912/913/914 Meter

912 Conductometer
913 pH Meter
913 pH/DO Meter
914 pH/Conductometer
914 pH/DO/Conductometer

Manual

8.912.8001EN / 2021-12-10

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This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g. conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

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1 Introduction

This manual gives you a comprehensive overview of the installation, functioning and operation of the 912/913/914 Meter instruments.

NOTICE

You can request application descriptions in the form of **Application Notes** and **Application Bulletins** from your Metrohm representative or download them from *http://www.metrohm.com*.

1.1 Instrument description

912/913/914 Meter instruments are designed for use both outdoors and indoors as well as for stationary use in the laboratory.

The measuring instruments are equipped with a permanently installed rechargeable battery for mobile use.

The instruments come in 5 basic versions, which differ in their design with regard to different measuring channels and respective functions.

912 Conductometer — With a measuring channel for measuring conductivity, TDS and salinity.

913 pH Meter — With an analog and a digital measuring channel each for measuring pH, potential and temperature.

913 pH/DO Meter — With an analog and a digital measuring channel each for measuring pH, potential, temperature and oxygen.

914 pH/Conductometer — With an analog measuring channel for measuring pH, potential and temperature and a measuring channel for measuring conductivity, TDS, salinity and temperature.

914 pH/DO/Conductometer — With a digital measuring channel for measuring pH, potential, temperature and oxygen and a measuring channel for measuring conductivity, TDS, salinity and temperature.

For stationary use in the laboratory, the instrument can be connected to the energy supply with a dedicated power supply unit.

1.1.1 Instrument versions and sales versions

912/913/914 Meter instruments are available in the following versions:

Table 1 Instrument versions

2.912.0010	912 Conductometer	Instrument with standard accessories
2.912.0110	912 Conductometer	Mobile version with accessories case
2.912.0210	912 Conductometer	Laboratory version with stand plate
2.913.0010	913 pH Meter (digital/analog)	Instrument with standard accessories
2.913.0110	913 pH Meter (digital/analog)	Mobile version with accessories case
2.913.0210	913 pH Meter (digital/analog)	Laboratory version with stand plate
2.913.0020	913 pH/DO Meter (digital/analog)	Instrument with standard accessories
2.913.0120	913 pH/DO Meter (digital/analog)	Mobile version with accessories case
2.913.0220	913 pH/DO Meter (digital/analog)	Laboratory version with stand plate
2.914.0020	914 pH/Conductometer (pH analog)	Instrument with standard accessories
2.914.0120	914 pH/Conductometer (pH analog)	Mobile version with accessories case
2.914.0220	914 pH/Conductometer (pH analog)	Laboratory version with stand plate
2.914.0030	914 pH/DO/Conductometer (pH digital)	Instrument with standard accessories
2.914.0130	914 pH/DO/Conductometer (pH digital)	Mobile version with accessories case
2.914.0230	914 pH/DO/Conductometer (pH digital)	Laboratory version with stand plate

NOTICE

The accessories for a given instrument version can be viewed as a PDF list on the Internet at *http://partslists.metrohm.com*.

1.1.2 Energy supply

The instrument is powered either by a built-in battery or, in stationary use, via a power supply unit.

1.1.3 Interfaces

You can connect a printer or establish a connection with a PC for data transfer (PC/LIMS report and CSV format) using the USB interface.

1.1.4 Sensors

Metrohm offers various sensors for specific measurements.

NOTICE

For more information on the basic theoretical principles, please refer to the Metrohm monograph **Electrodes in Potentiometry**.

1.2 Intended use

This instrument is suitable for measuring in chemicals and flammable samples. Therefore, the use of the 912/913/914 Meter requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge regarding the application of fire prevention measures prescribed for laboratories is also mandatory.

1.3 About the documentation

CAUTION

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.3.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Carry out these steps in the sequence shown.
Method	**Dialog text**, **parameter** in the software
File ▶ New	Menu or menu item
[Next]	**Button** or **key**

	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.
	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**WARNING** This symbol draws attention to a possible biological hazard.
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
	**NOTE** This symbol highlights additional information and tips.

1.4 Safety instructions

1.4.1 General notes on safety

WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.4.2 Electrical safety

Electrical safety when working with the instrument is ensured in compliance with international standard IEC 61010.

WARNING

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.

