DM 9600

USER MANUAL

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Legal notices / Intellectual property rights comments

Original user manual

Edition: 2021-05-17, V1.10.EN

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1 Information for product and safety

1.1. Safety manual

All general information and safety precautions of MRU products are listed in the supplied separate safety manual.

Therefore, this manual must be read and observed before the first use of the instrument.

Instrument-specific safety and warning requirements in this manual are pre-fixed before dangerous actions.

1.2. Safety precautions

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

	⚠ DANGER
⚠	Identifies an immediate, impending hazard that, if ignored, will result in severe bodily injuries or death.

	⚠ WARNING
⚠	Identifies an immediate, impending hazard that, if ignored, may result in severe bodily injuries, material damage or death.

	⚠ CAUTION
⚠	Identifies a possibly dangerous situation that, if ignored, may result in minor injuries.

	ATTENTION
❶	Identifies a possibly harmful situation that, if ignored, may result in damages to the device or its surroundings.

	NOTE
ℹ	Identifies user tips and other especially 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.

1.3. Ensure safety

• Please read the user manual completely before the first use.

- •Only use the analyser for the intended use and within the parameters specified in the technical data.
- •Do not use any violence and avoid falls.
- •Do not put the analyser into use, if the housing, power supply unit or supply leads are damaged.
- •Do not store the analyser together with solvents. Do not use desiccants.
- •Only carry out maintenance and service work on this analyser as described in the User Manual. Observe the prescribed action steps.
- •Operate the analyser only in closed, dry rooms and protect it from rain and moisture.
- •When operating the analyser on mains power, operate it only with the mains adapter supplied.
- •The analyser must not be located in the immediate vicinity of open fire or high heat.
- •Do not use metallic parts / accessories as electrical conductors.
- •Do not use the analyser in or under water.
- •Do not exceed the specified temperature range of the temperature sensors. The temperature sensors will otherwise be destroyed.
- •The pressure to be measured must not be higher than the specified measuring range

1.4. User guideline for rechargeable batteries

	NOTE
i	The rechargeable batterie is installed inside the analyser and is not accessible to the end customer. However, the following instructions must generally be observed when handling lithium-ion rechargeable batteries.

- •This rechargeable battery can only be used in this analyser.
- •Do not throw the rechargeable battery into a fire, charge it at high temperatures and store it in a hot environment.
- •Do not deform, short-circuit or modify the rechargeable battery.
- •The rechargeable battery must not be used in or under water.
- •Do not expose the rechargeable battery to strong mechanical forces and do not throw it.
- •Do not cut or squeeze the connecting cables of the rechargeable battery.
- •Do not connect the (+) contact to the (-) contact or metal.
- •Non-observance of the above guidelines can cause heat, fire and explosions

2   Introduction

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

2.1. Intended use

The analyser is intended as a monometer for pressure and temperature measurement of non-explosive gases.

Optionally, an HC probe for locating leaks in gas pipes or an external pressure sensor for measuring higher pressures can be connected via the AUX socket.

The analyser is specifically not intended as a safety device or personal protective equipment.

The analyser should not be used as a warning device to warn people against the presence of harmful gases.

The analyser must be used according to instructions for the intended use. Our analysers are checked according to the following regulations:

VDE 0411 (EN61010) and **DIN VDE 0701** before they leave the MRU GmbH factory.

MRU technical products are designed and manufactured according to **DIN 31000/ VDE 1000** and **UVV = VBG 4** of the professional guilds for fine mechanics and electrical engineering.

MRU GmbH assures that the analyser complies to the essential requirements of the legal regulations of the member states of the electro-magnetic compatibility **(89/336/EWG)**

⚠ WARNING
Risk from manipulations to the measuring device
Operational safety hazard
►Modifications or changes to the measuring device are not allowed.

2.2. About us

The analyser is produced by the MRU GmbH in Neckarsulm, Germany (Founded in 1984), a medium sized company that specializes in developing, producing and marketing high quality emission monitoring analysers.

MRU GmbH produces a wide range of instruments, from standard analysers up to tailor made industrial analysers.

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2.3. Packaging

Save the original carton and packing materials to prevent damage in transit in case you need to return the unit to the factory.

2.4. Return of hazardous waste

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

2.5. Return of analyser according to ElektroG

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

3   Description

The analyser is intended as a monometer for measuring pressure and temperature of non-explosive gases.
Optionally, an HC probe for locating leaks in gas pipes or an external pressure sensor for measuring higher pressures can be connected via the AUX socket.
The analyser has a compact and robust fibre-reinforced plastic enclosure.
It is entirely operated using the colour touch screen.

1	Touch screen	2	Mini USB interface for data transfer and battery charging
3	Pressure port P1	4	Pressure port P2
5	IR interface for external IR Printer	6	Rear magnets for hands free operation
7	Micro-SD-card reader	8	Temperature port Temp 1
9	Temperature port Temp 2	10	AUX-port
11	Reset-button (on the rear side)		

4 Operating

4.1. Power on and power off

The analyser is switched on via the touch display.
Touch the display, then press the green power button.

Switching off is done via the context menu button.
After pressing the button with the switch-off symbol, the analyser is switched off.

4.2. Zeroing

The zero point is taken when switching on.

4.3. Function Keys

Pre-defined function keys will appear on the upper and lower screen border – these keys will differ depending on the screen content.
The upper border typically displays the return and context buttons.
The lower border often displays the up and down buttons.
There can be additional or other buttons, depending which program or menu currently is used.

4.4. Display

You can obtain all the information you need to operate the analyser from the display, which contains the following information.

1	Main menu
2	Function keys
3	Function keys
4	Context key
5	Battery charging condition (Lithium-Ion Battery)
6	SD-Carte inserted SD-Card reader GREEN symbol – read and write is possible YELLOW symbol – read only)
7	Scroll bar indicator for the main menu
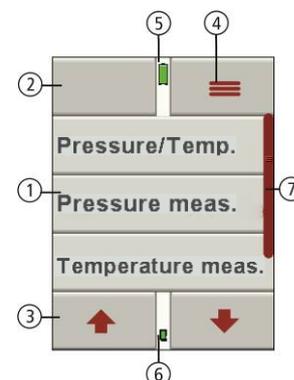
4.5. Context menu

The context menu button is an extension of the function keys. All functions offered in the current window are stored here.
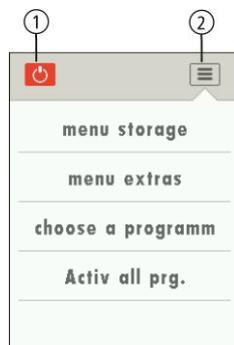
1	Switching off the analyser
2	Close context menu without action

4.6. Menu structure

The analyser organizes all available actions in three main menus:

Menu Measurement
All available measurement options will be displayed and can be selected here.

Menu Storage

All available storage options will be displayed and can be selected here.

Menu Extra
All other actions are available here to manage and customize the device

DM9600

Pressure meas.

Temperature meas.

Pressure/Temp.

View measurements

Delete measurement.

Sites administration

Settings

Default settings

Service values

The menu
Measurement
is explained
in
Chapter 7
Performing
measure-
ment, Page
20

The menu
Storage is
explained in
Chapter 8
Data storage,
Page 41.

The menu
Extra is ex-
plained in
Chapter 9
EXTRA / Set-
tings, Page
46.

5 Settings

After the analyser 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.

5.1. Preparatory steps

- Unpack the analyser.
- Read the User Manual completely.
- The analyser leaves the factory assembled and ready for use.
  Nevertheless, check the device for completeness and integrity.
- Charge the battery of the analyser for about 5 hours.
- Check date and time. Modify if needed.

