since 1984 ®

EMISSION MONITORING SYSTEMS

MONTEC

MANUAL

7202EN

MRU Messgeräte für Rauchgase und Umweltschutz GmbH
Fuchshalde 4 + 8 + 12
74172 Neckarsulm-Obereisesheim
Fon 07132 99620 · Fax 07132 996220
info@mru.de · www.mru.eu

The products described in this manual are subject to continuous development and improvement. We therefore welcome any customer feedback, comments and suggestions regarding our product and its operating instructions that help to improve the product, service or documentation.

You can reach us:

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

Fon (+49) 71 32 99 62 0 (Reception)
Fon (+49) 71 32 99 62 61 (Service)
Fax (+49) 71 32 99 62 20
Email: info@mru.de
Homepage: www.mru.eu

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Original operating instructions

Version of these instructions: V2.00.EN

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1 Table of contents

2 Introduction and basic conditions

W002

These instructions enable safe and efficient use of the product.

The user must read and understand these instructions carefully before starting work.

The basic prerequisite for safe working is compliance with all the specified safety instructions.

2.1 Where to store the instructions

The instructions are an integral part of the product and must be kept in the immediate vicinity of the product and accessible to personnel at any time.

2.2 General information on the manual

- This manual will enable you to understand and safely operate this MRU analyser.
- Please read this manual carefully.
- Familiarise yourself with the product before using it.
- This analyser may only be used by qualified personnel and only for its intended purpose.
- Please observe all safety instructions and warnings to avoid injury and damage to the device.
- Hand over all documents if you pass the analyser on to third parties.

2.3 Safety signs

These safety instructions are used in this manual

⚠ DANGER

Refers to an imminent danger that will lead to serious physical injury or death if ignored.

⚠ WARNING

Indicates an imminent danger which, if ignored, can lead to serious physical injury, damage to property or death

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor injury.

ATTENTION

Indicates a potentially hazardous situation which, if not avoided, may result in damage to the device or its surroundings.

NOTE

Indicates application tips and other particularly important information.

2.4 Symbols

Symbols help to identify a danger and escape that danger. You will find the following symbols in these instructions:

Warning symbol	Figure number	Meaning
	W001	General warning symbol to identify a danger

Mandatory symbol	Figure number	Meaning
	M002	Observe the operating instructions
	M004	Use eye protection
	M008	Use foot protection
	M009	Use hand protection

2.5 General important information for the operator of the measuring device

MRU measuring devices are developed and manufactured in accordance with the applicable standards. Nevertheless, a failure or malfunction of individual device components is possible within the service life of the device. It is the responsibility of the operator to consider and assess the effects of malfunctions on the device and, if necessary, to limit them by taking external measures.

CAUTION

Effects of device malfunctions

Unrecognised effects on the application of the measuring device operator may arise due to device malfunctions.

- ➢ The system operator must assess the effects of device malfunctions and, if necessary, limit them by taking external measures.

Every system operator, user and technician who operates or maintains the device must be aware of the potential dangers associated with the use of the device. These dangers are explained in this manual. The information and instructions in this manual must be observed. Only trained and qualified personnel are authorised to use MRU measuring devices.

CAUTION

Non-compliance with local regulations, provisions and standards

This may result in an inadequate risk assessment.

- ➢ Always ensure that the MRU measuring device is installed and operated in accordance with local regulations, provisions and standards. Hazards must be identified and suitable countermeasures taken as part of a risk assessment.

When using the MRU measuring devices to measure other devices or systems, the manufacturer's documentation of the system or device manufacturer must be observed.

CAUTION

Non-intended use

The warranty becomes void

- Only use the MRU measuring device for its intended purpose and observe the local regulations, provisions and standards. Only use your MRU measuring device within the limits of use specified in the technical data.

2.6 MRU warranty conditions

For the warranty conditions for your analyser, please consult MRU's general terms and conditions.

2.7 Disposal take-back guarantee

MRU undertakes to take back all contaminated parts supplied by us that cannot be disposed of in the "normal" way.

The return delivery must be free of charge for us. Parts containing hazardous substances are: e.g. electrochemical sensors.

2.8 Return of devices

MRU GmbH is obliged to take back all analysers delivered after 13 August 2005 for proper disposal. The device must be returned to MRU with postage prepaid.

2.9 Packaging

Keep the original carton and packing material to avoid damage in transit if you need to return the analyser to the factory.

2.10 Taking back parts containing harmful substances

MRU GmbH undertakes to take back all parts supplied by us that contain hazardous substances and cannot be disposed of in the normal way.

Parts containing hazardous substances are e.g. electrochemical sensors, batteries and accumulators.

The return delivery must be free of charge for MRU.

2.11 The company MRU GmbH

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

The measuring device is manufactured by MRU GmbH in Neckarsulm-Obereisesheim, a medium-sized company that has specialised in the development, production and sale of high-quality emission analysis systems since 1984. MRU manufactures both standard types and customised special versions.

3 Notes on device and safety

3.1 Qualification

The qualification matrix shows the activities during the life cycle of the device. Each activity is assigned a qualification level,

1. Instructed person: The person has been instructed in their task an informed about the risks and involved in carrying it out.
2. Trained specialist: The person has received training that enables them to fulfil their tasks. They are informed about all the risks involved in their work, are able to recognise risks themselves when carrying out their work and have a suitable switching authorisation.
3. You can contact the MRU service for repairs, calibrations, retrofitting and disposal issues.

Qualification \ Activity	Instructed person	Trained specialist	MRU service
Transport	**X**		
Unpacking	**X**		
Take measurement results	**X**		
Adjust settings		**X**	
Mounting		**X**	
Commissioning		**X**	
Routine maintenance		**X**	
Repair			**X**
Modification			**X**
Decommissioning		**X**	**X**

Qualification matrix

3.2 Instructions on the safe operation of the device

3.2.1 Visual inspection

Before switching on the device, carry out an overall visual inspection of the device and, where appropriate, the optional attachment parts.

CAUTION

Damaged parts

Unstable operating state

- ➢ Do not put the device into operation if it is damaged. Examples of parts which can be damaged by external influences, such as unintentional damage, animal bites or weather influences are:
  - Housing and inspection glass
  - Power supply unit
  - Power supply
  - Gas feed line
- ➢ Protect the device from access by unauthorised persons.

3.2.2 Maintenance work

The faultless operation of your device is only guaranteed with the correct maintenance.

CAUTION

Incorrect maintenance

Unreliability of the device during operation

- ➢ Only carry out maintenance work and repair work that is described in the operating instructions.
- ➢ Only use original spare parts.
- ➢ Only operate the device with the power supply unit supplied.
- ➢ Do not store the device together with solvents, acids or other aggressive substances.

3.3 Data security

MRU uses internationally available standard transmission systems for data transfer.

Compliance with the local general data protection conditions must be guaranteed and is the responsibility of the user of the device.

The use of electronic safeguarding measures to maintain data security is the responsibility of the system user based on his risk assessment.

3.4 Intended use

The digital manifold gauge Montec, only referred to as digital manifold gauge below, is a tool used during commissioning and maintenance of heat pumps and refrigeration systems. It supports the system evacuation and the system leak test and is used for the defined filling of systems with refrigerants up to an intended system pressure of max. 50 bar. Only refrigerants specified in the technical data must be used; see chapter “Technical Data”.

⚠ CAUTION

System overpressure, parts of the digital manifold gauge flying about

This may result in the destruction of the digital manifold gauge

- ➢ Ensure that the system is kept at a maximum tolerated system pressure of 60 bar.
- ➢ If the digital manifold gauge has been exposed to pressures above 60 bar, have it checked by your MRU Service Centre before putting the digital manifold gauge back into operation.

The digital manifold gauge can be used indoors and outdoors (IP54).

The digital manifold gauge must only be used within the limits of use specified in the technical data. Any other use deviating from this is not permitted.

Any other use is **not** in accordance with the intended use. MRU is not liable for this. Any guarantee or warranty is void.

Non-compliance with the operating instructions is **not** in accordance with the intended use.

Improper installation and commissioning is **not** in accordance with the intended use.

Improper maintenance or failure to carry out maintenance is **not** in accordance with the intended use.

Modifications to the device are not permitted; retrofitting must be carried out in consultation with MRU.

Improper disposal is **not** in accordance with the intended use. Observe the legal regulations of the country in which the device is disposed of.

The device must **not** be used as a safety-determining component whose measurement results could jeopardise the safety of persons, the system or parts thereof.

3.5 Environmental protection

Refrigerant can harm the environment. Observe the applicable environmental protection regulations and the manufacturer's safety instructions when handling refrigerants. MRU furthermore recommends the use of hoses with shut-off valves. The refrigerant can be evacuated from these hoses to allow as little refrigerant as possible to escape into the environment when disconnecting the digital manifold gauge from the system.

Dispose of the digital manifold gauge in accordance with the regulations applicable at the place of disposal or send it back to MRU return postage prepaid.

4 Description of the device

4.1 Rating plate

The respective configuration of your device can be read off the rating plate.

Rating plate

#	Description
1	Serial number
2	Model
3	Voltage supply
4	IP protection
5	Radio frequency
6	Wireless certification ID
7	Labels

5 Commissioning

PREREQUISITE:

M008

⚠ CAUTION

Falling down of the digital manifold gauge

The result can be bruising of the foot

- ➢ Wear safety boots
- ➢ Use the hook (Figure 1/10) to attach the digital manifold gauge.
- ➢ Do not hold devices, especially when they are connected to a system, in your hand and secure the devices against falling down.

☑ Check the carrying case of the digital manifold gauge for completeness. The basic equipment includes the digital manifold gauge, two wired temperature clamps and a charging cable with power supply unit.

STEPS:

▶ Charge the battery of the digital manifold gauge (Figure 1/10).

▶ Remove the digital manifold gauge from the transport case before starting with your work.

i The ambient temperature sensor is attached at the rear of the digital manifold gauge. The sensor must not be screened from external influences as this could falsify the measurement.

i An overview of the control elements of the digital manifold gauge can be found on the following pages.

✔ You can put the digital manifold gauge into operation.

5.1 Unpacking the device

M008

⚠ CAUTION

Weight of the device

Impact and crushing injuries

- ➢ Always put the device down safely.
- ➢ Unpack the device in a location where you are undisturbed.
- ➢ Observe the weight and the dimensions of the device; in case of doubt, lift the device with two persons or use a lifting device.

▶ Take the packaged device as closely as possible to the intended point of use.

NOTE

Do not unpack the device in ex zones.

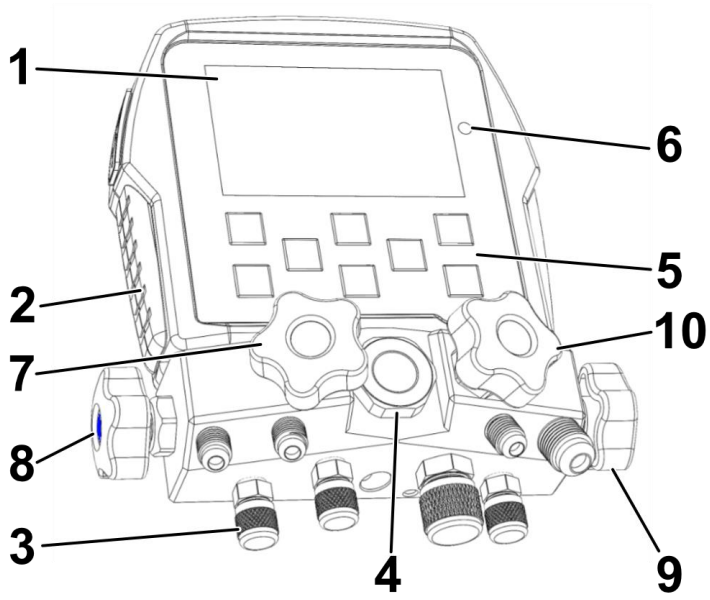
▶ Unpack the device. Avoid damaging the filling material.