WARNING

Never open the housing of the instrument. The instrument could be damaged.

There are no parts inside the housing which can be serviced or replaced by the user.

Rechargeable battery / power supply unit

WARNING

Only use the power supply unit for its intended purpose. Inappropriate use or use of non-approved or incompatible power supply units may cause fires and result in the revocation of the guarantee or warranty.

If you think that the rechargeable battery or the power supply unit has been damaged, have it checked by a service center. Do not use damaged batteries or power supply units.

Do not use the power supply unit outdoors.

1.4.3 Flammable solvents and chemicals

WARNING

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.4.4 Recycling and disposal

This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2 Overview of the instrument

2.1 Instrument connectors

2.1.1 912 Conductometer

Figure 1 912 Conductometer - connectors

1 **Conductivity measuring cell** Connection socket for conductivity measuring cells.	**2** **Type B mini USB connector** Connection socket for energy supply, data transmission and printing.

2.1.2 913 pH Meter | 913 pH/DO Meter

Figure 2 913 pH Meter - Connectors

1 **pH/mV electrode** Connection socket for analog pH/mV electrodes.	**2** **Temperature sensor / reference**
3 **pH/mV electrode | O_2 Lumitrode** Connection socket for connecting **iTrodes** with **854 iConnect** or the **O_2 Lumitrode**.	**4** **Type B mini USB connector** Connection socket for energy supply, data transmission and printing.

2.1.3 914 pH/DO/Conductometer

Figure 3 pH/DO/Conductometer (digital) - Connectors

1 **Conductivity measuring cell** Connection socket for conductivity measuring cells.	**2** **pH/mV electrode | O_2 Lumitrode** Connection socket for connecting **iTrodes** with **854 iConnect** or the **O_2 Lumitrode**.
3 **Type B mini USB connector** Connection socket for energy supply, data transmission and printing.	

1

2.1.4 914 pH/Conductometer

Figure 4 914 pH/Conductometer (analog) - connectors

1 **pH/mV electrode** Connection socket for analog pH/mV electrodes.	**2** **Temperature sensor / reference**
3 **Conductivity measuring cell** Connection socket for conductivity measuring cells.	**4** **Type B mini USB connector** Connection socket for energy supply, data transmission and printing.

2.2 Application environment

912/913/914 Meter instruments have been designed for use in laboratories and for mobile use indoors or outdoors.

The sturdy design meets the requirements in accordance with IP 67 degree of protection. The instruments are therefore protected against short-time immersion in water, provided that the respective plugs are plugged in at the sensor connectors.

2.2.1 Laboratory use

In the laboratory, **912/913/914 Meter** instruments can be placed in a stand plate.

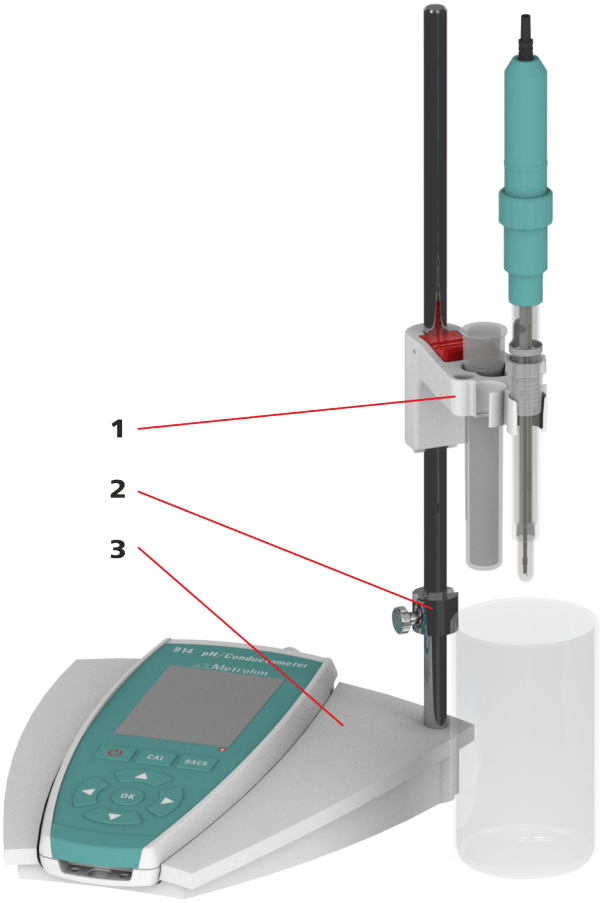


Figure 5 912/913/914 Meter in a laboratory setup

1 Electrode holder	**2 Clamping ring**
3 Stand plate Consisting of receptacle base and support rod.	

2.2.2 Mobile application

For mobile application, **912/913/914 Meter** instruments can be equipped with a carrying strap and one or two slide-in holders for electrodes.