5.2. Analyser settings

The following adjustments can be made in the menu „Extras":
:

Country		When changing the country, country specific pre-settings and measurement procedures will be activated. Please pay special attention if the country specific settings and procedures are working according to their regulations
Language		Select the operating language
LCD Brightness [%]	5 – 100	The LCD brightness is depending on temperature and personal perspective of each user. 50% brightness are normal at 68°F (20°C)
Keyboard beep	ON / OFF	Turn the Keyboard beep ON or OFF
Helping hints	ON / OFF	Turn the feature Helping hints ON or OFF
Temperature unit	°C / °F	Select the units for temperature
Pres. unit	Pa…mbar… mmHg…etc.	Select the units for pressure
Pressure P1	Positive / negative	Select the sign
Logo	ON / OFF	Select if logo at switch on
Printer type p	MRU / HP	Select between MRU protocol and HP protocol

5.3. Setting date and time

Under **EXTRA/DATE / TIME** you can check the current date and time and set them if necessary
The analyser has an automatic changeover from summer to winter time.
If the built-in rechargeable battery is completely discharged, a new setting of these values is required.
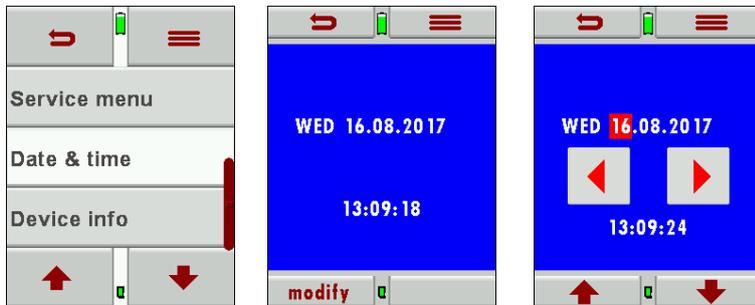
Make the necessary settings with the arrow buttons right/left and up/down.

5.4. Setting Bluetooth (optional)

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:
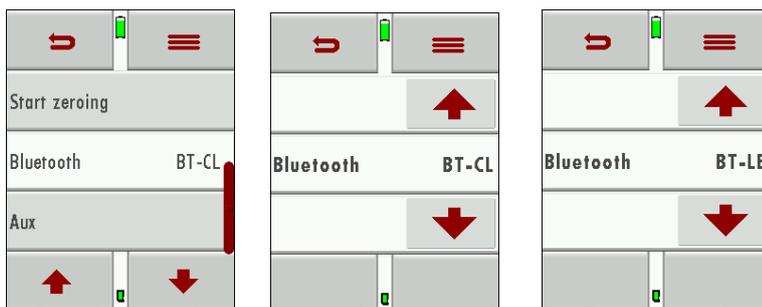
The Bluetooth mode can be viewed and selected in the
EXTRAS / Setting / Bluetooth menu.

If the settings window appears as shown above, please select whether you are connected to an Android (BT-CL) or iOS smartphone (BT-LE). You realise a connection to the Bluetooth printer or to MRU4WIn with the setting "(BT-CL) ANDROID".

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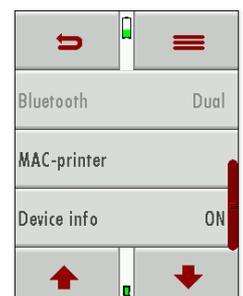
6 Preparing measurement

6.1. Ensure power supply

The analyser can be operated optionally:

•with built-in MRU rechargeable battery.
•with supplied power supply via the USB socket.
•through USB cable at the PC.

6.2. Automatic Auto-off function

The Auto-off function powers down the device if no key has been touched for 60 minutes.
During measurement and/or battery charging the Auto-off function is deactivated.

The device will give an acoustic signal and will display that it wants to shut down, the shutdown can be prevented by touching the screen.

6.3. Measuring with grid power supply / Battery charging

The device can be charged by connecting the supplied charger 90...260 V / 50/ 60Hz to the USB port.
The device can be operated while it is charged.
The device will switch to trickle charge mode once the battery is fully charged.
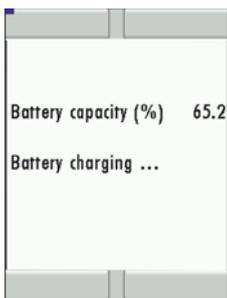
6.4. Battery charge condition

The battery symbol indicates the battery capacity. The battery symbol will start to flash every second in red once the battery reaches a remaining operation time of +/- 60 minutes (depending on device configuration). The device will shut down if the batteries are not charged in time to prevent a total battery discharge.

6.5. Operating temperature

If the analyser has been stored in a very cold place, wait until the analyser has acclimatized in a warm environment to avoid condensation inside the analyser before switching it on.
If the operating temperature is not within the specified range (see also Chapter 11.1 Technical data, S. 48), a corresponding message is displayed. The analyser may be too cold or too hot.

	ATTENTION
	No further function is possible with the analyser in these conditions - an acoustic signal sounds during warm-up.

6.6. Power up and zeroing

The analyser is switched on by tapping on the display and then on the power button.
The zeroing of the pressure sensor can be repeated during operation

7 Performing measurement

In the basic configuration, each analyser has the complete functionality that the customer needs for pressure and temperature measurement.
For the other types of measurements, the corresponding accessories are required.

7.1. Auto-Log function

The measurement duration and the measurement interval for the measurement can be set in the Auto-Log.
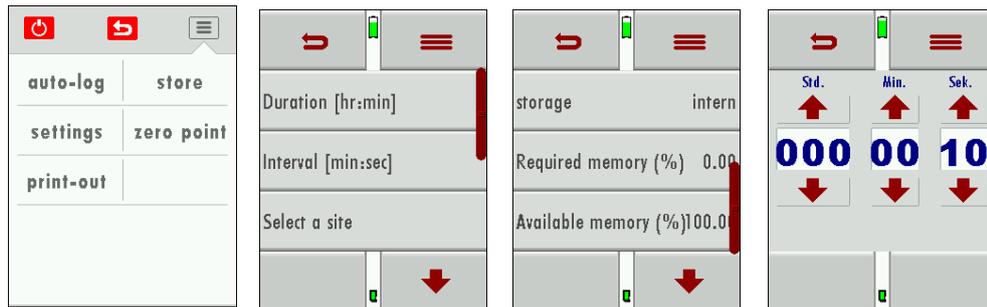
Auto-Log settings:

Measuring time is the complete time for one measurement cycle.
Press the button measuring time to be able to set the measurement time (using the arrows up and down to change the time).
Press the button interval to select how frequently you want to save the results.
Press the Site Selection to determine to which site the results will be saved to.
Each interval will be saved to the selected site.

The Auto-Log can save results either on the internal memory or onto the SD Card.
Press the Store button and then select where the results should be stored.
Please make sure that there is enough storage space available.