▶ Retain the original packaging so that you can transport the device safely.

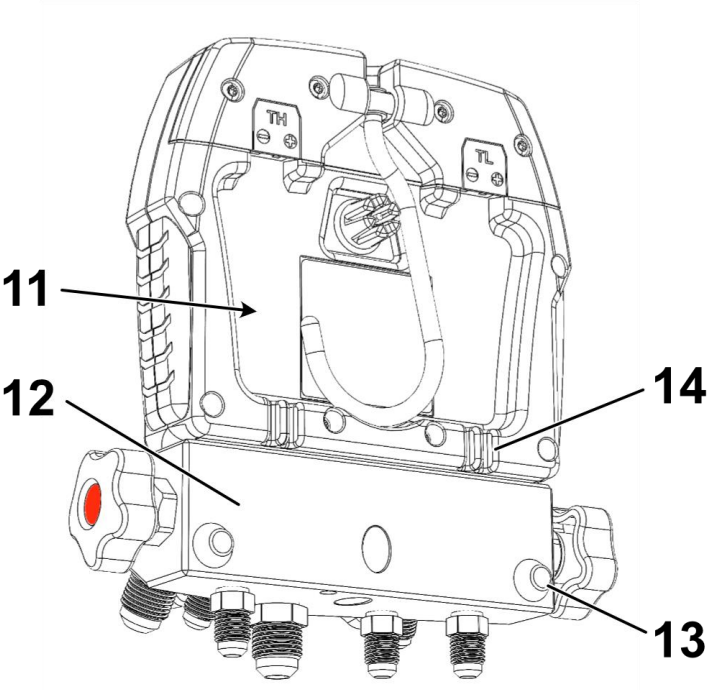
▶ Check the delivery for completeness.

6 Operation

6.1 Overview digital manifold gauge



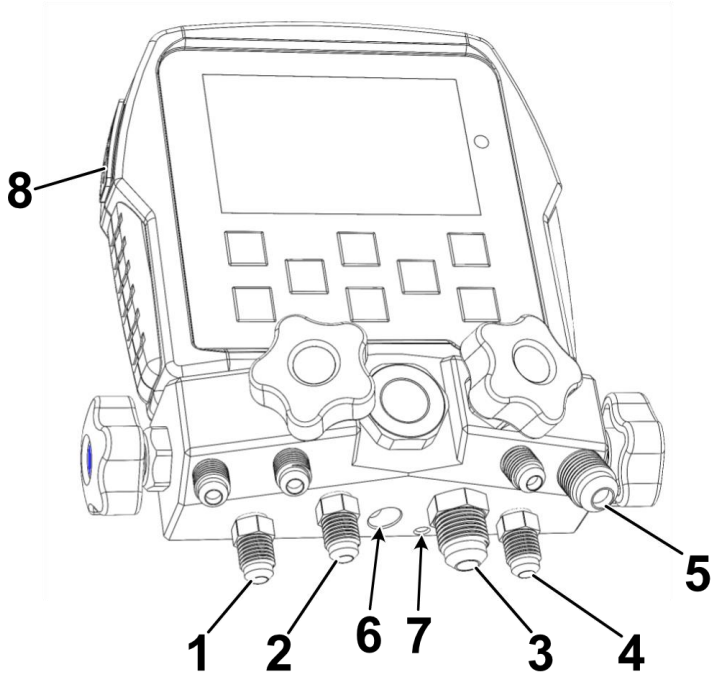
Montec front



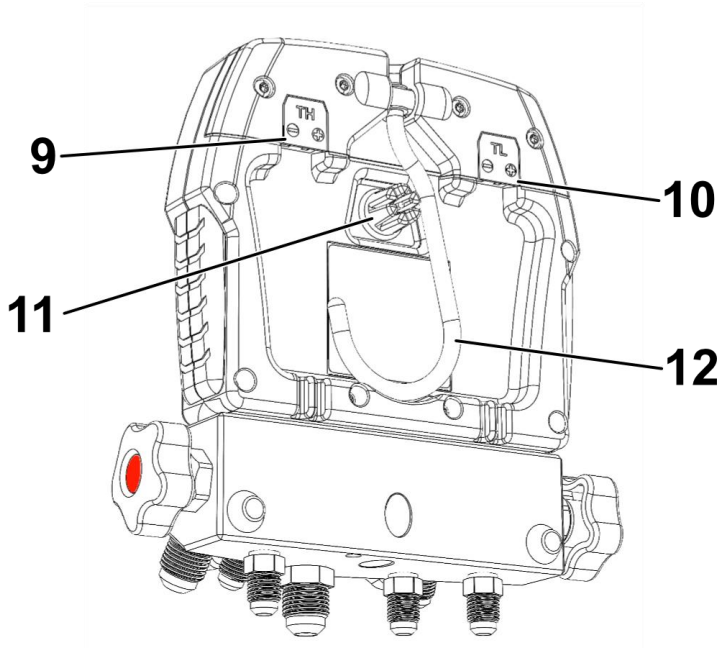
Montec back

#	Description
1	Display
2	Mouldings allow the digital manifold gauge to be securely gripped by hand
3	Screw-in socket with screwed-on **protection caps** i The protection caps protect the screw-in sockets against mechanical damage and contamination. Be sure not to lose the protection caps!
4	Inspection glass
5	**Keypad**
6	LED i Long-term measurements can be carried out with the display dimmed or switched off. The red LED serves as a reminder that the digital manifold gauge is still in operation.
7	**Shut-off valve** gas connection
8	**Shut-off valve** low-pressure side, marked blue
9	**Shut-off valve** high-pressure side, marked red
10	**Shut-off valve** vacuum connection
11	Battery below the cover
12	Valve block
13	Rubber buffer on which to place the device
14	**Cable bushing** connecting cable at type K sockets

6.2 Connections digital manifold gauge



Connections Montec valve block



Connections Montec back

#	Description
1	**Connection** low pressure
2	**Connection** test gas or refrigerant
3	**Connection** vacuum pump
4	**Connection** high-pressure side
5	**Screw-in socket** to screw down unused connecting hoses
6	Drilled hole for **theft protection**
7	**Earth connection**
8	**USB-C connection**
9	**Type K socket** (thermocouple socket) high temperature
10	**Type K socket** (thermocouple socket) low temperature
11	Ambient temperature sensor
12	Fold-out **hook** to attach the digital manifold gauge at a suitable position in the system during the measurement

The housing holds the sensors for the measurement operations and the display to show the measuring results of the connected heat pump or refrigeration system. The electronic components are supplied by a rechargeable battery. The battery can be recharged via the USB-C connection. For the purpose of data transfer, for instance to carry out a software update, the digital manifold gauge can be connected to a computer via the USB-C connection.

6.2.1 Shut-off valves

Each screw-in fitting is equipped with a mechanical shut-off valve by means of which the associated screw-in fitting can be opened and closed again. See p.20 - Overview digital manifold gauge.

- The shut-off valve marked in red opens or closes the high-pressure side connection of the heat pump or refrigeration system.
- The shut-off valve marked in blue opens or closes the low-pressure side connection of the heat pump or refrigeration system.
- The front right shut-off valve opens or closes the connection to the vacuum pump.

- The front left shut-off valve opens or closes the connection to the gas cylinder with refrigerant or test gas.

CAUTION

Pressure or vacuum in the valve block

Stress and premature wear of the gaskets between valve block and shut-off valve can be the result.

- Ensure that after the completion of work, there is no pressure or vacuum in the valve block between the shut-off valves. Evacuate refrigerant and close the shut-off valve only after evacuation.
- If there is still pressure or vacuum in the valve block, open the shut-off valve only by a fraction of a revolution and equalise the pressure/vacuum in a controlled manner with the environment. Pay attention that there is no refrigerant in the valve block.

CAUTION

Measuring error

Error when filling the system, stress and premature wear of the gaskets between valve block and shut-off valve can be the result.

- Clean the valve block with rubbing alcohol after working on systems filled with refrigerant.
- Avoid mixing different refrigerants. Clean the valve block when working on different systems or refrigerants.
- The sensors of the digital manifold gauge can be impaired if oil mists from the system settle on the sensors. This can result in a drift of the pressure or vacuum values. Clean the valve block regularly.

6.2.2 Valve block

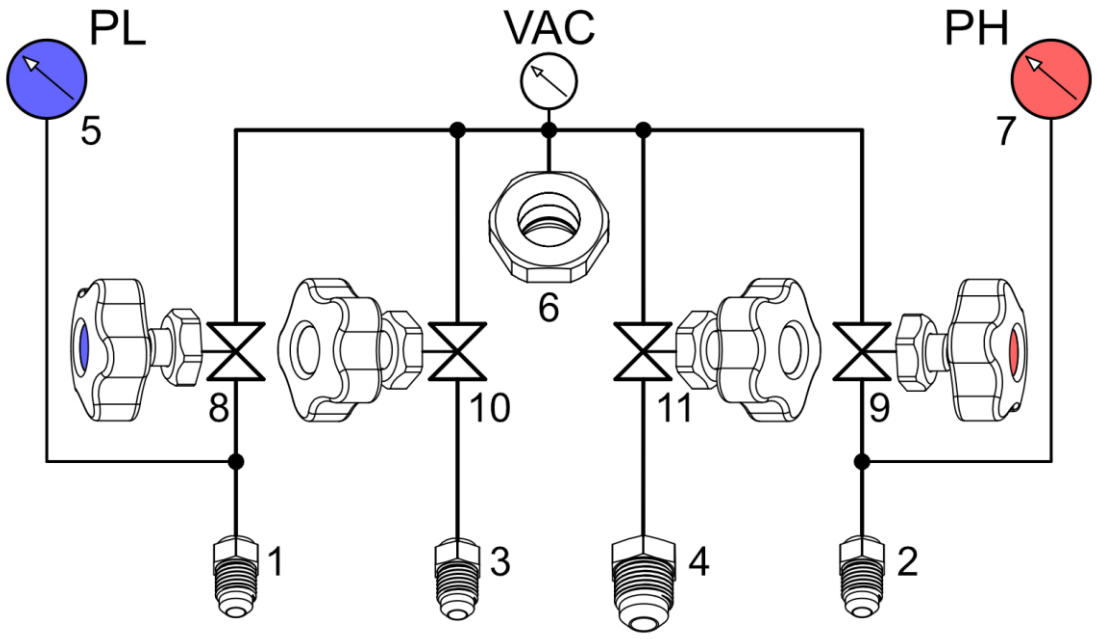
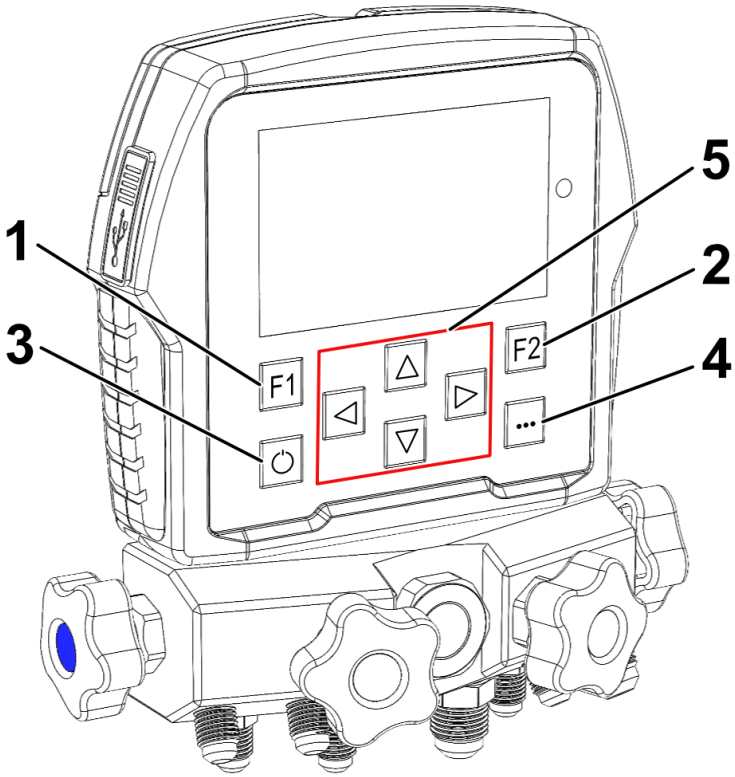


Figure 4: Valve block – schematic representation

#	Description
1	**Connection** low-pressure side
2	**Connection** high-pressure side
3	**Connection** refrigerant/test gas
4	**Connection** vacuum generation
5	Pressure sensor low-pressure side
6	Vacuum sensor
7	Pressure sensor high-pressure side
8	**Shut-off valve** low-pressure side
9	**Shut-off valve** high-pressure side
10	**Shut-off valve** refrigerant/test gas
11	**Shut-off valve** vacuum generation

The schematic diagram is also displayed in the menu **Device information**.