Figure 6 912/913/914 Meter for mobile application

1 **Electrode holder** The holders can be inserted from both sides (left/right) of the instrument.	**2** **Eyelet for carrying strap**

3 Installation

3.1 Unpacking and inspecting the instrument

3.1.1 Packaging

The instrument is supplied in protective packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.1.3 Application area

912/913/914 Meter instruments have been designed for mobile application outdoors and/or in the laboratory.

CAUTION

Influence of weather conditions

Damage to instruments as a result of direct sunlight or temperatures below the freezing point.

When you are not using the instrument, do not expose it to direct sunlight or to temperatures below 0 °C.

3.2 Energy supply

The **912/913/914 Meter** is equipped with a built-in rechargeable battery which means it can be used for mobile applications. For stationary use in the laboratory, the instrument can be operated with a power supply unit.

NOTICE

First charging of the instrument

The instrument must be fully charged prior to the initial start-up.

CAUTION

Unauthorized manipulations

The instrument may be damaged as a result of unauthorized manipulations.

- For charging, only use the supplied power supply unit (6.2166.100) or the optional 12 V USB adapter (6.2166.500), which have been approved as accessories for use with this instrument.
- Your instrument's battery cannot be removed.
- Do not attempt to remove the battery from the instrument. To replace the battery, take the instrument to your nearest authorized Metrohm Service.
- Unauthorized replacement of the battery may result in a loss of the warranty.

NOTICE

Function of the control keys

For the installation steps below you need to use the control keys.

These are described in the following **Operation** chapter *(see chapter 4.4, page 26)*.

NOTICE

Instrument in battery operation

If the instrument is used in battery operation, recharge the instrument as soon as possible.

3.2.1 Charging the battery

NOTICE

Charging capacity

Charging requires a minimum capacity of 500 mAh and can be executed with:

- Power supply unit (6.2166.100), supplied
- USB connector on the computer (PC) or USB hub with external energy supply
- 12 V USB adapter (6.2166.500) from Metrohm accessories

1 Connect the USB cable to the supplied power supply unit or to the 12 V USB adapter.

2 Connect the power supply unit to the power outlet or the 12 V USB adapter to the 12 volt socket.

or

Connect the USB cable directly to the computer (PC).

3 Connect the USB cable (mini USB connector) to the instrument.

- The instrument starts and goes into standby mode.
- The instrument battery is charged.

4 As soon as the battery is fully charged, disconnect the power supply unit first from the instrument and then from the power outlet or from the USB connector of the computer (PC).

NOTICE

Battery condition

The battery performance may deteriorate over time.

If the operating times are much shorter than usual, take the instrument to the closest Metrohm Service to have the battery replaced.

3.2.2 Operation with power supply unit

You can operate the **912/913/914 Meter** with the supplied power supply unit without restrictions.

CAUTION

Measuring with power supply unit connected

Inappropriate power supply units interfere with the measuring signal.

Use only the supplied power supply unit (6.2166.100) for measuring.

NOTICE

Charging the battery with energy supply

The battery will not be overcharged if the instrument is used for extended periods with the power supply unit connected. The instrument is equipped with a charging controller to protect the battery.

3.2.3 Operation via USB connector (PC)

NOTICE

Measuring signal interference

Inappropriate power supply units of a PC interfere with the measuring signal.

- Use PCs or laptops with a grounded power supply unit.
- When using an ungrounded PC power supply unit, cut the USB connection between 912/913/914 Meter and PC before the measurement.

Operating the instrument with power supplied via a USB connector requires a minimum capacity of 500 mAh *(see chapter 3.2.1, page 14)*.

3.3 Connecting sensors

NOTICE

Connecting the sensor

Sensors can be connected while the instrument is running.

