; service
System configuration	system configuration error, service

12.2 Operation References

12.2.1 Operation References - Symbols

On the display in the right column symbols may indicate following activated functions:

Charge of battery

Charging battery

Error

internal pump working

USB connection

12.2.2 Electric Power Supply

The instrument possesses a rechargeable nickel metal hydride battery. In principle only the provided charger may be used for charging the **EM200plus-E**. The sensors of the instrument need continuous power supply (as well if the instrument is switched off). Charge after every use of the measuring device.

The charge condition of the battery is checked by the instrument and displayed. When the voltage and the capacity of the battery is too low, this is indicated by red flashing of the LED on the top of the instrument. The battery should be charged immediately.

The charging lasts 1 to 4 hours, depending on the charge condition. During charging the LED on top of the instrument is lit red. At the beginning of the charging a green flashing of the LED indicates that battery and charging system is checked. After finishing of the charging, the red light of the LED changes to green. That means the battery gets only conservation charge.

If the charging circuit has an error detected, the LED will flash green and red together.

Please note, that the measuring instrument may be charged only at ambient temperatures between + 5 °C and + 35 °C. Do not charge or store the instrument in the sun.

Change battery only with an original MSI spare part.

If the charging has been forgotten, the instrument will been shut off automatically. If it is impossible to switch on the **EM200plus-E**, because of low voltage, plug in the charger and switch on the instrument again!!

13. Technical Data

13.1 General Technical Data

Humidity	10 - 90 % r.h. not condensing
Barometric pressure	800 bis 1.700 hPa
Operating temperature	+5 °C ... + 40 °C
Storage temperature	-20 °C ... + 50 °C
Dimensions	ca. 165 mm x 195 mm x 75 mm
Weight	ca. 1.100 g
Approvals	produced according to EN 50379 Part 1-3
Charger	Wall power supply prim. 100 … 240 V; sec. 12 V; 0.8 A
Battery	Internal NiMH Battery, 4.8 V 2000 mAh
Gas sampling	Membrane pump for gas sampling
Gas conditioning	Integrated, position independent, gas conditioning cartridge with condensate trap and particle filter
Interfaces	USB as PC interface Infrared for printer and PDA Multiple function interface for accessory devices
Display	Graphic display, adjustable brightness

13.2 Technical Data Measured and Calculated Values

Measurement variable	Measuring principle	Measuring range	Resolution	Accuracy
CO, Kohlenmonoxid	El.-chem. Sensor,	0 ... 2.000 ppm	1 ppm	< ± 3 % v. MR
NO$_x$, Stickoxide		0 ... 2.000 ppm	1 ppm	< ± 3 % v. MR
NO, Stickstoffmonoxid	El.-chem. Sensor	0 ... 2.000 ppm	1 ppm	± 5 ppm or < 5 % of MR
NO2, Stickstoffdioxid	El.-chem. Sensor	0 … 200 ppm	1 ppm	± 5 ppm or < 5 % of MR
Atmospheric pressure	Piezo-bridge	800 ... 1.700 hPa	1 hPa	

MR = Measuring range

14. Maintenance and service

14.1 Storage

By their very nature, gas sensors react to gases in the ambient air, even when the device is not working. Please ensure that the device is stored in a place at room temperature free of exposure to solvents, exhaust gases or fuels and that it is charged regularly.

14.2 Care

The gas treatment cartridge should be cleaned after use. Furthermore, the cartridge should be checked regularly for leaks. The filter discs and the filter fleece must be replaced in case of soiling.

The device can be cleaned with a damp cloth. Be careful not to clog the gas outlets on the underside of the appliance.

14.3 Maintenance

In order to maintain measurement accuracy and safe functioning, the EM200plus-E should be checked once a year by an authorized service in accordance with the requirements of EN 50379 and, if necessary, readjusted.

14.4 Consumables & Accessories

Printer with IR data transmission   5601048

Printer Paper for Printers   5690151

Consumables Set 2:   5600411
composed of:
10 x Filter Disc
20 x Filtervlies ø 26