6.3 Control elements of the digital manifold gauge display



Keypad

#	Description
1	Function key **F1** multiple assignment
2	Function key **F2** multiple assignment
3	Switch digital manifold gauge **on** and **off**
4	Calling the Home **menu**
5	Direction keys **up, down, left, right** - to navigate the menus

6.4 Switching the digital manifold gauge on and off

6.4.1 Switching on

▶ Press the **ON/OFF** to switch on the digital manifold gauge.

✔ You will see the Home menu, the device is switched on.

6.4.2 Switching off

▶ Press the **ON/OFF** to switch off the digital manifold gauge.

i You will be asked “Really switch off device?”

▶ Using the arrow keys **up/down** select “Yes, switch off” and confirm this with the **F2** to switch off the digital manifold gauge.

✔ The screen turns dark, the digital manifold gauge is switched off.

i Alternatively, you can abort the switch-off procedure.

▶ Use:

- the function key **F1** to select “return”,
- the **menu**,
- or the arrow keys **up/down** to select “**No, return**” and confirm with the **F2** to return to the Home menu.

✔ You will once more see the Home menu.

6.5 Display of the digital manifold gauge

This chapter describes the menu navigation that is shown on the display of the digital manifold gauge.

Navigate or change the displayed values with the arrow keys **up**, **down**, **right** and **left**.

Confirm your selection or select the next submenu with the function key **F2** depending on the instructions in the toolbar.

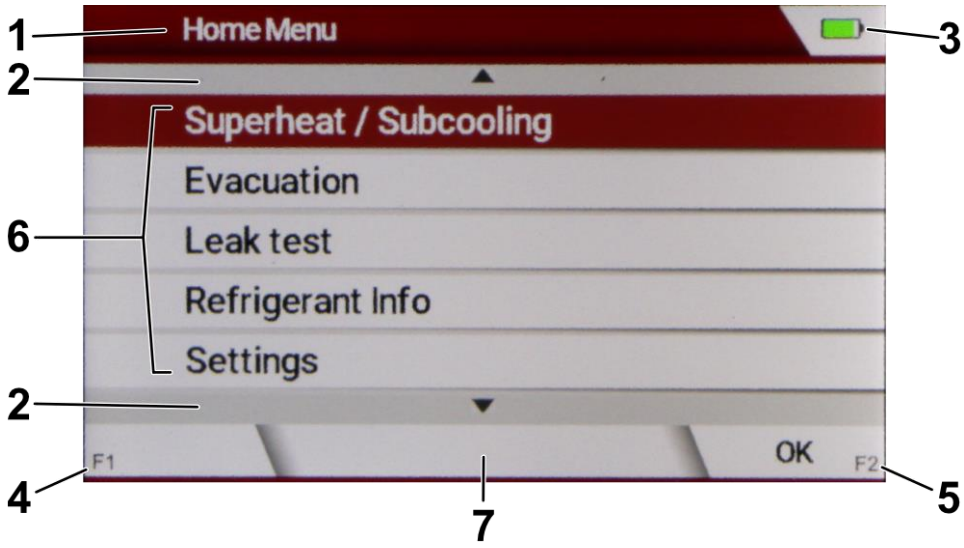
Use the function key **F1** to return to the previous menu.

Use the **Home** menu button to return to the first display, the **Home** menu.

6.5.1 Home menu

The Home menu shows you the first display of the menu navigation after you have switched on the device.

The layout of the Home menu looks as follows:



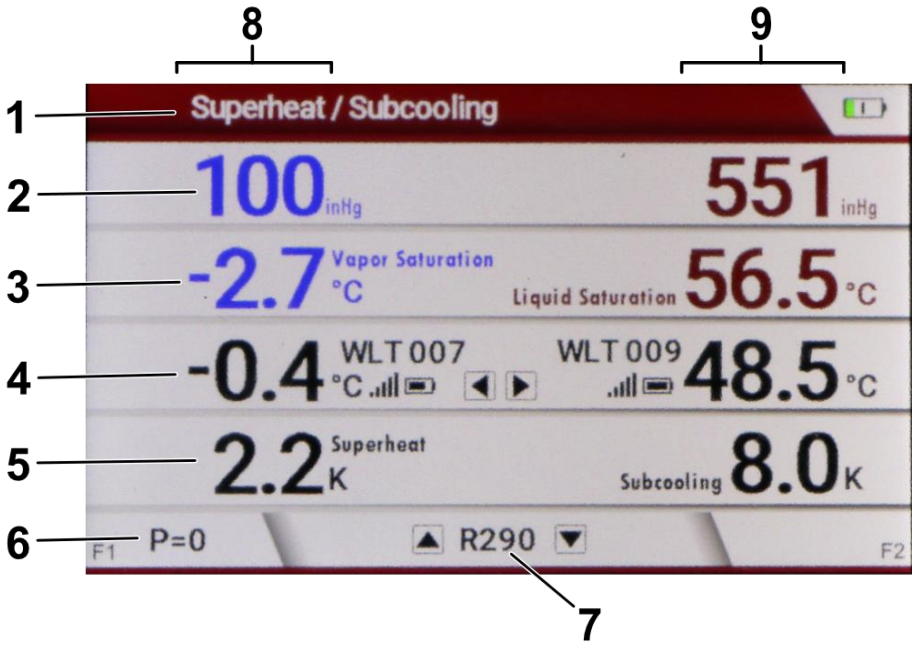
Home menu

#	Designation
1	Menu bar
2	**Rolling** up/down
3	State of charge of digital manifold gauge battery
4	Field with multiple assignments: • In submenus **return** • Zeroing **P=0**
5	Field with multiple assignments: • Selection **OK** • Measurements **Start**
6	Subitems of the Home menu
7	Variable field

6.5.2 Superheat/Subcooling

Under the menu item **Superheat/Subcooling** you will find the measured values of the sensors you have connected, a possibility for zeroing and for selecting the refrigerant.

▶ Select the menu item **Superheat/Subcooling** in the Home menu.



Superheat/Subcooling menu

#	Designation
1	**Superheat / Subcooling** menu
2	Pressure: measured: The absolute pressure (ambient pressure) required to calculate the vapor saturation/liquid saturation temperature is measured internally by the measuring device and taken into account.
3	Temperature: calculated from refrigerant and pressure
4	Temperature: for instance measured via the type K sockets (thermocouple sockets) or wireless
5	Temperature: calculated from vapor saturation/liquid saturation and the temperatures TL/TH
6	Zeroing **P=0**:

	To achieve a meaningful measuring result it is crucial to take into account the local conditions. This can only be ensured by zeroing before every measurement. The pressure in the system can for instance be influenced by factors such as solar radiation and temperature change in the measuring range. <Ziel der Handlung> **PRERWQUISITE:** ☑ The digital manifold gauge is not connected to a system, gas cylinder or vacuum pump. ☑ The shut-off valves on the high- and low-pressure side are open. **STEPS:** ▶ Press F1 **F1**. ▶ You are asked "Carry out zeroing?". Use **up** and **down** to select "**Yes**". i Carry out zeroing before every measurement. ✔ You have carried out zeroing. Alternatively, you can abort zeroing. ▶ You are asked whether you really would like to carry out zeroing after you have pressed **F1**. ▶ You are asked "Carry out zeroing?". Use **up** and **down** to select "**No**". ✔ You did not carry out zeroing.
7	Selection of **refrigerant**: ▶ Use **up** and **down** (figure 3/1) to select another refrigerant from the list that appears. ▶ Press **F2** to save the selected refrigerant. ✔ You have changed the refrigerant. i You can abort the procedure by pressing **F1**.
8	Low-pressure side
9	High-pressure side

Return to home menu

▶ Press ■ **Menu**.

✔ You reach the Home menu.

CAUTION

Pressure sensor defective

Hence, the measurement is not reliable

- ➢ Put the digital manifold gauge out of operation if the pressure sensor does not display anything. Have the digital manifold gauge examined by your MRU Service Center.

6.5.3 Evacuation

Under the menu item **Evacuation** you find settings regarding the evacuation measurement of your system. The **vacuum sensor** of the digital manifold gauge is used for that purpose.

▶ Select the menu item **Evacuation** in the Home menu.

Here you can specify the following values for the vacuum retention test:

- **Evacuation target mbar**
- **Maximum vacuum mbar**

▶ Use **up** and **down** to select **evacuation target** or **maximum vacuum**.

▶ Use the arrow keys **left** and **right** to increase or decrease the values.

✔ You have stored the evacuation target and the maximum tolerable rise in pressure for the vacuum retention test.

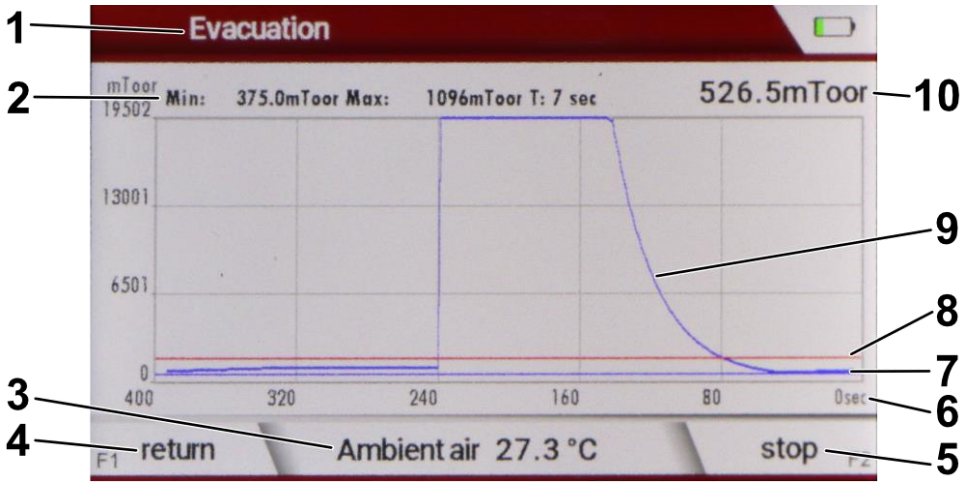
i To meet the manufacturers' evacuation regulations, you must carry out the vacuum retention test up to the **evacuation target**. If the pressure only rises up to the **maximum vacuum** it can be assumed that the system is free of foreign gases or foreign liquids.

Starting the evacuation measurement:

i The warmup phase of the pressure sensor can take several seconds. A screen display "**Warmup vacuum sensor XX sec**" informs about the remaining warmup time. The sensor starts the warmup phase as soon as you open the **Evacuation** window. Depending on the period of time you require to make your settings, the sensor will have already heated up and the measurement can start immediately.