Press the start button to start the Auto-Log, it will end automatically after the defined measurement time has elapsed
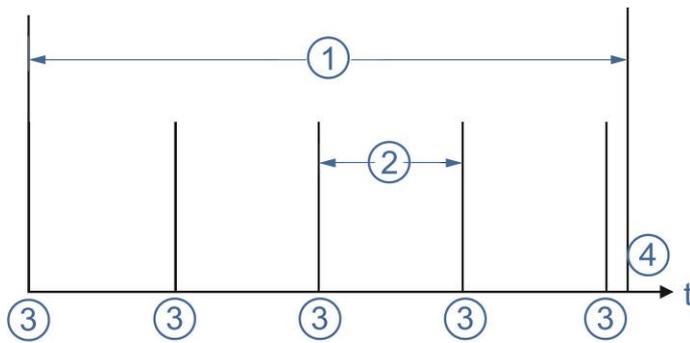
1	Measurement time
2	Interval
3	Measurements
4	Storage point

	NOTE
i	The Start button is only displayed if Measurement duration is > Interval

7.2. Performing pressure/temperature measurement

During pressure / temperature measurement, the measured pressure and the measured temperatures are displayed and can be auto-logged or saved as a single measurement. The pressure and temperatures can be displayed as text view or graphic view.
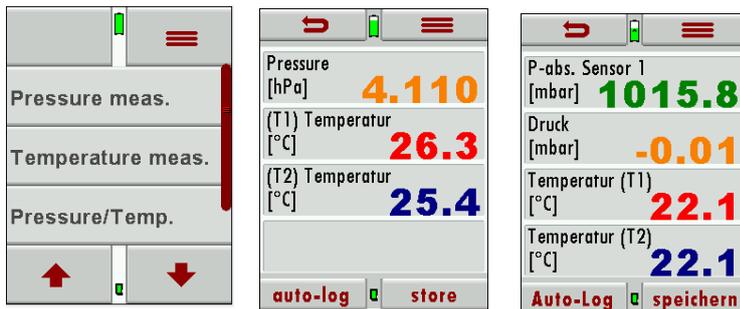
	NOTE
i	Optionally the absolute pressure can be displayed.

Opening context menu

You can customize the measurement to your needs in the context menu.
Press the context menu button.

☞ See also 4.4 Display, page 13.

The context menu appears:
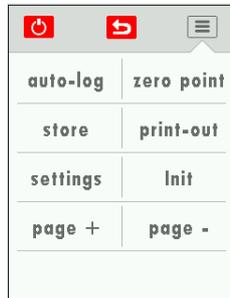
auto-log:
Measurements will be logged.

zero point:
The pressure value will be set to zero.

store:
Single measurements will be stored

print-out:
The measured values will be printed out. A printer is required.

Init:
Graphic display starts again.

page +:
Turn to next page.
page - :
Turn to previous page.

settings
The units can be set.

The temperature unit can be set.

The damping time (T90/s) can be set.

NOTE

Each pressure sensor has a particular quality (noise behaviour). If no precautions are taken, the measured value (pressure display) would "wobble". Therefore, the noise behaviour of a sensor is optimized with a filter. For example, the measured values are collected over a certain period of time and then divided by the total number of measuring points (this is a simple filter)

Example

0.5Pa + 0.4Pa + 0.6Pa = 1.5Pa -> 1.5Pa / total number (3) = 0.5 Pa (average value)

As a result, the analyser "displays" a stable pressure value (less noise and "wobbling").

However, this averaging is at the expense of the dynamic measuring behaviour, i.e., rapid pressure changes can no longer be displayed immediately. This behaviour is called damping. Therefore, this setting is required.

Depending on the specific use, a different damping is necessary.

1 = minimum damping

50 = maximum damping
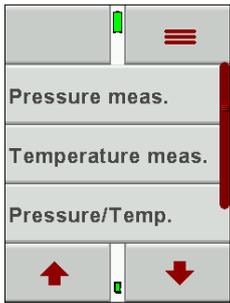
7.3. Performing pressure measurement

Press Pressure measurement to enter this menu.

On the first page of the pressure measurement 4 pressure values can be recorded.

The current displayed pressure value can be assigned and saved to one of the 4 available spots.

The adjustments are done in the context menu.

The hose (e.g., draft measurement) will be connected to the draft port P1.

For differential pressure measurements, a second hose will be connected to the P2 port.

On the second page, the pressure flow is visualized in a graph. The pressure can be Auto-logged (see Auto-Log function). When saving results, the max and min values are saved as well as the pressure average.
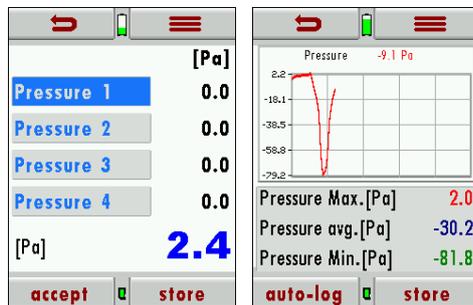
ATTENTION

If the measuring range is exceeded positively/negatively, the pressure sensor will be destroyed.

Therefore, the following message is displayed as a warning:

Fault message „ Pressure too high ".

There will also be an additional acoustic warn signal

Opening context menu

You can customize the measurement to your needs in the context menu. Press the context menu button.

☞ See also 4.4 Display, page 13.

The context menu appears:
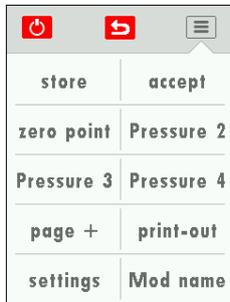
accept:
Accept the measurement to a description field (e.g., Pressure 1)

auto-log:
Measurement will be logged (only in the graphic view)

Pressure 2, Pressure 3, Pressure 4

NOTE
The currently selected pressure is not displayed in the context menu. In this example, print 2 is selected and is not displayed in the context menu.

Select the corresponding pressure.

Mod name:
Change the selected text fields (only for text view windows).

☞ For menu items of the context menu not shown here, see also, Chapter Opening context menu, page 22 of the Chapter 7.2 Performing pressure/temperature measurement, page 21.

7.4. Performing temperature measurement

In the menu temperature measurement, 2 temperatures can be measured. The K-Type temperature sensors are connected at port T1 and T2 – the temperatures T1 and T2 will be displayed as well the temperature difference. The temperatures can be saved or Auto-logged. On pages 2 and 3 temperatures are displayed as graph
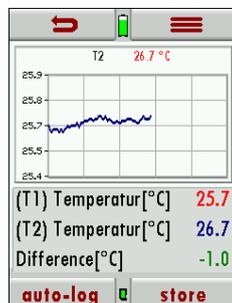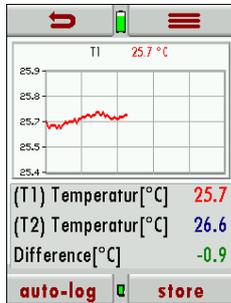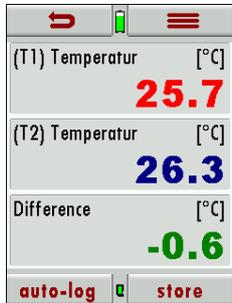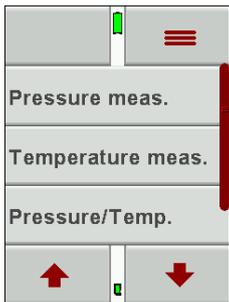
	NOTE
(i)	The measurement accuracy can only be granted with original MRU temperature sensors.

Opening context menu

You can customize the measurement to your needs in the context menu. Press the context menu button.

7.5.   Leak detection using the external HC-Probe (option)
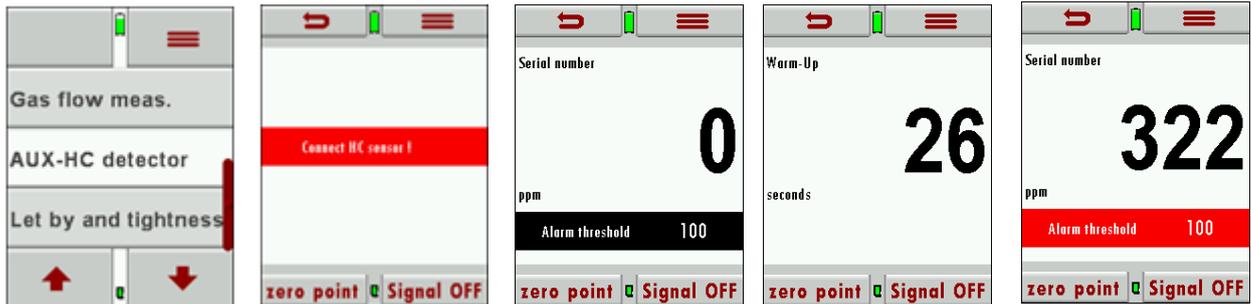
The external HC probe can be connected to the AUX port (if equipped) and is used for leak detection.
Please make sure that the red dot on the AUX port and the red dot on the HC probe plug are aligned when connecting the HC probe to the DM9600.