NOTICE

Parameter setting

Please note that if you change the sensor, the sensor either has to be selected in the **Menu ► Parameters X ► Measuring parameters ► Sensor name** menu dialog, or a new sensor has to be entered in the sensor list.

NOTICE

iConnect for iTrodes

Sensors from the **iTrodes** line are only supported by the **854 iConnect series 07** or higher.

The **series** is indicated by the number **17** in the following serial number example:

18540010**17**216

3.4 Disconnecting sensors

CAUTION

Cable damage

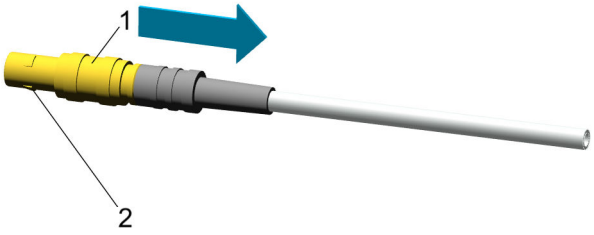
The connection cable can get damaged if it is handled incorrectly.

- Only remove the connection cable by pulling on the plug.
- Do not remove the connection cable by pulling on the cable.

NOTICE

Sensor cable with HF plug

Cables with an HF plug feature a connector lock and can only be unplugged via the grooved plug sleeve (see figure below).



1 Plug sleeve	**2 Connector lock**

3.5 Connecting a printer

Printers for report output are connected with the USB Y cable (6.2151.140).

NOTICE

Printer function

The connected printer will only work if the **912/913/914 Meter** is connected to the power grid with the power supply unit.

NOTICE

Measuring signal interference

Inappropriate power supply units of a printer interfere with the measuring signal.

- With the Metrohm USB printer "Custom" there is no interference.
- Only use printers with a grounded power supply unit.

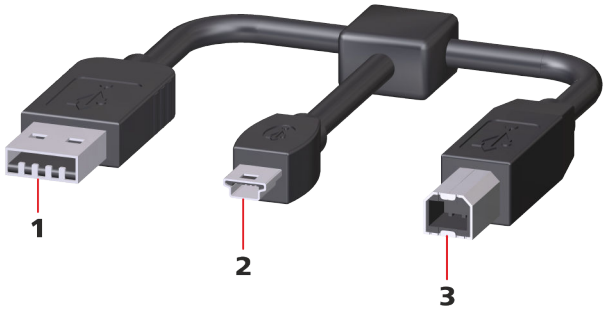


Figure 7 USB Y cable

1	**USB type A** Power supply unit connector for energy supply.
2	**USB type B mini** Instrument connector **912/913/914 Meter**.
3	**USB type B** Printer connector.

3.6 Initial configuration

The steps for switching the instrument on and off are described in the Operation chapter *(see chapter 4.1, page 21)*.

3.6.1 Setting the Language

NOTICE

"Language" factory setting

English is set in the language settings on instruments delivered ex works.

The following languages are available on the instrument:

- German
- English
- Spanish
- French
- Portuguese
- Chinese

Setting the Language

You can access the menu structures via the **Menu** item *(see figure 13, page 28)* in the main screen.

1. Select the entry point with the  or  arrow keys.
2. Use the  key to change to the menu structures.
3. Select the **Configuration** menu structure with the  arrow key and change to the menu structure with the  key.
4. Select the **Language** menu dialog with the  arrow key and change to the selection dialog with the  key.
5. Select the required language with the  or  arrow keys and confirm with the  key.

3.6.2 Setting the date and time

NOTICE

"Date and time" factory setting

The date and time values of the manufacturer are set on the instruments ex works.

In case of deep discharge of the battery, the system time is reset to the default value.

Setting the date and time

You can access the menu structures via the **Menu** item *(see figure 13, page 28)* in the main screen.

1. Select the entry point with the  or  arrow keys.

2 Use the OK key to change to the menu structures.

3 Select the **Configuration** menu structure with the  arrow key and change to the menu structure with the OK key.

4 Select the **Date** or the **Time** menu dialog with the  arrow key and change to the editing dialog with the OK key.

- Date format: YYYY-MM-DD
- Time format: hh:mm:ss

5 Select the required character with the  ,  ,  , and  arrow keys and confirm each with the OK key.

6 Confirm the final value with the  editing element and the OK key.

4 Operation

4.1 Switching the instrument on and off

Switching on the instrument

Proceed as follows:

1 Press the  key.

The instrument is initialized and a system test is performed. This process takes some time.