▶ When you use **F2** to press **Start** you are taken to the evacuation measurement.

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.



Evacuation menu

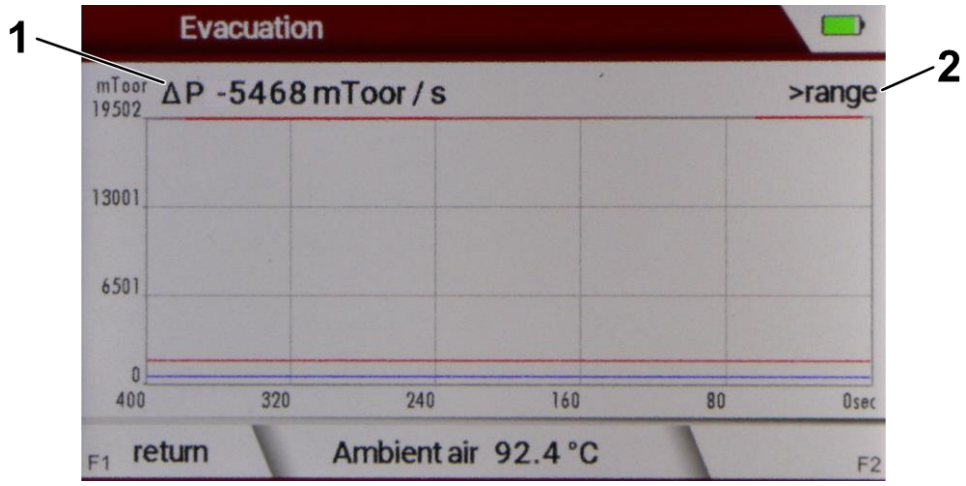
#	Description
1	**Evacuation** menu
2	✔ Y axis (pressure)
3	Measured ambient air temperature
4	**return** to setting the **evacuation target** and **maximum vacuum** ▶ Press F1 **F1**. You are taken to the menu where you can set the evacuation target and the maximum vacuum
5	**stop** the measurement
6	X axis in sec
7	Set evacuation target
8	Set maximum vacuum
9	Measured gradient of the vacuum retention test during **evacuation**
10	Current pressure in the system (absolute pressure)

Return to home menu

▶ Press **Menu**.

✔ You reach the Home menu.

Pressure gradient:



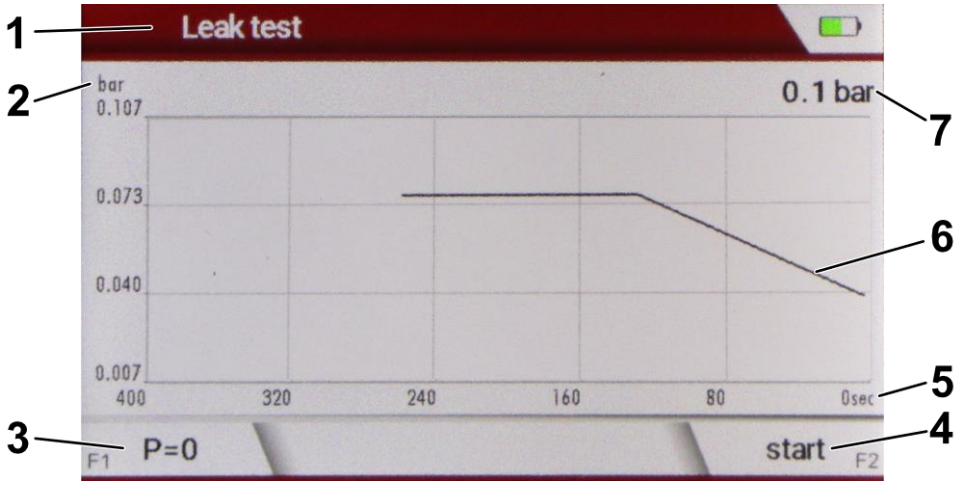
Pressure value outside the measuring range of the vacuum sensor

#	Description
1	The **pressure gradient** ΔP specifies an orientation value by how many **mbar per second** the pressure drops or rises. Here the pressure **ΔP** drops by **-17.4 mbar/s**. The pressure gradient is calculated from one of the two pressure sensors (high pressure/low pressure sensor). For that purpose, at least one shut-off valve to the high pressure / or low pressure sensor must be opened, see p. 26 - Valve block. The information is no longer displayed when the measuring range of the vacuum sensor is reached.
2	If **> range** appears, the values of the current measurement are outside the measuring range of the vacuum sensor that is used to depict the **Evacuation** menu. In that case, the absolute pressure in the system that you are evacuating is still above 26 mbar.

6.5.4 Leak test

Under the menu item **Leak test** you find the graphical representation of the pressure gradient of the connected measuring instruments over time.

▶ In the Home menu, select the menu item **Leak test**.



Menu leak test

#	Description
1	**Leak test**
2	Y axis (pressure)
3	Zeroing **P=0**: To achieve a meaningful measuring result it is crucial to take into account the local conditions. This can only be ensured by zeroing before every measurement. The pressure in the system can for instance be influenced by factors such as solar radiation and temperature change in the measuring range. ▶ Press **F1**. ▶ You are asked “Carry out zeroing?”. Use **up** and **down** to select “**Yes**”. i Carry out zeroing before every measurement. ✔ You have carried out zeroing. Alternatively, you can abort zeroing.

	▶ You are asked whether you really would like to carry out zeroing after you have pressed **F1**. ▶ You are asked “Carry out zeroing?”. Use the arrow keys **up** and **down** to select “**No**”. ✔ You did not carry out zeroing.
4	**Start** / **Stop** of measurement ▶ Press **F2**. ✔ Measurement starts. i The results of the measurement are also displayed to you in figures (Min. in bar, Max. in bar, and time in sec./min.) below the menu bar (Figure A/1). ▶ Press **F2** again to stop the measurement. ✔ You have stopped the measurement.
5	X axis in sec
6	Pressure gradient over the time of measurement
7	Relative pressure

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

Return to home menu

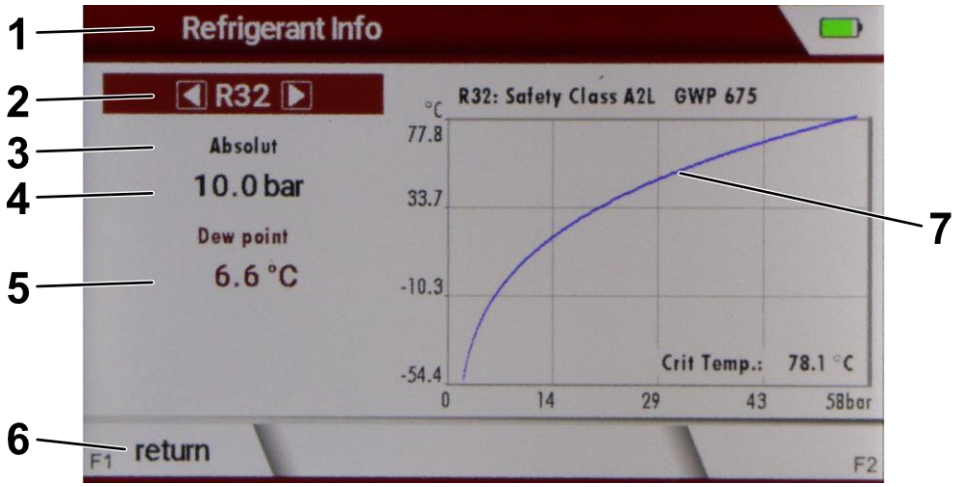
▶ Press **Menu**.

✔ You reach the Home menu.

6.5.5 Refrigerant info

Under the menu item **Refrigerant info** you obtain information on the refrigerant you would like to work with.

▶ Select the menu item **Refrigerant info**.



Display Refrigerant info

▶ Use ▲ **up** and ▼ **down** to navigate between the setting options **1** to **4**.

#	Description
1	**Refrigerant information** menu
2	**Refrigerant** ▶ Use ◀ **left** and ▶ **right** to select the desired refrigerant. ✔ You see the data of the refrigerant you have selected.
3	**Absolute** / **relative** ▶ Use ◀ **left** and ▶ **right** to choose between absolute / relative pressure. ✔ Depending on your selection, the absolute pressure or the relative pressure are shown. i For absolute pressure the pressure above vacuum and for relative pressure the pressure above atmospheric pressure is specified.
4	**Pressure**

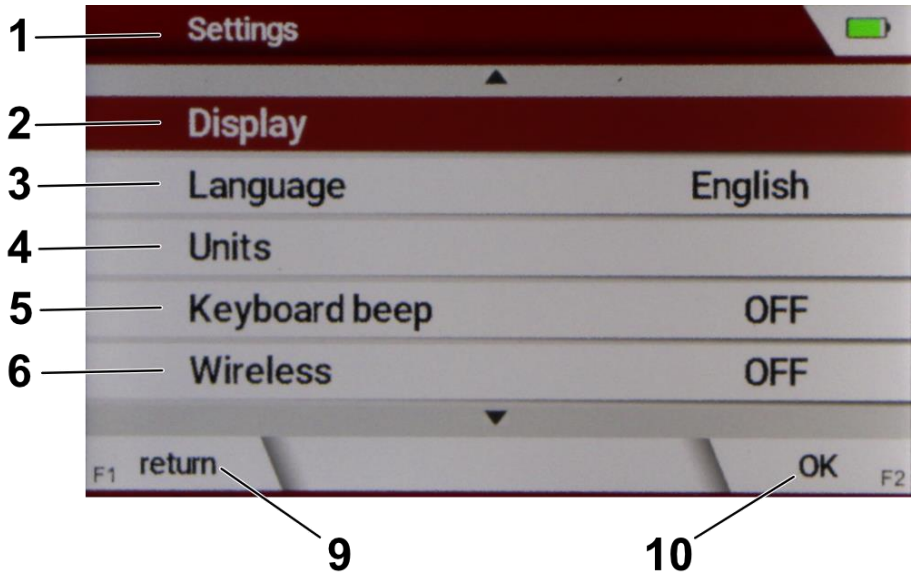
	▶ Use **left** and **right** to select the desired **pressure** and to view the change in temperature. ✔ You see the pressure you have selected and the temperature stored for this pressure.
5	**Dew point** ▶ Use **left** and **right** to select the desired **temperature** and to view the change in pressure. ✔ You see the temperature you have selected and the pressure stored for this temperature.
6	**Return** ▶ Press **F1**. ✔ You reach the Home menu.
7	Graphical representation of the refrigerant behaviour at pressure and temperature

The values under **Refrigerant information** serve as guidelines. Despite thorough research, we can accept **no** liability for the correctness of all values. MRU in particular assumes **no** liability for any damage or consequences arising from the use of the refrigerant information.

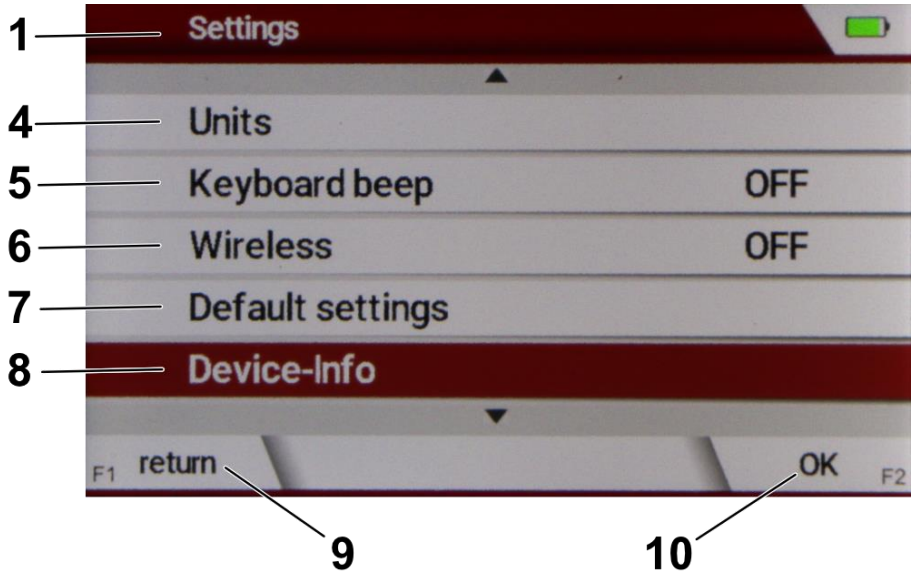
6.5.6 Settings

Under the menu item **Settings** you find the device settings, such as language and display brightness, resetting to default settings and many other customisable applications.