There will be a red flashing information (connect HC probe) on the screen in case the HC probe has not been connected yet.
After the HC probe has been connected the red flashing information will be replaced with the serial number of the HC probe.
During the warm up phase (zeroing) you will see a count down from 30 to 0 on the display

Performing leak test

The HC probe will be ready after zeroing.
There are user definable alarm settings, values below the alarm value will be displayed in black and value above the alarm setting will be displayed in red.
Additional to the red value there will be an acoustic signal to indicate that the value is above the threshold.

Setting alarm threshold and zeroing

Modifying the alarm threshold and zeroing

Zeroing
Threshold activate/deactivate Gray bar: Threshold deactivated/Alarm OFF Red bar: Threshold activated/Alarm ON

Peak value

The measured peak value will be displayed above the threshold bar.
This value can be reset with zero point.
The max value will also be set to zero during zeroing

Maintenance

It is recommended to calibrate the HC sensor annually to ensure accurate readings. The functionality of the HC probe can be tested with the gas of a cigarette lighter (without flame) or a test gas from a gas cylinder.
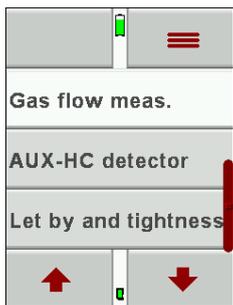
7.6. Performing gas flow measurement (option)

In this menu, the flow velocity can be determined.
On page 1 the flow velocity as well as the norm volume are displayed. On page 2 the absolute pressure, the static pressure and differential pressure is displayed.
On page 3 the gas temperature, the gas density and the duct cross section is displayed. Measurements can be saved or Auto-logged.
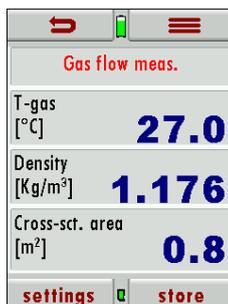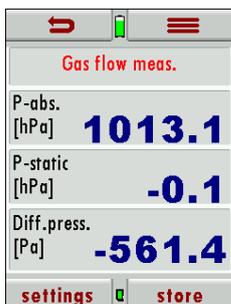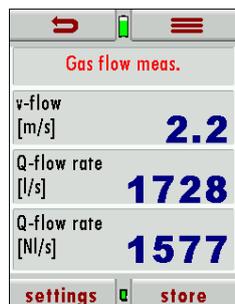
Connecting the Pitot tube
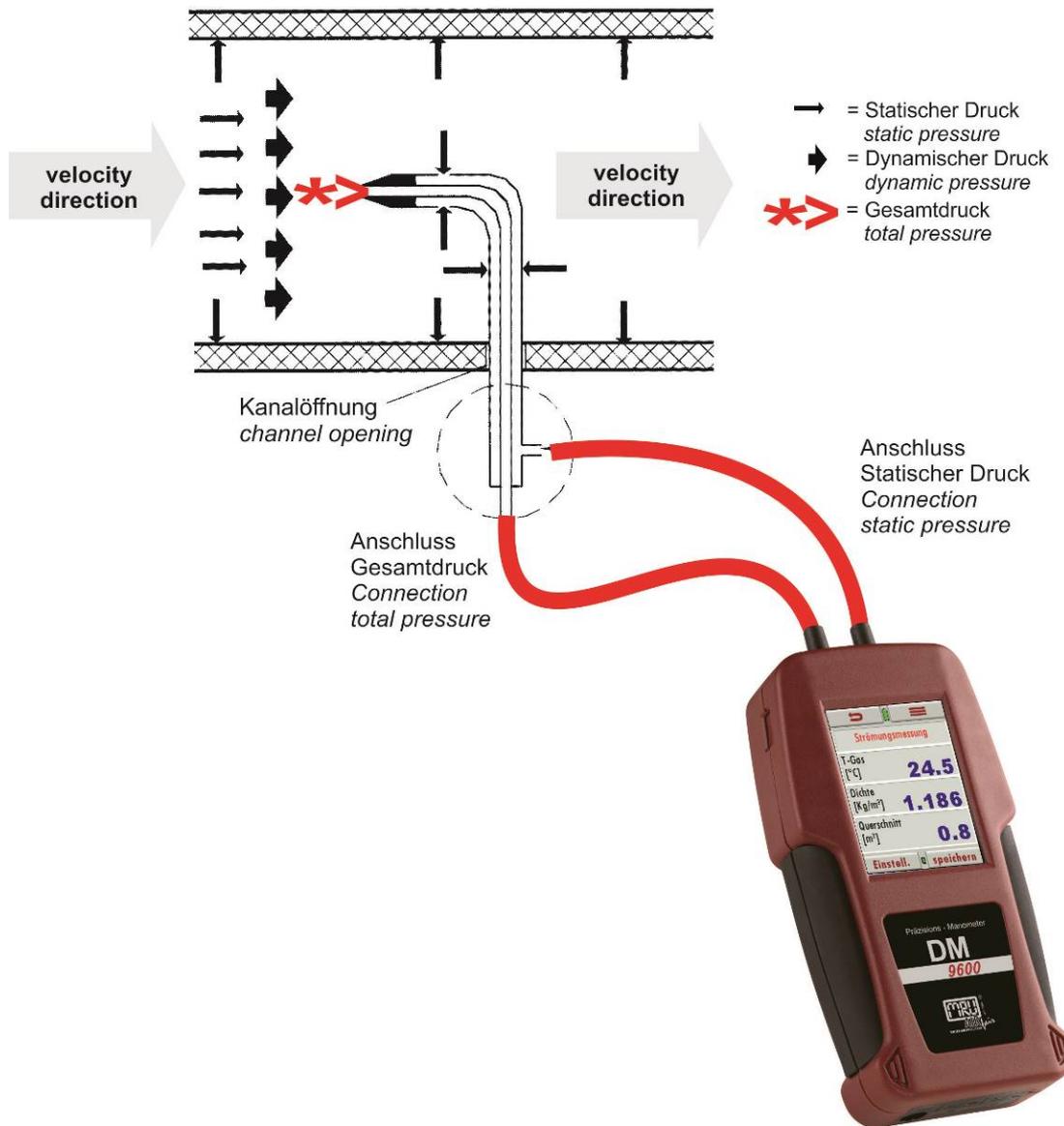
Opening context menu

You can customize the measurement to your needs in the context menu.
Press the context menu button.
See also 4.4 Display, page 13.
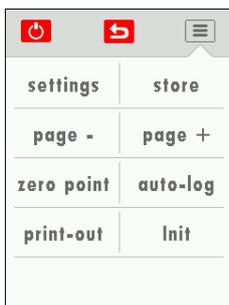
settings

The units can be set.

The cross-section can be set.
The gas composition can be set.
The Pitot factor can be set.

☞ For menu items of the context menu not shown here, see
also, Chapter Opening context menu, page 22 of the Chapter 7.2 Per-
forming pressure/temperature measurement, page 21.

7.7. Performing flow velocity measurement with vane wheel/anemometer (Option)

This option allows the flow velocity to be measured with a vane
wheel/anemometer, which is connected to the AUX input of the analyser via
a Smart-plus adapter.