A **starting image** is displayed during start-up.

Then the main dialog is displayed. Now the instrument is ready.

Switching off the instrument

1 Press the  key.

The **912-129 Shut down** message appears, the instrument saves the data and switches off.

If the instrument is connected to the energy supply, it switches to standby mode.

4.2 Displays

The **912/913/914 Meter** has a total of four display types containing specific displays and/or operating functions.

- Main dialog
- Menu dialog
- Editing dialog
- Selection dialog
- Standby display

NOTICE

Active dialog field

The actively selected dialog field is always displayed with the **Metrohm green** contrast color.

In this case, the entry point for the **Menu** menu structures is selected.

Main dialog

The main dialog (example: both measuring channels displayed) is the normal status after the instrument has been switched on.

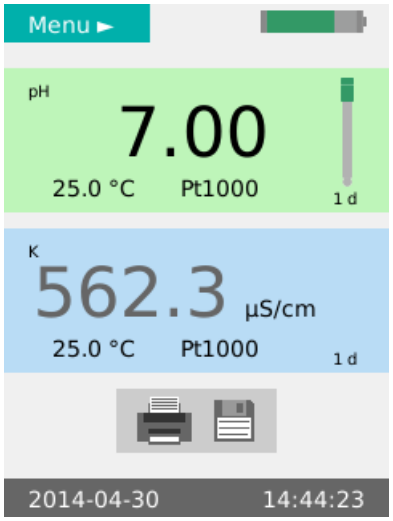


Figure 8 View - Main dialog

Menu dialog

The menu dialog is used for navigating through the functional structures.

Menu lines with an arrow contain another, deeper structure with further dialogs.

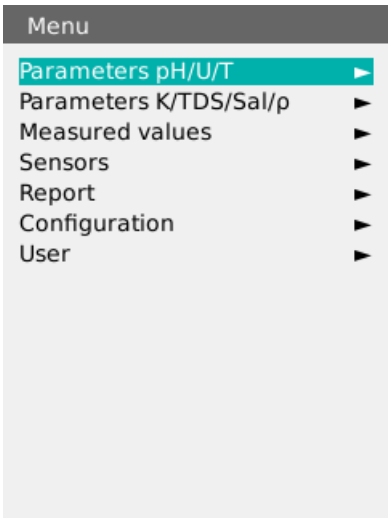


Figure 9 View - Menu dialog

Editing dialog

Editing dialogs are used in general for data entry and editing.

Depending on the data type, a different set of possible characters is available.

NOTICE

Capital letters and special characters

You can insert capital letters and special characters by holding the OK key.

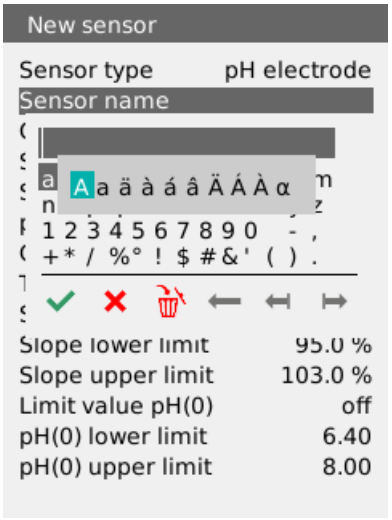


Figure 10 View - Editing dialog

Selection dialog

Selection dialogs offer default values for selection in corresponding data fields.

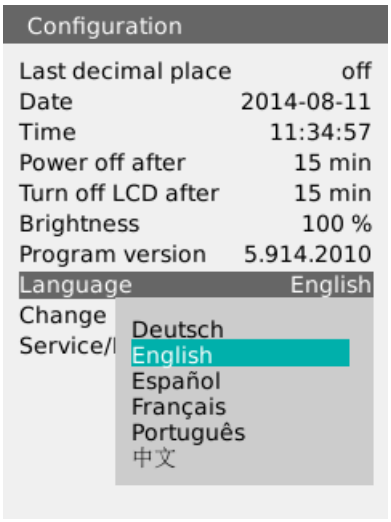


Figure 11 View - Selection dialog

Standby display

The standby display appears during charging if the instrument is turned off.