In the Home menu, select the menu item **Settings**.



Settings menu, first display



Settings menu rolled down, further setting options

#	Description
1	**Settings** menu
	Display: Configure the display settings according to your requirements. ▶ Select **Display** to set the following in the submenu with ◀ **left** and ▶ **right**: • **LCD brightness** (in % from 20 -100) • **LCD dimming** (from 0 min (**Off**) to 20 min) i If the display (figure 1/1) is automatically dimmed, a red LED (figure 1/15) blinks to the right of the display. This merely serves as a reminder that the digital manifold gauge is still in operation. • **LCD off after [h]** (1-48) • **Automatically off after [h]** (1-48) ✔ You have set up the display.
2	**Language**: Use your preferred language. ▶ Use ◀ **left** and ▶ **right** to set the language of your choice. ✔ You are using your preferred language.
3	**Units**: Use your preferred units independent of the **Country** setting. ▶ Select **Units** and navigate to the measurand you want to set up. Use ◀ **left** and ▶ **right** to select your preferred unit. The following units for the measurands can be set • **Temperatures in** °C; °F; K • **Pressure in** bar; inHg; psi; kPa; MPa • **Ambient pressure in** hPa; mbar; bar; inHg • **Differential pressure in** bar; inHg; psi; Pa; hPa; kPa; MPa • **Vacuum in** mbar; inHg; inH20; micron; mToor; Toor; mmHg; hPa; Pa ✔ You have saved the unit of your choice.
4	**Keyboard beep**: You can set up an acoustic beep when you operate the digital manifold gauge via the control elements (Figure 1/3). ▶ Use ◀ **left** and ▶ **right** to set the beep to **ON** or **OFF**.

	✔ You have switched the keyboard beep on or off.
5	**Wireless sensors**: Turn the submenu **Wireless** in the Home menu **ON** or **OFF.** ▶ Use ◀ **left** and ▶ **right** to turn the submenu Wireless **ON** or **OFF**. ✔ You have turned the submenu Wireless in the Home menu **ON** or **OFF**.
6	**Default settings**: You can reset the digital manifold gauge to the default settings provided ex works. **NOTE** Your settings and saved values will be lost when resetting to default settings! ▶ Select **Default settings** The following selection appears: **Restore default settings?** **Yes, reset** **No** ▶ Select **Yes, reset** to restore the default settings ✔ You have restored the default settings. i Alternatively, you can abort the operation. ▶ Use: • the F1 **F1** to select “return”, • the **Menu**, • or select **No** with ▲ **up** or ▼ **down** and confirm with F2 **F2** to return to the **Settings** menu. ✔ You once more see the **Settings** menu.
8	**Device info**: Select Device info to obtain all the data for your digital manifold gauge in the submenu. Here you find: • Manufacturer • Device type • Firmware version • Hardware version • Bootloader version

	• Serial number Return to the **Settings** menu: ▶ Select **return** to return to the **Settings** menu. ✔ You have returned to the **Settings** menu.
9	**Return** ▶ Press F1 **F1**. ✔ You reach the Home menu.
10	Selection **OK**

W008

⚠ CAUTION

The digital manifold gauge moves in an unpredictable manner as refrigerant flows through it at high pressure.

As a result, the digital manifold gauge can fall down.

- ➢ Wear safety boots
- ➢ Attach the digital manifold gauge at the air conditioner or heat pump with the hook provided.

⚠ CAUTION

A damaged device can be leaking

Consequently, refrigerant can escape from a damaged device and endanger persons or parts of the system.

- ➢ Visually inspect the digital manifold gauge for damage every time before you put it into operation.
- ➢ Have a device that has fallen down checked by the customer service before you put it into operation.

M004, M009

⚠ WARNING

Very hot or very cold or poisonous gas or poisonous refrigerant

Health damage due to burns, frostbite or poisonous refrigerants can be the result.

- ➢ Wear protective gloves and protective goggles when working with the digital manifold gauge.

- Check the sound condition of the connection hoses.
- Ensure that the connection hoses have been correctly screwed in and tightened hand-tight. Only start work once you have done so.

CAUTION

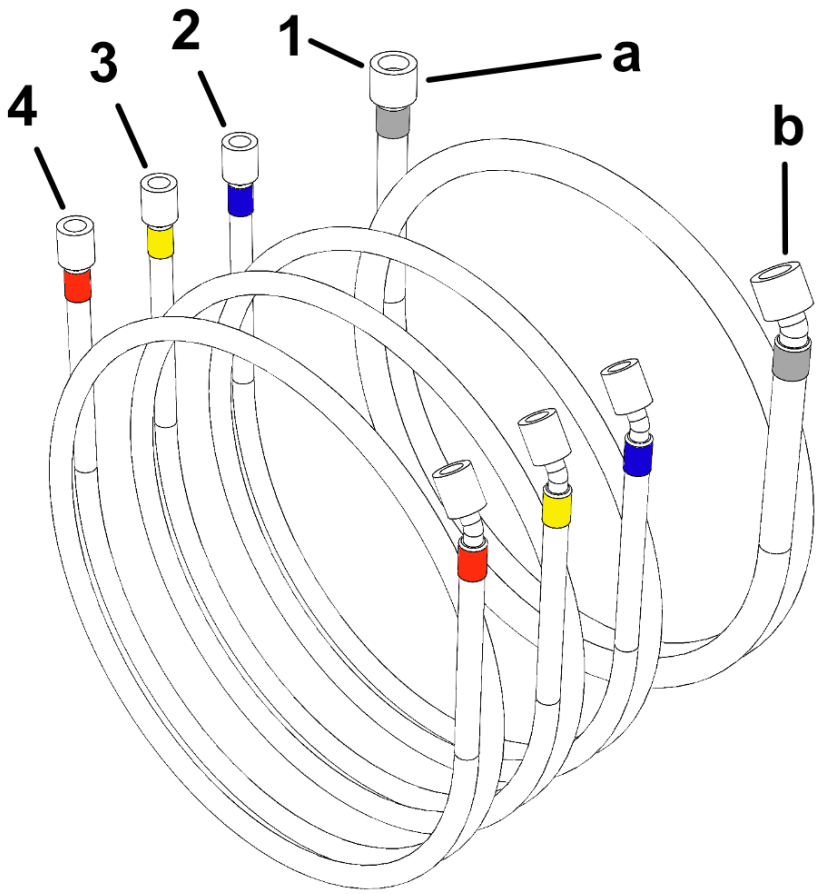
Gasket in the shut-off valve or hose connection damaged

This can result in leaks at the shut-off valve or hose connection.

- Only close the shut-off valve hand-tight.
- Also only connect hose connections hand-tight, do not use pliers to tighten.

6.6 Hoses

The digital manifold gauge comes with four hoses. These are exclusively intended for use within the scope of the technical data of the digital manifold gauge.



Hoses

#	Description
a	Straight screwed connection - recommended connection of the hose with the digital manifold gauge
b	Angled screwed connection – recommended connection of the hose to the heat pump/refrigeration system or the **screw-in socket** i In case hoses **1-4** are not used or for transporting them on the **hook**, you can screw the hoses to the **screw-in sockets**. You thus avoid soiling or unintended damage.
1	Hose marked in grey; for vacuuming

2	Hose marked in blue; recommended application: Low pressure
3	Hose marked in red; recommended application: High pressure
4	Hose marked in yellow; recommended application: Test gas/refrigerant

6.7 Long-term measurement

When you carry out a long-term measurement, you can dim and switch off the display to save electricity. Long-term measurements can be carried out during **evacuation** and during the **leak test**.

Proceed as follows to dim and switch off the display:

▶ In the Home menu, select **Settings**.

▶ After that, select **Display**.

▶ Set the desired time after which the display is dimmed. To this end, select **LCD dimming** and set the time with ◀ **left** and ▶ **right**.

▶ Set the desired time after which the display is switched off. To this end, select **LCD off after [h]** and set the time with ◀ **left** and ▶ **right**.

i The measurement continues even when the display is off.

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

✔ You have dimmed and switched off the display.

6.8 Initial filling of heat pumps and refrigeration systems

Your safety takes top priority when you commission systems or carry out maintenance.

⚠ WARNING

Refrigerant escaping from leaking systems

Personal injuries and environmental damage can be the result.

- ➢ Carry out a leak test before filling a system.

⚠ CAUTION

Uncontrollably whipping hoses

Pressure can cause the hose to whip uncontrollably when it is disconnected from the device.

- ➢ Do not disconnect pressurised hoses from the device.
- ➢ If this cannot be avoided, allow the pressure to systematically escape. Unscrew the hose slowly until you hear a hissing sound. Do not continue unscrewing. A few thread turns of the hose should still remain screwed to the digital manifold gauge. Wait until the pressure has equalised. Now you can completely unscrew the hose.

CAUTION

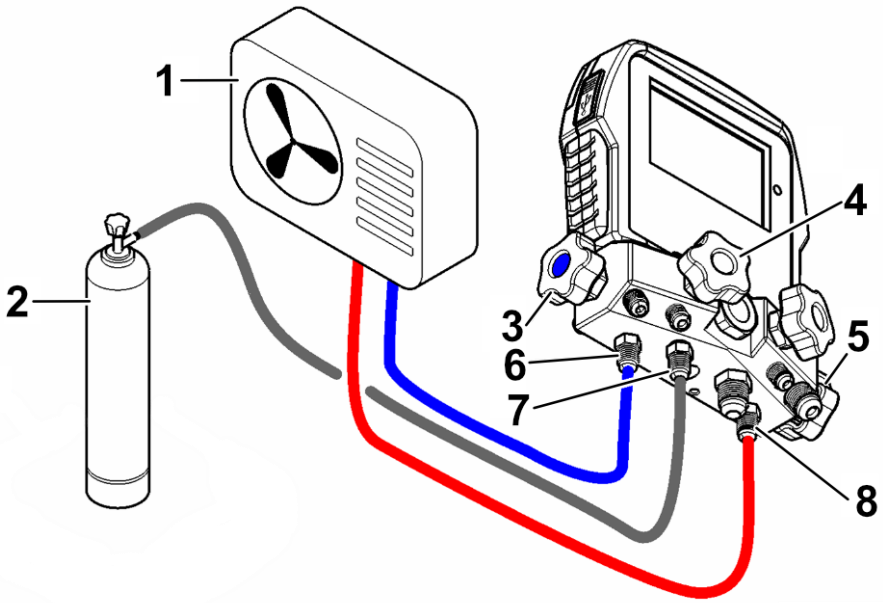
Mixing refrigerants and oils

This can lead to machine damage and environmental damage.

- ➢ Different refrigerants use different oils, mineral oils and synthetic oils to lubricate moving components in the refrigeration circuit. Mineral and synthetic oils must not be mixed. Clean the valve block regularly.

6.8.1 Pressurising the system with test gas

[i] The most common test gas for leak tests on heat pumps or refrigeration systems is nitrogen or forming gas.