When plugging in, the red marking on the plug must match the red marking
on the socket. The connecting plug of the impeller is plugged into the corre-
sponding socket of the Smart-plus-Adapter. It is necessary to remove the
cover cap of the vane wheel before measuring

There are two possibilities to measure the volume flow:
1.
The user enters the cross-section of the flow channel by entering the cross-
section shape (circle, rectangle or square) and its dimensions in Settings.

2.
A volume flow hood is used. For this purpose, the user selects in Settings
("Settings" button) as cross-sectional shape neither a circle, rectangle or
square, but a "funnel" - there is no need to enter dimensions. The vane
wheel/anemometer is attached to the hood (note the flow direction) and the
hood is placed on the inlet or outlet of the flow channel.

7.8. Performing 4 / 8 Pa-test (Option)

The 4 Pa test is used to determine the negative pressure limit in closed rooms. 4 Pa for rooms with exhaust air systems (e.g., extractor hoods in kitchens). 8 Pa for room-air-independent fireplaces.

A capillary tube must be connected to P1 and inserted through a window seal to the outside or through a door or keyhole in a stairwell.

The second capillary tube must be connected to the pressure connection P2 (if necessary, remove the fine draft tube beforehand) and left in the closed room

	Before starting the measurement, wait until the pressure sensor is ready. Recording interval: 1 second, Resolution: 0.1 Pa
	Touch Duration (min) duration to set the measurement time. zero point": The pressure sensor can be zeroed if necessary. Touch start to begin the measurement.
	The measurement can be displayed as graphic view or as text view. For switching you should press + /- at the edge of the display or context menu page. The measurement can be stopped either automatically or with the button accept.
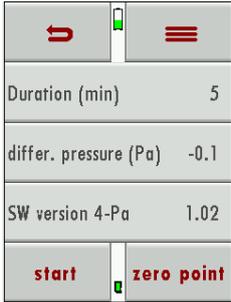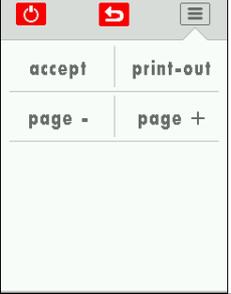
	Init diag: Graph is initialized, curve is shown from the beginning
	graphic>>: Scroll graphic to the right, or with your finger on the graphic above
	graphic <<: Scroll graphic to the left, or with your finger on the graphic below
	store: The measurement will be stored

Performing

Before starting the measurement, please disconnect the hoses from the device and carry out the zero point measurement. After zeroing, plug the hoses back into the analyser. The 4 Pa test begins.
The remaining time of the measurement is displayed in the menu line.

The measurement is performed in the following procedure.

1. Close all windows and doors of the utilization unit. Switch on the differential pressure gauge, disconnect the capillary tubes from the analyser - press any key on the analyser - and wait for zero point determination, connect the capillary tubes to the analyser - confirm by pressing any key on the analyser - (reference = (-) connection, installation room = (+) connection), open windows and lay the outer capillary tube (for reference pressure), check zero point on the measured value display, start pressure curve recording approx. Wait 30 seconds with open window or outside door to record zero line.

2. Switch on the firing system and set maximum output. All existing air extraction equipment must be put into operation. The measurement shall record the worst-case condition, i.e., the assessment shall be made with the highest power level of the air extraction device(s). In cases where the ventilation device is not in the same room as the fireplace, all doors and openings between the installation room of the fireplace and the ventila-

tion device shall be kept open. The zero point should not change after the fireplace and air extracting devices have been put into operation with the windows or outer door of the installation room open.

3. Close window/door, wait approx. 30 seconds, check vacuum, check clean exhaust fumes.
4. Open window/door, wait about 30 seconds, zero line must be reached again.
5. Close window/door, wait approx. 30 seconds, check vacuum, check clean exhaust fumes.
6. Open window/door, wait about 30 seconds, zero line must be reached again.
7. Close window/door, wait approx. 30 seconds, check vacuum, check clean exhaust fumes.

During the measurement, the remaining time in seconds and the current value are displayed in the menu line. With the keys in the context menu Graphic <</>> or pressing on the graphic Up/Down you can scroll to the left or right while the measurement is running. The recording continues in the background. The measurement can be terminated prematurely with the "accept". The previous measurement will then remain stored.
After the measurement has been completed, the result can be displayed in text or graph form by pressing the context menu key Page + /- or by clicking on the edge of the display (area of the graph) right or left.

The test is passed successfully if the pressure difference between the room and the outside is less than 4 Pa (4 Pa test) or less than 8 Pa (8 Pa test).

Data storage

To save, please press the store. Select a site and press store button. The measurement is saved. Please make sure that there is still enough free memory.

Printing measurement results

With "print-out" in the context menu the measured values can be printed.

7.9. Performing usability check (Option)

What is a usability check?
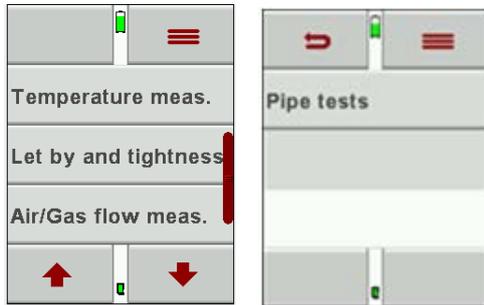
The usability check helps to determine and judge leakages (gas leakage) in low pressure gas pipes.
Tested will be all in operation or repaired pipes with all faucets, however without gas units and their regulators and security devices. The gas meter can be included in this test (using backward test).
The usage capabilities test may not be performed when:

• New installed pipes (= pipes within warranty)
• Pipes that had a limited usage capability or a NO usage capability and had been repaired to be used
• Not in use pipes which want to be used again
• Pipes in middle- and high-pressure range.

Test medium: Air or Methane
Test pressure: 23 mbar according to DVGW worksheet G600.

Unlimited usage capability: > 0 l/h to < 1,0 l/h
The pipe can be used for unlimited time without repair.

Limited usage capability: >1,0 l/h up to < 5,0 l/h
The pipe may be used for a maximum of 4 weeks. Within these 4 weeks the pipe must be repaired to achieve Unlimited Usage Capacity again (Leak-tight test).

NO usage capability: > 5,0 l/h
The use of this pipe must be stopped immediately. Take action to determine the defect.

Important is the technical security judgment:
Also, a leak tight gas pipe can have limited or no usage capability. The physical condition must be considered as well!
Once you smell gas the system is leaking. The above-mentioned usage capability grading's do not apply.

	NOTE
i	Important for the safety evaluation: Also, a leak tight gas pipe can have limited or no usage ca-

pability. The physical condition must be considered as well.

Once you smell gas the system is leaking. The above-mentioned usage capability grading's do not apply

Connection diagram usage capability test without dismounting gas meter

1 # 59387
Test port
2 # 50482
Silicone hose 6x2
3 # 59074
T-connector 3x6mm
4 # 50482
Silicone hose 6x2
5 # 50482
Silicone hose 6x2
6 # 59047
Mini ball valve
7 # 50482
Silicone hose 6x2
8 # 61499
Syringe 108ml
9 DM9600

108 ml = Syringe not pulled

Pressures higher than 100 mbar can occur when pulling out the syringe piston rapidly.

ATTENTION:
Slowly pull out the syringe piston to have pressures lower than < 50 mbar on the analyzer.

Operation

To be able to calculate the leakage rate first the pipe capacity must be determined.
In the first screen of the usage capability test you are asked if you want to determine the pipe capacity automatically. As alternative you can insert the pipe capacity manually.
No - Enter pipe capacity manually
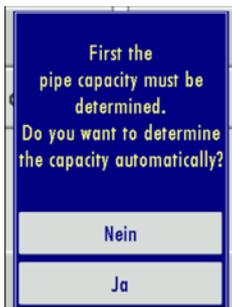
Automatic capacity determination

The capacity determination is done by extracting a defined volume from the closed pipe system using the syringe. The analyser uses the pressure drop to calculate the pipe volume.
Please follow the instructions on the analyser screen.