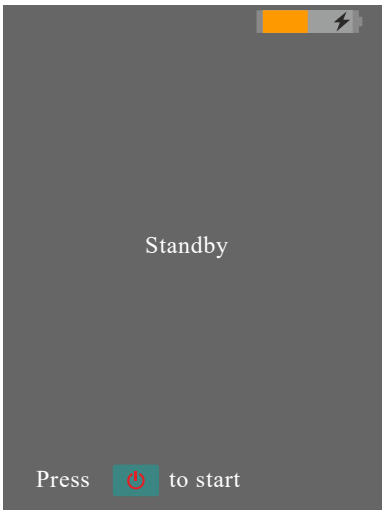


Figure 12 View - Standby display

4.3 Status displays

The main dialog displays contain corresponding graphical elements to show instrument and sensor statuses.

4.3.1 Rechargeable battery status

The battery status is displayed in 6 stages with colored graphical elements.

The battery is fully charged and charging is complete.

The battery is nearly full but still charging.

The battery is charged to 75%.

The battery is charged to 50%.

The battery is charged to 25%.

The battery is empty.

NOTICE

Flash icon

The flash icon indicates that the instrument is connected to a power source for charging.

4.3.2 User rights

The user rights can be set in the **Menu** under **User** as **Dialog type**:

1. **Expert**
   Use of the instrument is unrestricted. All functions are available.
2. **Routine**
   The **Configuration** and **Sensors** menu structures are locked.

If the key icon  (on top in the main dialog) is displayed, then the user menu is limited to the functions for **Routine** users.

4.3.3 Sensor quality for pH electrodes

The sensor quality is indicated with 3 colored graphical elements.

The criteria for the display status are set in the calibration parameters *(see chapter 4.7.5, page 48)*.

The electrode is in a good range with regard to the limit values set.

The electrode is close to the limit value range.

The limit value range is defined as follows.

- **Slope limit value** with an approximation of 1% to the set limit value.
- **Limit value pH(0)** with an approximation of 0.1 pH to the set limit value.

The electrode is outside the limit values.

4.3.4 Sensor status for DO sensors

The sensor quality is indicated with 3 colored graphical elements.

The criteria for the display status are specified in the system as function of the signal intensity *(see chapter 4.7.5, page 48)*.

The signal intensity is in the correct range.

The signal intensity is in the range of the lower limit value. Order a replacement cap for the O_2 Lumitrode.

The signal intensity is below the lower limit value. Correct measuring cannot be ensured anymore.

4.4 Control keys

Keypad

Switching the instrument on or off.

- To switch on, **briefly** push the key. The instrument turns on.

- To switch off, **briefly** push the key. A message appears and the instrument turns off.

CAL

The **CAL** key starts the procedure to calibrate a sensor.

NOTICE

Calibration

A sensor can be calibrated only in the corresponding one-channel main dialog.

BACK

The **BACK** key causes the entry to be accepted and/or exits the dialog.

OK

The **OK** key confirms a selection or starts a process.

The **LEFT/RIGHT arrow** keys are used for navigating in the text and number editor for selecting characters, or for toggling between the measuring channel displays in the main dialog.

The **UP/DOWN arrow** keys are used for navigating the selection bar one line up or down, or for selecting characters in the text editor.

4.5 Basic operation

The following chapters describe the various displays and how to operate them.

4.5.1 Main dialog with two measuring channels

The view with two measuring channels is displayed after the instrument start-up.

NOTICE

This does not apply for the **912 Conductometer**, as this instrument has only one measuring channel.

NOTICE

Temperature display

The temperature displays on the two measuring channels can only be compared in the same medium.

As a result of temperature sensor and instrument tolerances, the displayed values might deviate from each other.