Leak test; connection digital manifold gauge, system and test gas

#	Description
1	Heat pump/refrigeration system
2	Test gas cylinder
3	**Shut-off valve** low-pressure side
4	**Shut-off valve** test gas
5	**Shut-off valve** high-pressure side
6	**Connection** low-pressure side
7	**Connection** test gas
8	**Connection** high-pressure side

PREREQUISITE:

☑ Make sure that the **test gas cylinder** is closed.

☑ The **digital manifold gauge** is switched off, all the **shut-off valves** are closed.

☑ You have connected all **connections** as specified in the figure above. Connect the high-pressure side of the heat pump or refrigeration system with the high-pressure side of the digital manifold gauge and also connect the low-pressure sides with each other and the **test gas cylinder** with the screwed connection of the test gas connection.

STEPS:

▶ Switch on the **digital manifold gauge** and open the menu **Leak test**, see p.38 - Leak test.

▶ Open the **test gas cylinder**.

▶ Open the **shut-off valves** of test gas, low-pressure side and high-pressure side.

▶ Fill the system with the desired amount of test gas.

i Continuously check the system pressure during filling.

▶ Close the **shut-off valve** to the test gas and then the **test gas cylinder**.

▶ Wait for the time specified by the manufacturer to check whether the system holds the pressure.

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

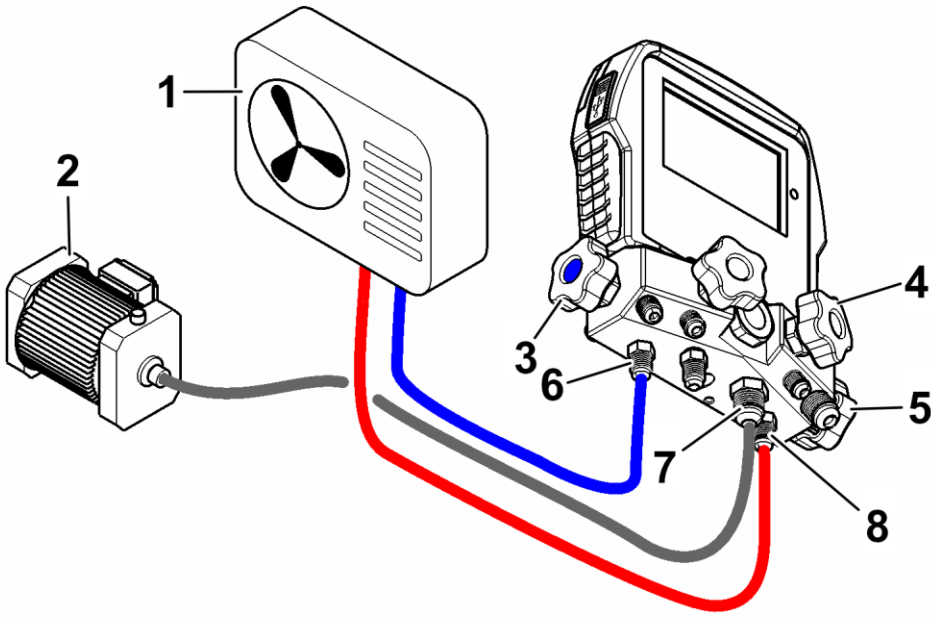
✔ If the system holds the pressure with the tolerance specified by the manufacturer, you have tested it for leak tightness in the overpressure range.

NOTE

If the system pressure during the leak test is outside the tolerance specified by the manufacturer, check the hose connections. If any leaks are found, retighten the connections hand-tight. Do not use any pliers to tighten the connections as you might damage the

rubber gaskets. Replace any damaged gaskets and check the system leak tightness again.

6.8.2 Carrying out evacuation and leak test



Evacuating the system; connection digital manifold gauge, system and vacuum pump

#	Description
1	Refrigeration system or heat pump
2	Vacuum pump
3	**Shut-off valve** low-pressure side
4	**Shut-off valve** vacuum pump
5	**Shut-off valve** high-pressure side
6	**Connection** low-pressure side
7	**Connection** vacuum pump
8	**Connection** high-pressure side

PREREQUISITE:

☑ The **vacuum pump** is off.

☑ The **digital manifold gauge** is switched off, all the **shut-off valves** are closed.

☑ You have connected all **connections** as specified in the figure above. Connect the high-pressure side of the heat pump or refrigeration system with the high-pressure side of the digital manifold gauge, and the low-pressure sides with each other and connect the **vacuum pump** with the screwed connection of the vacuum connection.

STEPS:

▶ Switch on the **digital manifold gauge**, open the menu **Evacuation**, see p.35 - Evacuation.

▶ Open the **shut-off valves** on the high-pressure side, low-pressure side and on the vacuum pump.

▶ Switch on the **vacuum pump**.

▶ Switch on the **vacuum pump**, the vacuuming time depends on the device manufacturer's regulations and the locally applicable provisions.

▶ Close the **shut-off valve** of the **vacuum pump**.

▶ Switch off the **vacuum pump**.

▶ Check whether the system is able to hold the vacuum for a longer period of time. Observe the system manufacturer's specifications and the local provisions in doing so.

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

✔ If the system holds the vacuum within the tolerance specified by the manufacturer, you have evacuated the system and tested it for leaks.

NOTE

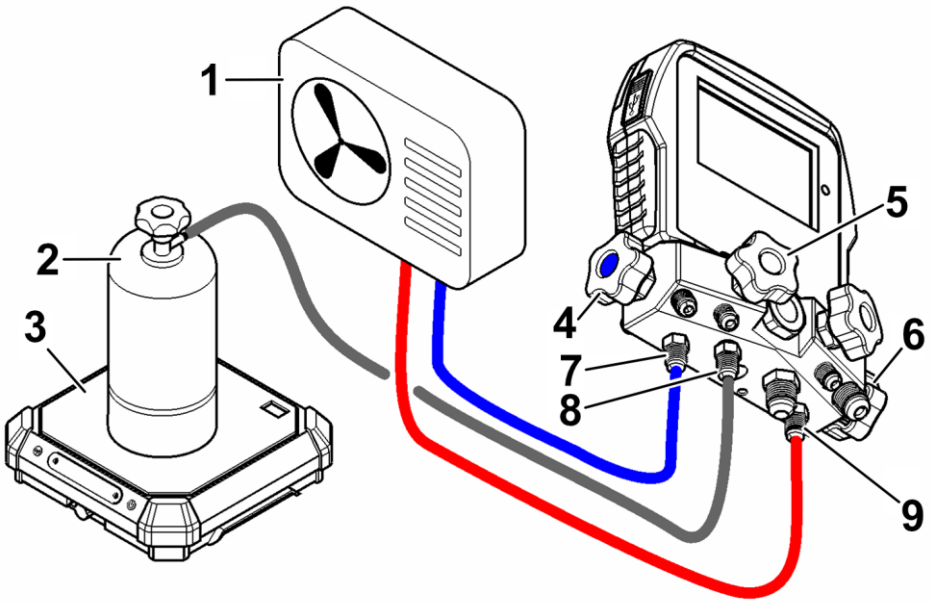
If the system pressure during vacuuming is outside the tolerance specified by the manufacturer, check the hose connections. If any leaks are found, retighten the connections hand-tight. Do not use any pliers to tighten the connections as you might damage the

rubber gaskets. Replace any damaged gaskets and check the system leak tightness again.

6.8.3 Filling in refrigerant

NOTE

Refrigerant at the vacuum sensor can falsify the measurement as the refrigerant has a lower thermal conductivity than air or nitrogen. Deviations can be expected from approx. 1 mbar above absolute vacuum. To achieve an accurate measurement above 1 mbar, rinse the valve block with air or nitrogen.



Refrigerant filling; connection digital manifold gauge, system and test gas

#	Description
1	Heat pump/refrigeration system
2	Refrigerant cylinder
3	Scales
4	**Shut-off valve** low-pressure side
5	**Shut-off valve** test gas

6	**Shut-off valve** high-pressure side
7	**Connection** low-pressure side
8	**Connection** test gas
9	**Connection** high-pressure side

PREREQUISITE:

☑ Ensure that the **refrigerant cylinder** is closed.

☑ The **digital manifold gauge** is switched off, all the **shut-off valves** are closed.

☑ You have connected all **connections** as specified in the figure above. Connect the high-pressure side of the heat pump or refrigeration system with the high-pressure side of the digital manifold gauge, and the low-pressure sides with each other and connect the **refrigerant cylinder** with the screwed connection of the refrigerant connection.

STEPS:

▶ Switch on the **digital manifold gauge**, open the menu **Superheat / Subcooling**, see p.32 - Superheat/Subcooling.

▶ Switch on the **scales**, place the **refrigerant cylinder** on the scales and write down the weight.

▶ Open the **refrigerant cylinder**.

▶ Open the **shut-off valves** of refrigerant connection, low-pressure side and high-pressure side.

▶ Fill the system with the desired amount of refrigerant.

i Continuously check the system pressure during filling.

▶ Close the **refrigerant cylinder** and then the shut-off valve between digital manifold gauge and **refrigerant cylinder**.

✔ You have filled the system with refrigerant.

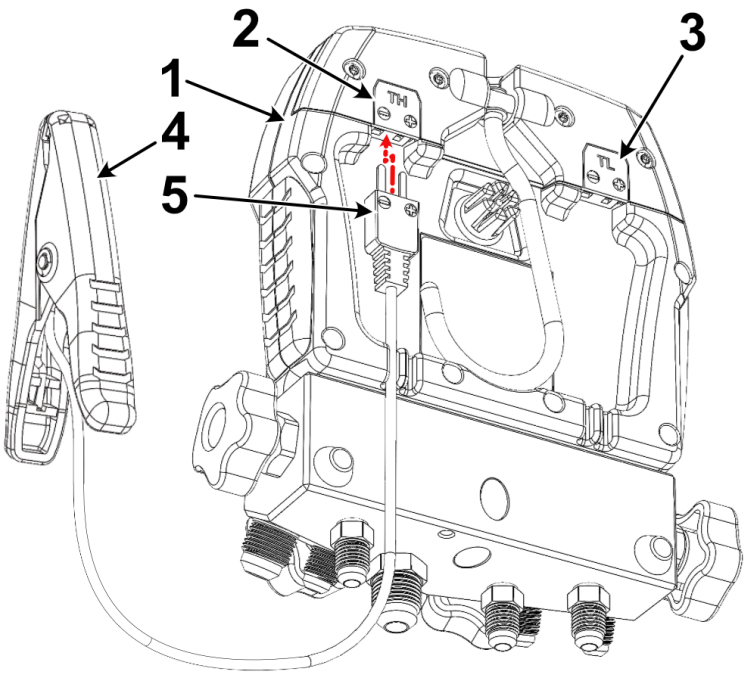
NOTE

Check the system function afterwards.

6.9 Temperature measurement

6.9.1 Wired temperature measuring clamps

When checking a system's function and measuring the subcooling and superheat values, you can use the wired temperature clamps.



Connection temperature clamp to type K socket

#	Description
1	Digital manifold gauge
2	**Type K socket** low temperature range
3	**Type K socket** high temperature range
4	Temperature clamps
5	**Type K plug** [i] Note the polarity of the plug

[▶] Connect the temperature clamps to the digital manifold gauge with a **type K plug**.