The syringe volume is not big enough to achieve the wanted differential pressure, if the pipe volume is bigger than (>200 Liter). This will be indicated with a red pressure value.
In this case the syringe volume can be increased using the ▶ button and you can take an additional syringe volume.
Continue with entering all additional parameters
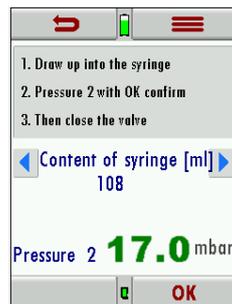
Entering pipe volume manually

Enter the calculated pipe volume.
Entering range is 3 to 1000 l (standard value is 20 l).
The DM9600 will calculate with 3 l should the calculated value be smaller than 3 l.
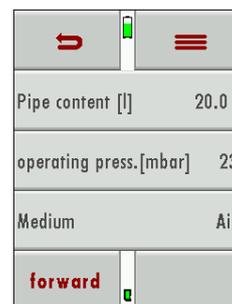
Entering additional parameters

	Min value	Max value	Standard value
Operating pressure	15	100	23
Stabilization time t	1	80	5
Test duration	1	20	1
P-abs	800	1200	1013
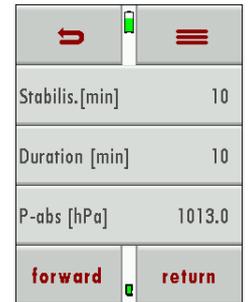
Entered operating pressure lower than 30 mbar – a reference operating pressure of 23 mbar will be used for calculations.
Entered operating pressure higher than 30 mbar – the actual entered value will be used for calculations.
Under "MEDIUM" you can select between air and Methane. It is important to select the medium that you are using to get the correct results. Methane can escape easier than air in a leakage situation.
The results are always based on Methane

Applying test pressure

This window is used to pressurize the pipe section that needs to be tested. There will be a red bar should the pressure be below 20 mbar and there will be an error message when starting the test.

.
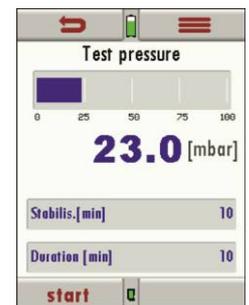
Stabilization time

The stabilization time can be shortened by using the "Skip" button. With the „Temp „button the temperature curve will be displayed.
The test starts automatically at the end of the stabilization time.
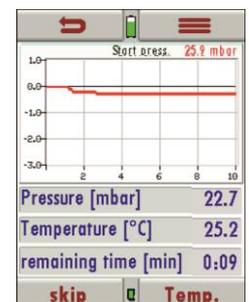
Test phase

The usability check is now active. With the „Temp "button the temperature curve will be displayed

The temperature curve can be used to evaluate the test results. A drop of temperature during the test phase can be the reason for a slight pressure drop. There is no automatic temperature compensation for the pressure.

Displaying measurement result

The start pressure, end pressure and the resulting leakage rate will be displayed at the end of the test.
Results can be saved using the „store "button.

Storing measurement result
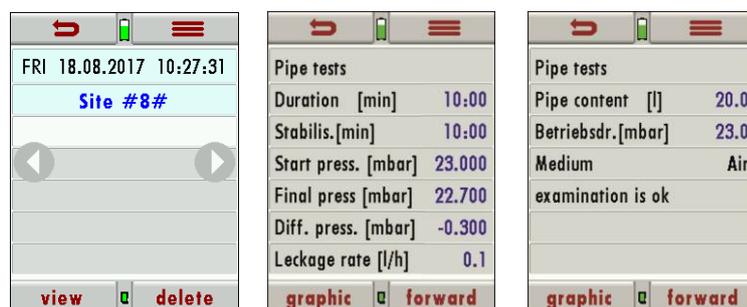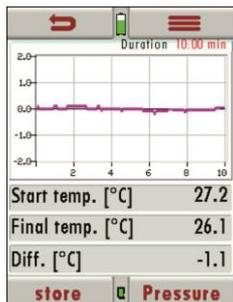
Results should be assigned to a site. Here you will assign your results to a site. Results can be saved using the „store" button. With Back, you will reach the measurement menu.
This is the bottom part of a test result
Results can be viewed once they have been stored.
Additional parameters can be viewed using the arrows up and down

7.10. Printing measurement results

In jedem Messprogramm können mit dem Ausdruck-Button im Messwertfenster / Kontextmenü die Messwerte ausgedruckt werden, die in den Messwertfenstern 1 bis 5 zur Anzeige gebracht wurden. Doppelte Wertanzeigen werden dabei unterdrückt.

8   Data storage

8.1. Organizing data storage

The main component of data storage is the site. Each site has a distinct site number and 8 user definable text components which can be used for the address, customer name and so on. The analyser can save up to 500 different sites.
New sites can be generated. Modifications and additions can be transferred using the PC program MRU Win.

	NOTE
i	Sites that have been created in the analyser will NOT be transferred back to the PC. Only measurement results will be transferred from the analyser to the PC which will be identified by the site number. Measurement results are stored and must be assigned to a site

8.2. Information about data storage

In the „menu storage „you select „Memory info" to get information about the available storage capacity of the unit. You will see the number of stored sites (max 500) and the number of stored measurements (max 1000).

8.3. Measurements in the data storage

Viewing measurements

Measured results can be viewed in the menu „view measurements".
Once selected you will see an overview of the different measurement modes with the number of saved results for each mode.

•Select one of the available modes.
•You will first see context information about the stored measurement. Use the arrow buttons to jump in between different stored measurements.
•Press „view "to see the details of the selected measurement. Results will be displayed as they are defined in the measurement screen.

With „back „you will return to the context information screen.

Only logged measurements will display the measured time, the interval and the number of measurements.

	NOTE
i	It may take a bit longer to read the results if the number of measurements or the logged measurements have a high data volume.
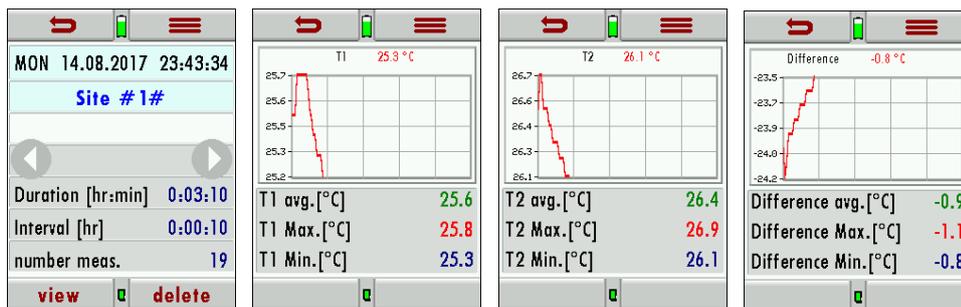
Deleting measurements

You can:

- •Delete single measurements when pressing the delete button while the measurement is being displayed.
- •Or delete all measurements of a measurement mode. You will be asked to confirm your intention to delete all measurements.

Managing sites

In the menu sites, you can:

- •View all data of the stored sites
- •Add new sites
- •Change data in existing sites
- •Delete sites
- •

Sites created in the analyser will not be transferred to the PC.