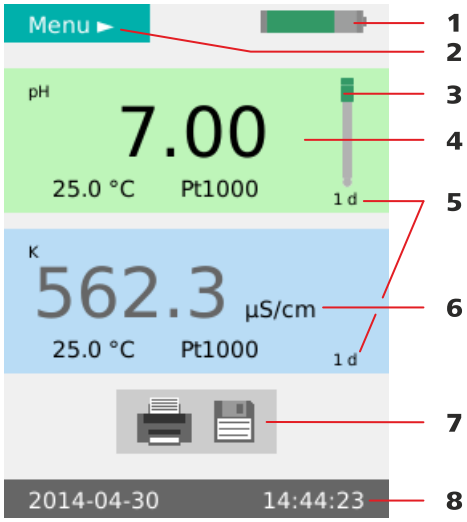


Figure 13 Operation - Main dialog, two-channel pH and conductivity

1 **Battery state of charge** *(see chapter 4.3.1, page 25).*	**2** **Menu access** *(see "Accessing the menu structures", page 31).*
3 **Sensor condition** *(see chapter 4.3.3, page 25).*	**4** **Display measuring channel 1**
5 **Calibration interval display** Time in days until the next calibration is due.	**6** **Display measuring channel 2**
7 **Print/save measured value** Button for the functions **print**, **save** or **print+save**. Both measured values are printed and/or saved.	**8** **Date/time display**

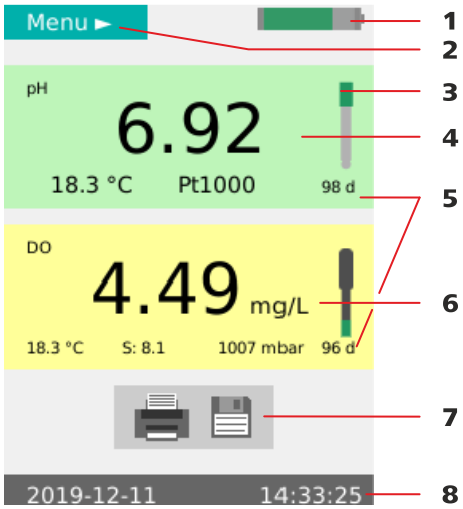


Figure 14 Operation - Main dialog, two-channel pH and conductivity

1 **Battery state of charge** *(see chapter 4.3.1, page 25).*	**2** **Menu access** *(see "Accessing the menu structures", page 31).*
3 **Sensor condition** *(see chapter 4.3.3, page 25).* *(see chapter 4.3.4, page 26).*	**4** **Display measuring channel 1**
5 **Calibration interval display** Time in days until the next calibration is due.	**6** **Display measuring channel 2**
7 **Print/save measured value** Button for the functions **print**, **save** or **print+save**. Both measured values are printed and/or saved.	**8** **Date/time display**

NOTICE

The procedure for functions of the main dialog with two measuring channels is the same as for the main dialog with one measuring channel:

- *(see "Accessing the menu structures", page 31).*
- *(see "Toggling from one-channel to two-channel view", page 31).*

4.5.2 Main dialog with one measuring channel

The corresponding measuring channel is displayed according to the selection.

In addition, the display and input fields ID1, ID2 and User are displayed in the main dialog with one measuring channel.

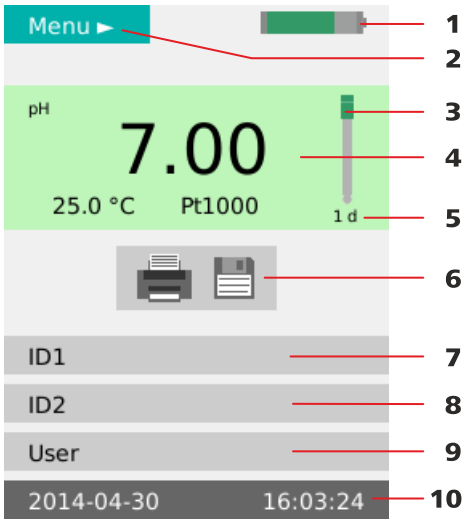


Figure 15 Operation - Main dialog, one-channel pH

1 **Battery state of charge** *(see chapter 4.3.1, page 25).*	**2** **Menu access** *(see "Accessing the menu structures", page 31).*
3 **Sensor condition** *(see chapter 4.3.3, page 25).* *(see chapter 4.3.4, page 26).*	**4** **Measuring channel display**
5 **Calibration interval display** Time in days until the next calibration is due.	**6** **Print/save measured value** Button for the functions **print**, **save** or **print+save**. The measured value with the currently selected measuring channel is printed and/or saved.
7 **ID1** Input option for sample designation/identification (e.g. name, number, etc.).	**8** **ID2** Input option for sample designation/identification (e.g. batch number, lot number, etc.).
9 **Users** Input option for the user name or display of the preset value from the **User** menu dialog *(see chapter 4.7.8, page 57).*	**10** **Date/time display**

4.5.3 Operation in the main dialog

Accessing the menu structures

You can access the menu structures via the **Menu** item *(15-**2**)* in the main dialog.