[i] Bear in mind that the **type K plug** has a broad and a narrow contact. Carefully slide the contacts into the **type K socket**

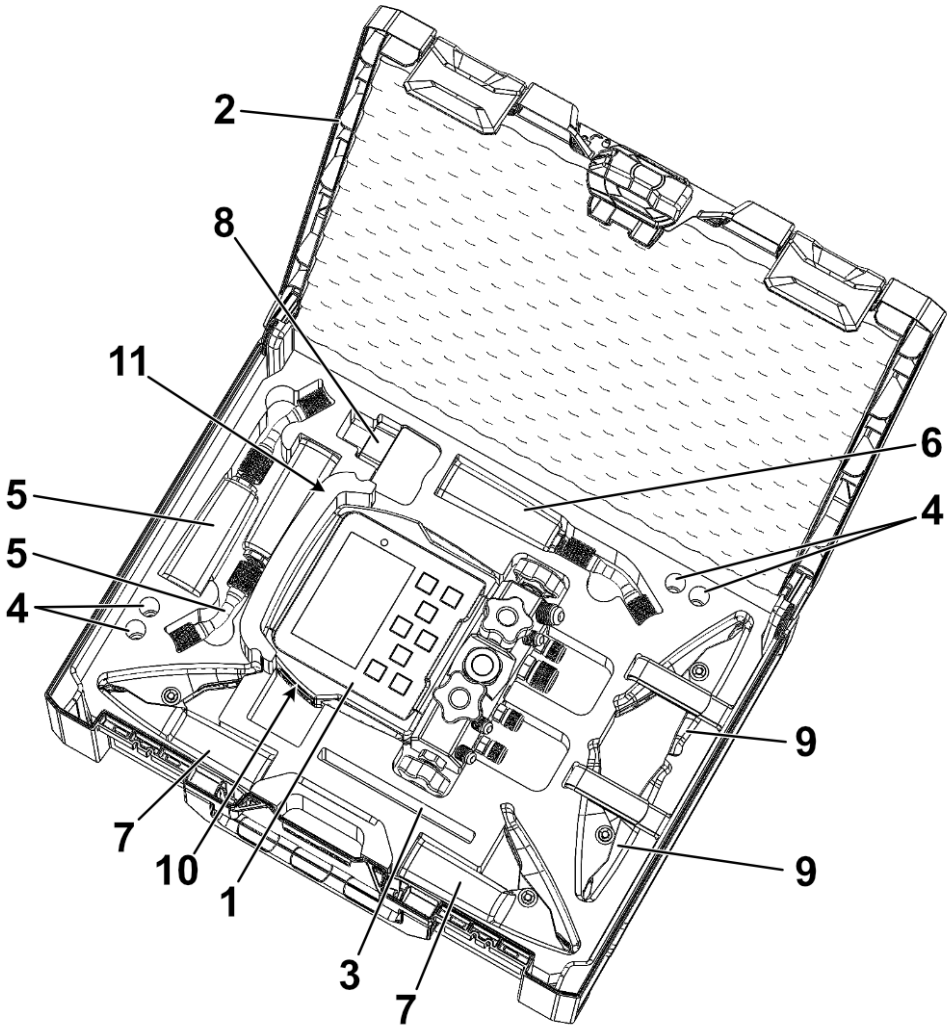
✔ The measuring result is shown on the display of the digital manifold gauge.

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

7 Options

7.1 Accessories

The optional accessory parts described in this section can be supplied with the digital manifold gauge.



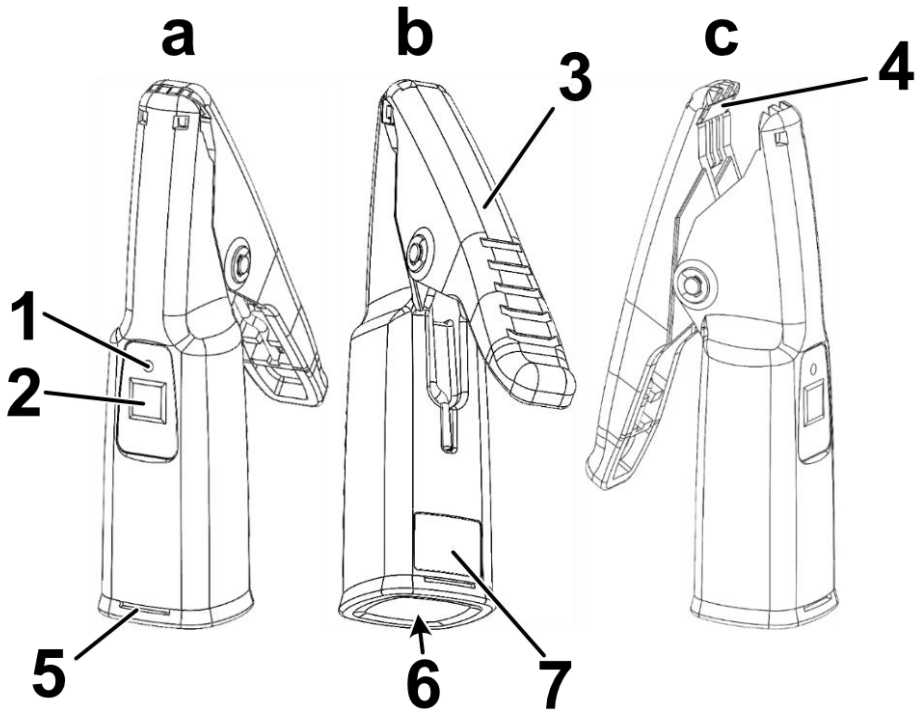
Digital manifold gauge with options

Pos.	Description	Function	Piece
1	Digital manifold gauge	Measurements at heat pumps or refrigeration systems	1
2	Case	Transport and protection of the digital manifold gauge	2
3	Storage space	multi-purpose	1
4	Storage space	for batteries/rechargeable batteries	4
5	Wireless sensors		2
6	Wireless sensor		1
7	Wireless temperature clamps	Temperature measurement in remote positions	2
8	Charging device power supply unit	Charging the digital manifold gauge	1
9	Wired temperature clamps	Temperature measurements at heat pumps or refrigeration systems	2
10	Charging cable Montec power supply unit	Charging cable of the digital manifold gauge is located underneath the digital manifold gauge, not illustrated	1
11	Hoses	Can be placed around the guide, not illustrated	4

7.2 Carrying out tests with (optional) wireless accessories

7.2.1 Wireless temperature measuring clamps

When you check the function of a system, you can use the wireless temperature clamps.



Wireless temperature measuring clamp

#	Description
a	View **bottom side** left
b	View **upper side** left
c	View with **open clamp** bottom right hand side
1	**LED** The **LED** blinks **blue** when the temperature measuring clamp is switched on and sends data. The LED blinks **red** once when you switch off the temperature measuring clamp. [i] Please note that the wireless temperature measuring clamps switch off after 4h.
2	Button **On/Off**

3	**Clamp handle**
4	**Temperature sensor**
5	**Recess** to open the battery compartment
6	**Battery compartment** for 2x AA batteries
7	**Rating plate**

Commissioning the wireless temperature measuring clamps:

▶ Open the **battery compartment**.

▶ Insert the batteries.

▶ Press **On** for 1 sec.

i The **LED** blinks **blue**.

✔ The wireless temperature measuring clamp is ready for operation.

CAUTION

Wrong connection of the batteries to the positive terminal ⊕ or negative terminal ⊖ of the wireless temperature measuring clamp

The device will get damaged

➢ Observe the instructions ⊕ ⊖ regarding the direction in which the batteries must be inserted into the wireless temperature clamp

Switching off the wireless temperature clamp:

PREREQUISITE:

☑ The wireless temperature clamp is switched on.

STEPS:

▶ Press **Off** for 3 sec.

i The **LED** blinks **red** once.

✔ You have switched off the wireless temperature clamp.

7.2.2 Operating the wireless temperature measuring clamps with the digital manifold gauge

To measure at measuring points you cannot reach with the wired temperature measuring clamps you can use the wireless temperature measuring clamps.

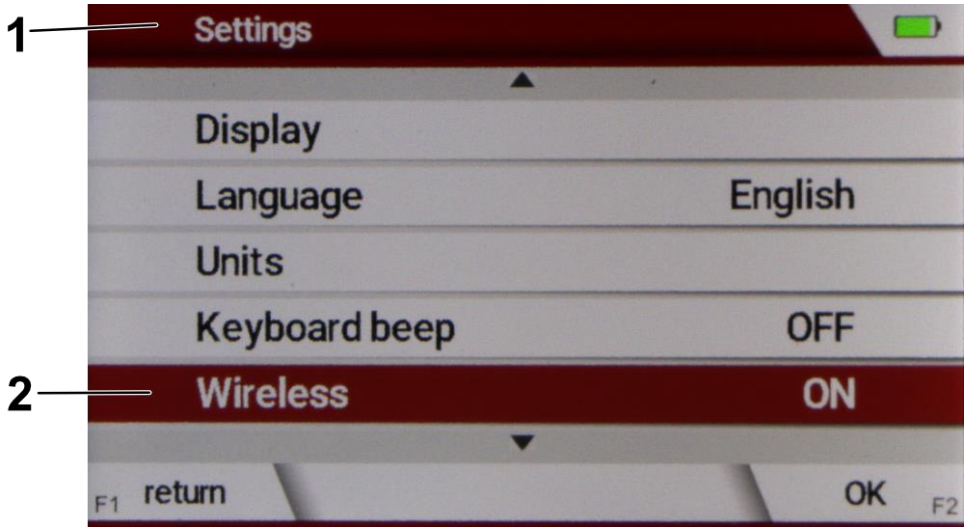
The digital manifold gauge shows the measuring results on the display. The display of measuring results can be managed individually.

Wireless sensors are supported from software version 1.00.00. If your digital manifold gauge still runs on an earlier version, please contact your MRU Service Centre.

To activate the wireless sensor settings:

▶ Select **Settings** from the Home menu.

▶ Use the arrow keys **left** ◀ and **right** to set the wireless sensors ▶ to **ON**.



Menu settings - Wireless sensors

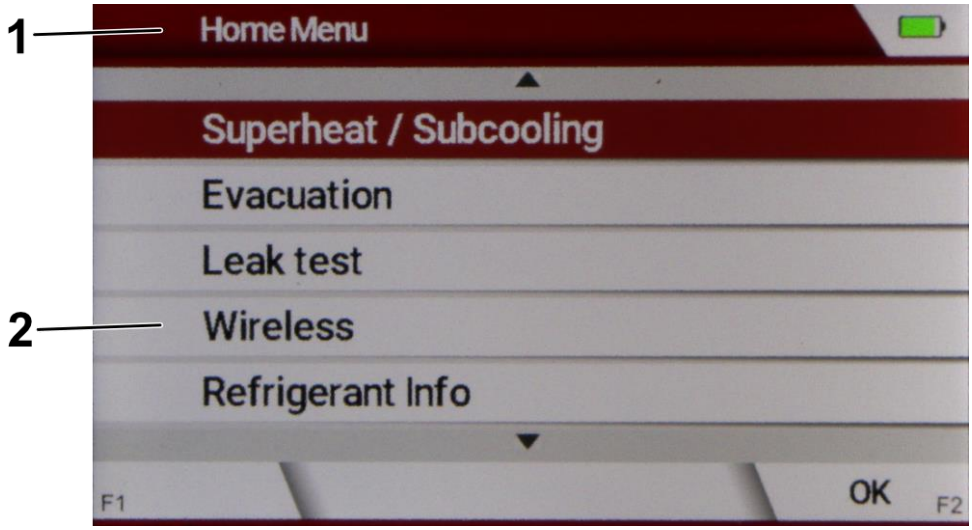
#	Description
1	**Settings** menu
2	Wireless sensors **ON** / **OFF**

✔ The setting **Wireless sensors** is activated. The Home menu shows the item **Wireless sensors**.

▶ Return to the **Home menu**.

Managing wireless sensors:

▶ Select **Wireless sensors** from the Home menu.