Add new sites

New sites can be added and modified in the „Sites administration"menu. Select "new" to add a new site. You will then see:

- •The first line which must have a distinct site number for identification. The DM9600 can also create a new site number (the next available site number will be selected).
- •All other lines are user definable lines for address, customer name and so on

(These lines can only be filled with a PC program like the MRU4Win)
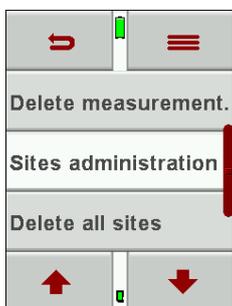
View sites

In the menu „Sites administration"each site will be displayed with:

- •The distinct site number, which is displayed in blue to indicate it's significance,
- •And addition 8 user definable fields.

You can page through the sites using the arrow buttons left and right

Change data in existing sites

Select the site that you want to change
Press the context menu button.
The context menu appears.
Press modify.
An input field appears
Enter the desired changes.

	NOTE
i	Any change of data of a site is not transferred to the PC.

Delete sites

You can

- •You can delete single sites in the menu „Sites administration" by selecting delete in the context menu,
- •Or you can delete all sites at once
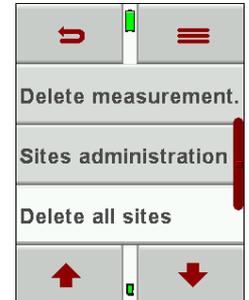
You will be asked to confirm your intention to delete all sites.

8.4. Transfer data via SD card

For data transfer, we use the CSV format
CSV is a simple file format used to store tabular data, such as a spreadsheet or database. Files in the **CSV** format can be imported to and exported from programs that store data in tables, such as Microsoft Excel or OpenOffice Calc. **CSV** stands for "**comma-separated values**"

1.Import of sites
2.Export of sites
3.Export of stored measurements

Import of sites
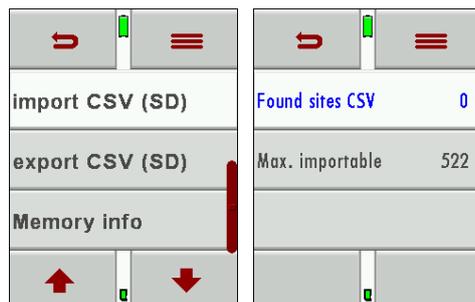
This function can be used to transfer a CSV file that has been created on a PC.

IMPORTANT: The file name must be "analgen.csv"!

The file may not contain any header information, meaning, the first line will contain actual data.

Each line that is not empty and which doesn't start with a comma (both would result in an empty site number which is not permitted) will be transferred.

Each line and/or data set a maximum of nine lines will be transferred. A maximum of 24 numbers and letters are allowed for each line, everything longer than 24 letters/numbers 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

Examples with 3 invalid sites: (reason for error)

,A1-F2,A1-F3,A1-F4,A1-F5,A1-F6,A1-F7,A1-F8,A1-F9 (Comma at the beginning)

(Space)

,A3-F2,A3-F3,A3-F4,A3-F5,A3-F6,A3-F7 (Comma at the beginning)

NOTE

No check is performed inside the file or the DM9600 for duplicate site numbers (line1).

The DM9600 can handle duplicate numbers, however that can be difficulties later to assign measurements to site numbers when exporting these back to the PC.

(see also 3. + 4. Export of measurements)

The DM9600 will mark duplicate site numbers after import. If the same file is imported to the same DM9600 an indication will be displayed in red letters

Export of sites

This function can either be used as backup of the sites to a PC or to transfer them to a different DM9600. This is very useful especially when modifications (like modified telephone number, etc.) have been made manually in the Sites Administration of the DM9600 and these modifications need to be updated in the PC program. Or, if the same sites must be installed in a second DM9600.
The format of this file is identical as the one described in "Import of sites". Only the file name is different, in this case "ANLxxxxx.csv". The xxxxx in the file name are consecutive numbers containing zeros. The exported file can be used to import the sites into another DM9600, however the name must be changed to "anlagen.CSV" before it can be used for import

Export of stored measurements

This function is used to export measurements to a PC.
Attention: this is not a backup function and the results can't be transferred to another DM9600!
The created file has the file name "TMPxxxxx.csv" the xxxxx in the file name are consecutive numbers containing zeros
The created file has a header with information like, Site number, Date/time, measuring values and units, all the information that is also stored inside the unit.

Here is an example:

	A	B	C	D	E	F	G
1	Anlagen-Nr.	Speicherdatu	Speicheruhrz	Intervall	P-abs.	Druck	
2					[hPa]	[hPa]	
3	Anlage #0#	10.05.2017	10:01:59	00:00:01	1009,18	10,25	
4					1009,21	11,25	
5					1009,3	11,15	
6					1009,4	12,37	
7							
8							
9							
10							

NOTE
It can take up to 2 minutes to export measurements, depending on the number of measurements that are being exported.
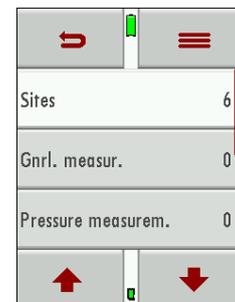
9 EXTRA / Settings
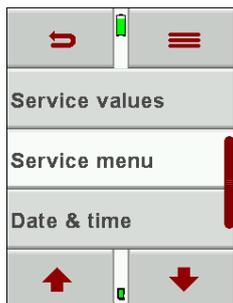
The DM9600 leaves our factory with standard firmware settings, and in most cases, this will cover your daily needs. However, these settings are adjustable and customizable to make work even easier.

9.1. Service adjustment menu

The service adjustment menu is PIN code protected. Only authorized and trained personnel may enter this menu.

You will be prompted back to the "settings menu" once you have entered a wrong PIN code.
Please contact an MRU service partner (www.mru.eu) to get the correct PIN code.
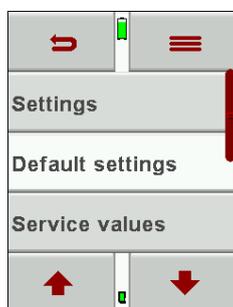
9.2. Factory settings

The analyser will be reset to factory settings

Settings:

LCD brightness (%)	50
Helping hints	AN
Keyboard beep	AN

9.3. Service values

Device errors can often be determined by using the values in the "service vales" menu.
The service values of all installed sensors are displayed here.
Please contact your local MRU service partner in case you have a malfunction of your device.
It's always handy to have the device next to you when make a service call, most likely the technician will ask you for these values and the serial number of the device
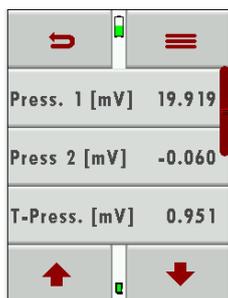
10 Maintenance and care

The analyser required only little maintenance:
Charge the battery completely in case you will not use the analyser over a longer period. Then recharge the battery every 6 months (using the included battery charger connected to the USB port).

NOTE
Please note that correct operation of the analyser 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.