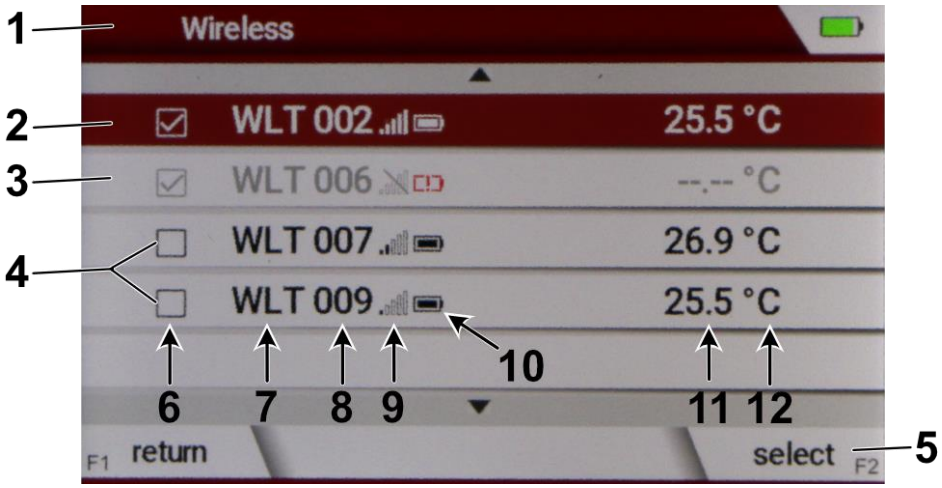


Home menu - wireless sensors

#	Description
1	Home menu
2	Submenu **Wireless sensors** The menu is only displayed if the **wireless sensors** are set to **ON** in the submenu Settings.

✔ The menu **Wireless sensors** is displayed.

Working with the wireless temperature measuring clamps:



Menu wireless sensors

#	Description
1	Menu **Wireless sensors**
2	First **sensor** in the list of wireless sensors
3	Second **sensor** in the list of wireless sensors
4	Third **sensor** in the list of wireless sensors
5	**Select** / **deselect** the sensor (hook / unhook)
6	Selected and deselected sensors
7	Name of sensor
8	Sensor numbering to avoid confusions
9	Received signal strength of sensor
10	Charge state of sensor
11	Measurement result of sensor
12	Unit of measurement result

The values of a selected sensor are displayed in the menu **Superheat/Subcooling**. Make the following settings to use a sensor:

▶ Switch on the sensor.

NOTE

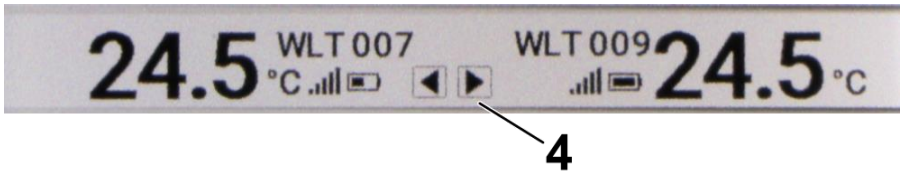
Always ensure that you check the charge state of your batteries before you start a measurement.

▶ Select the desired sensor with the arrow keys down and up. Press **Select**.

▶ Change to the menu **Cold/Heat** via the Home menu.

✔ The sensor shows the measurement results in the menu **Cold/Heat**.

Menu Cold/Heat display of wireless sensor and type K sensor



Menu Cold/Heat display of wireless sensor

#	Description
1	**Cold / Heat** menu
2	Measured value of wired temperature measuring clamps

	The measured value of the wired temperature measuring clamps is always shown on the side where the wired temperature measuring clamp is plugged into the **type K socket**.
3	Measured value of the wireless temperature measuring clamps The **display position** is variable.
4	Selection of **display position** Select the display position with the arrow keys left and right .

Fast measurement:

If the **temperature sensors** of the temperature measuring clamps make contact to metallically conductive material, the temperature can be determined particularly fast due to the electrical connections.

Note

If the surfaces are dirty or corroded, the measurement point may need to be cleaned to ensure optimum contact between the temperature sensors during measurement.

Making long-term measurements:

i Pay attention that the time of the setting **Automatic off after [h]** is greater than the expected time of your long-term measurement and the set time of the setting **LCD off after [h]** to avoid you interrupting your measurement inadvertently.

Please note that the wireless temperature measuring clamps switch off after 4h.

8 Maintenance of the MRU measuring device

8.1 Maintenance

Maintenance point	Activity	Interval
Valves	Check valves for leak tightness, have leaking valves replaced at your MRU Service Centre.	Before every assignment
Connecting hoses	Check condition	Before the assignment
Digital manifold gauge, accessory parts	Clean surfaces with a damp cloth and a mild detergent.	After the assignment
Valve block	Clean the valve block of the digital manifold gauge, see p.70 - Cleaning the valve block.	When changing between refrigerants after maintenance of a defective system
Calibration temperature and pressure sensors	Have the calibration carried out by the service of the MRU Service Centre or another certified service provider	The interval must correspond to the requirements on measuring accuracy. To be able to lastingly and reliably warrant your device's function, the device must be sent to your MRU Service Centre once a year.
Leak tightness of the overall device	System test	To be able to lastingly and reliably warrant your device's leak tightness, the device must be sent to your MRU Service Centre once a year.

8.2 Cleaning the valve block

PREREQUISITE:

☑ The digital manifold gauge is no longer connected to any gas cylinders or heat pumps or air conditioning systems.

☑ The valve block is no longer pressurised.

☑ All **shut-off valve**s are closed.

☑ The digital manifold gauge is switched off.

STEPS:

▶ Open a **shut-off valve**.

▶ Fill rubbing alcohol into the valve block.

▶ Close the **shut-off valve**.

▶ Shake the digital manifold gauge.

▶ Drain the rubbing alcohol.

Repeat the steps as required at least three times or until the contaminations have been removed.

i If an incorrect refrigerant has been used, for instance ammonia (NH3), have the digital manifold gauge checked by your MRU Service Centre.

✔ You have cleaned the digital manifold gauge.

9 Technical data

9.1 General technical data digital manifold gauge

Specification	Value
Operating temperature	-20°C ... +50°C
Storage temperature	-20°C ... +50°C / -4°F ... 122°F
Internal rechargeable battery, operating time	Li-Ion, >20h (brightness 100%) >40h (brightness 50%) >150h (display off)
Rel. atmospheric humidity during operation, non-condensing	<95%
Power supply	100 - 240 V / 5V DC / 1200 mA
Weight	1.75 kg
Dimensions	W: 190 mm H: 108 mm T: 89 mm
Connections	3x SAE 1/4" male (7/16"-20 UNF) 1x SAE 3/8" male (5/8"-18 UNF)
Nominal diameter of the refrigerant ducts	Block: 7 mm Port 3/8": 7 mm Port 1/4": 5 mm
Housing material	PA6GF30
Type of protection with protective cap	IP54
Bluetooth frequency range and output power	2.402 GHz - 2.480 GHz RF transmit power: <18.5 dBm

9.2 Measured values

Temperature measurement	T1, T2
Number of thermocouple type K inputs	2
Measuring range	-40 °C .. 999°C
Accuracy abs. / of measured values	±1°C / 0.50%
Pressure	**Details on measurement accuracy**
Number of pressure sensors	2
Measuring range	-1...50 bar
Overload	60 bar
Resolution	0.01 bar
Accuracy	± (0.5 of reading + 0.1 bar)
Vacuum	**Details on measurement accuracy**
Measuring range	0 ... 26 mbar (0 ... 19500 micron)
Accuracy @25°C	±(10% of reading + 0.010 mbar), 0.10 to 1.50 mbar

9.3 Refrigerant

Use	Refrigerant
Intended	R12, R22, R32, R134a, R290, R404a, R407c, R407f, R410a, R417a, R448a, R449a, R452a, R502, R507, R513a, R600a, R1234yf, R1234ze(E)
Non-intended	NH3

9.4 Temperature clamp WDT

Specification	Value
Operating temperature	-20°C ... +45°C
Storage temperature	-20°C ... +50°C / -4°F ... 122°F
Weight	0.1 kg
Dimensions	Width: 22 mm, Height: 120 mm Depth: 70 mm
Material	PA6GF30
Sensor type	Type K thermocouple
Measuring range	-40°C ... 150°C
Accuracy abs. / of measured values	±1°C / 0.5%
Response time T90	< 2 sec. (on electroconductive surfaces)

10 Indications or malfunctions

Indication / malfunction	Cause	Remedy
The symbol for the battery state of charge takes on a red colour and an exclamation mark appears next to the symbol.	The battery is almost empty.	Recharge the battery.
Device switches off automatically.	The battery is empty.	Recharge the battery. If the battery discharges too fast, have the battery replaced at your local MRU Service Centre.
The device cannot be switched on.	The battery is empty.	Recharge the battery.
Instead of a measuring result, only dashes are displayed during a measurement.	The sensor is not connected with the correct type K socket.	Check whether the sensor is connected correctly.
Instead of a measuring result, only dashes are displayed during a measurement.	The sensor is not selected, see p.64 - Operating the wireless temperature measuring clamps with the digital manifold gauge.	Select the sensor or check whether the sensor is switched on and blinks in blue.

11 Decommissioning

Irrespective of the device version, the following steps must be taken before decommissioning:

- ▶ Evacuate all remaining analysis gases from the device.
- ▶ Rinse the device with nitrogen or ambient air.
- ▶ Dispose of the device in a professional manner. Observe the legal conditions at the place of disposal of your device.

  i Information on the disposal of your device can be obtained from your MRU Service Centre. Parts containing hazardous substances, such as electrochemical sensors, batteries or rechargeable batteries can be sent back to MRU. The return shipment must be free of charge for MRU.

12 Declaration of Conformity

EU-Konformitätserklärung
Declaration of conformity

CE

MRU Messgeräte für Rauchgase und Umweltschutz GmbH

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

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

Name / *name:*	Dr. Dietmar Doll
Funktion / *function:*	Geschäftsführer / *Managing Director*
Firmenname / *company:*	Messgeräte für Rauchgase und Umweltschutz GmbH
Straße /Ort // *street / city:*	Fuchshalde 4 / 8/ 12, 74172 Neckarsulm
Land / *country:*	Deutschland / *Germany*

Produkt/Product

Bezeichnung /*designation:*	Digitale Monteurhilfe / *Digital mechanic aid*
Produktname / *name:*	MONTEC
Funktion / *function:*	Kältetechnik / *Refrigeration technology*

Hiermit erklärt die MRU GmbH, dass der Funkanlagentyp „ESP32-H2-MINI-1"der Richtlinie 2014/53/EU entspricht. Das oben beschriebene Produkt entspricht allen einschlägigen Bestimmungen, es erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:
MRU GmbH hereby declares that the radio equipment type „ESP32-H2-MINI-1" is in compliance with directive 2014/53/EU. The product described above complies with all relevant regulations, it meets the requirements of the directives and standards mentioned below:

- ETSI EN 300 328 V2.2.2
- ETSI EN 301 489-1 V2.2.3
- Draft ETSi EN 301 489-17 V3.2.6
- EN 50665:2017
- EN IEC 62311:2020
- EN IEC 62369-1:2020 + A11:2020
- 2014/30/EU (EMV)
- 2014/35/EU (low voltage)
- 2011/65/EU (RoHS)
- DIN EN 61010-031:2016-07
- DIN EN 61000-6-1: 2007
- DIN EN 61000-6-3: 2007+ A1: 2011 + AC:2012

Neckarsulm, 19.06.2024

Dr. Dietmar Doll (Geschäftsführer / *Managing Director)*

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14 Customer service, service centres

MRU customer service can be contacted by telephone, fax and email:

Tel.: +49 (0) 7132 - 99 62 61
Fax: +49 (0) 7132 - 99 62 60
service@mru.de

To find your nearest **MRU service centre** for your **MRU products**, please visit our website:

https://www.mru.eu/service/regionale-servicestellen/