11 Appendix

11.1. Technical data

General data

Prüfmedien	non-aggressive gas	suitable for
Durchmesser Anschluss Druck-/Unterdruck	8,0 mm	Connector diameter
Größe Silikonschlauch	Ø 6 x 2 mm	Size silicone hose
Betriebstemperatur	+ 5 - + 40 °C	Operating temperature
Lagertemperatur	- 20 - + 50 °C	Storage temperature
Anzahl und Typ Batterien	Li-Ion	Qty and size of batteries
Betriebsdauer	20h	Operating time
Display	2,8"touch TFT	Display
Gehäusematerial	PA6GF30	Housing material
Schutzart	IP30	IP degree of protection
Gewicht	340 g	Weight
Maße	83x38x180 mm	Size

Accuracy

Sensor	±75 hPa (mbar)	Sensor
Messbereich	-75,0 hPa ... +75,0 hPa	Range
Maximaldruck	150 hPa	Max Pressure
Auflösung	0,1 Pa	Resolution
Genauigkeit abs. / vom Mess-wert	± 2,0 Pa / 0,5%	Accuracy abs. / reading
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,4 %	Temp. variation (typical)
Sensor	**±150 hPa (mbar)**	**Sensor**
Messbereich	-150,0 hPa ... +150,0 hPa	Range
Maximaldruck	1200 hPa	Max Pressure
Auflösung	0,01 hPa	Resolution
Genauigkeit abs. /vom Mess-wert	± 0,03 hPa / 0,5 %	Accuracy abs./reading
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,4 %	Temp. variation (typical)
Sensor	**±350 hPa (mbar)**	**Sensor**
Messbereich	-350,0 hPa ... +350,0 hPa	Range
Maximaldruck	1200 hPa	Max Pressure
Auflösung	0,01 hPa	Resolution
Genauigkeit abs. /vom Mess-wert	± 0,3 hPa / 0,5 %	Accuracy abs./reading
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,5 %	Temp. variation (typical)
Sensor	**±1.000 hPa (mbar)**	**Sensor**
Messbereich	-1000,0 hP +1.000,0 hPa	Range

Maximaldruck	2000 hPa	2000 hPa
Auflösung	0,1 hPa	Resolution
Genauigkeit abs. /vom Mess-wert	± 1,0 hPa / 1%	Accuracy abs./reading
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,5 %	Temp. variation (typical)
Sensor	**±4.200 hPa (mbar)**	**Sensor**
Maximaldruck	4.500 hPa	Max Pressure
Auflösung	±0,00-99,99 hPa 0,01 hPa ±100,0-999,9 hPa 0,1 hPa ±1000-4200 hPa 1 hPa	Resolution
Messbereich 1	± 200,0 hPa	Range 1
Genauigkeit abs. /vom Mess-wert	± 0,5 hPa / 1 %	Accuracy abs./reading
Messbereich 2	± 4.200 hPa	Range 2
Genauigkeit abs. /vom Mess-wert	± 1,0 hPa / 1%	Accuracy abs./reading
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,5 %	Temp. variation (typical)
Sensor	**±7.000 hPa (mbar)**	**Sensor**
Maximaldruck	10.000 hPa	Max Pressure
Messbereich 1	-99,8 hPa ... +500,0 hPa	Range 1
Auflösung	0,1 hPa	Resolution

Genauigkeit abs. /vom Mess-wer	± 0,5 hPa / 1 %	Accuracy abs./reading
Messbereich 2	-7.000 hPa ... +7.000 hPa	Range 2
Auflösung	0,1 hPa	Resolution
Temperatureinfluß (typisch)	(0 ... 50 °C): ±0,5 %	Temp. variation (typical)
Temperaturmessung	**T1, T2**	**Temperature Measuremen**t
Anzahl der Thermoelement Typ K - Eingänge	2	Number of thermo-couple type K input
Messbereich	-40 °C .. 1200 °C	Measuring Range
Genauigkeit	±1°C / 0,5%	Accuracy
Strömungsgeschwindigkeit (optional #10711) (Nur in Ver-bindung mit DM9600 - 75hPa #912200 basierend auf Differenz-druckmessung mit Prandtlrohr	**v**	**Velocity** (optional #10711) Only in com-bination with DM9600 - 75 hPa #912200) based on differential pressure measurement with Pitot tube
Messbereich Differenzdruck-	75hPa	measuring range dif-

| messung		ferential pressure
Genauigkeit Differenzdruck-messung	±0.5 Pa / 1% with <5°C temp. change <30min meas. time	Accuracy differential pressure
Messbereich	1 m/s ... 100 m/s	measuring range
Genauigkeit ohne Fehler des Prandtlrohrs	±1 m/s (0<v<2m/s) ±0.2 m/s (2<v<10m/s) ±0.5% (v>10m/s)	Accuracy without error of Pitot tube
Absolutdruckmessung (setzt den Absolutdrucksensor von oben voraus)	•	absolute pressure measurement (requires abs. pressure sensor above)
Gaslecksuche		**Gas Sniffer**
Messbereich CH_4	5 - 20000 ppm	Measuring Range CH_4
Überlast	100000 ppm	Overload
Auflösung	1 ppm	Resolution
Ansprechzeit	T_{90}< 5s	Response Time

11.2. Firmware update

Installing new software in the analyser

Turn on the device. Select the context menu / extras / device info
In the 3rd line you will see the current installed firmware version for example 1.02.37
We will need the following information from you in case something has gone wrong with the update.

Please write down the firmware version of your device

_____
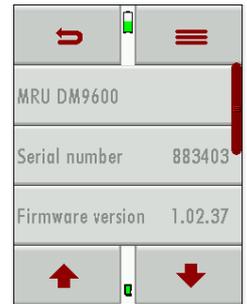
Please write down the serial number of your device

Performing and verification of an update

Preparing a SD card
Typically, you will receive an update by email. You will have to unzip the file in case you have received the file in a zip format (you would do this on your PC).
Now you will copy the unzipped file „1128.fwb" onto the root directory of the SD card.

Performing the update:

•Copy the 1128.fwb file onto the root directory of the SC card
•Insert the SD card into the card reader of the device and startup the device

NOTE

The SD card contact pins must face towards you when you insert them into the device and must snap into place once inserted.
Slightly push the SD card into the device and let go again to release the SD card

- Please wait, until you see the message „New firmware found"
- Select and confirm „install firmware"
- The update procedure will start…
- This will take about 45 seconds, don't press any keys during the update
- The device can be started again once the update has been installed
- You will get the information „Firmware update was performed…" confirm with OK
-

How can I verify that the update was successfully?
Turn on the device. Select the context menu / extras / device info

In the 3rd line you will see the current installed firmware version for example 1.02.37

What can I do if see that the old firmware version number is still displayed?
Repeat the update procedure.

Who can help me if I can't perform an update?
Contact your local sales office or send an email to: info@mru.de

11.3. Trouble shooting

Device trouble shooting

1. Effect	2. Error	3. Reason	4. Solution
Device shows no reaction		Device doesn't react to any touch screen commands.	Press the reset button
Device is too cold and can't be used.	Display notice: "Device too cold" or A beep every 5 seconds	e.g. Device was stored in the trunk of a car during winter time.	Take the device into a warm room and give it time to adapt to the room temperature!
Device can't be turned on or doesn't react once powered up.		Battery drained.	Connect the device to the battery charger and charge the battery.
Wrong temperature measurement results	Gas temperature too high or jumping	K-Type plug not connected properly Broken wire or broken thermo-couple.	Check the connection Check the wire for damages Remove condensate drops from thermo-couple tip.

12   Declaration of conformity

EU-Konformitätserklärung

Declaration of conformity

CE
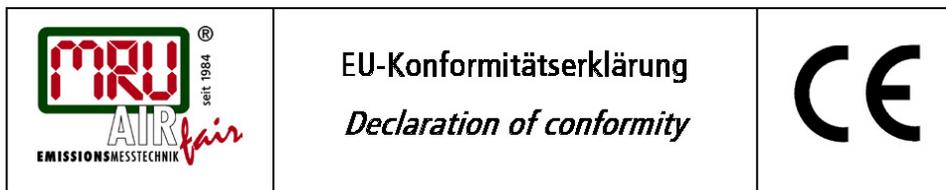
MRU Messgeräte für Rauchgase und Umweltschutz GmbH

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

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

Produkt/Product

Bezeichnung /*designation:*	Präzisions Digitalmamometer
	Digital Precision Manometer
Produktname / *name:*	DM*9600*
Funktion / *function:*	Druckmessung / Pressure measurement

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

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

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

Neckarsulm, 06.04.2017

Erwin Hintz, Geschäftsführer / *Managing Director*