1 Select the entry point with the  or  arrow keys.

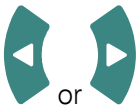
2 Use the  key to change to the menu structures.

Toggling from one-channel to two-channel view

The view can be changed in instruments with two measuring channels. Three views can be displayed as follows:

- Display with both measuring channels.
- Display with **measuring channel 1** and the data **ID1**, **ID2** and **User**.
- Display with **measuring channel 2** and the data **ID1**, **ID2** and **User**.

1

You can toggle between the views as needed with the  or arrow keys.

Printing and/or saving measured values

Measured value recording is started with the **Print/save measured value** button.

-  - Printing the measured values.
-  - Printing and saving the measured values.
-  - Saving the measured values.

The respective triggering is determined by the settings in the menu:

- **Menu ► Measured values ► Values**
  and
- **Menu ► Measured values ► Data**
  (see chapter 4.7.4, page 46).

4.5.4 Menu dialog

The further menu structures, editing dialogs and selection dialogs can be selected in the menu dialog.

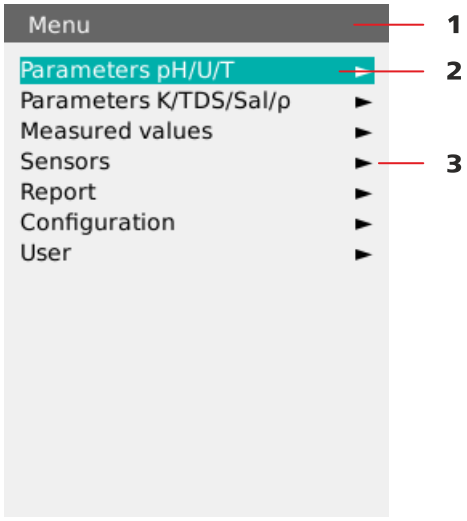


Figure 16 Operation - menu dialog

1 Menu title
The menu title indicates which menu structure is currently open.

2 Menu line selected
The selected menu line is always displayed in the color **Metrohm green** and in inversed text.

3 Arrow icon
The arrow icon indicates that there are further substructures.

Navigation in the menu structures

You can access the menu structures via the **Menu** item *(15-**2**)* in the main dialog.

1 Select the desired menu line with the ▲ or ▼ arrow keys.

2 Change into the next substructure with the OK key.

3 Change back to the higher structure with the BACK key.

4.5.5 Editing dialog

The entries can be created and edited again in the editing dialog.

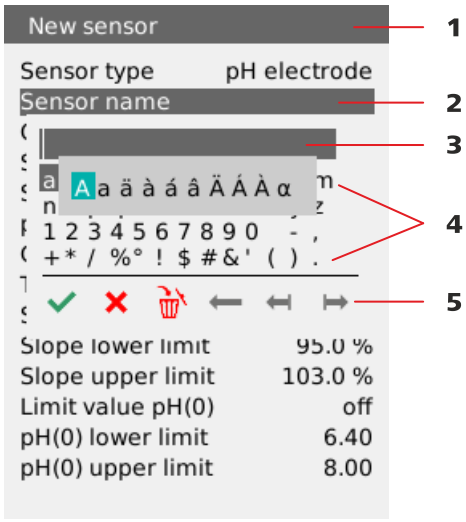


Figure 17 Operation - editing dialog

1	**Menu title**	**2**	**Menu line**
3	**Data field**	**4**	**Selectable characters**
5	**Function elements**		

The data entry is accepted with the **Entry** editing element.

The editing dialog is closed without changing the existing data value with the **Cancel** editing element.

The entire contents of the data field are deleted and a new data value can be entered with the **Delete all** editing element.

The character to the left of the cursor is deleted in the data field with the **Backspace** editing element.

The cursor moves one space to the left in the data field with the **One space to the left** editing element.

The cursor moves one space to the right in the data field with the **One space to the right** editing element.

NOTICE

Capital letters / special characters

Capital letters and special characters can be entered by holding the OK key on the respective standard character.

4.5.6 Selection dialog

In selection dialogs, you can select and apply fixed data values.

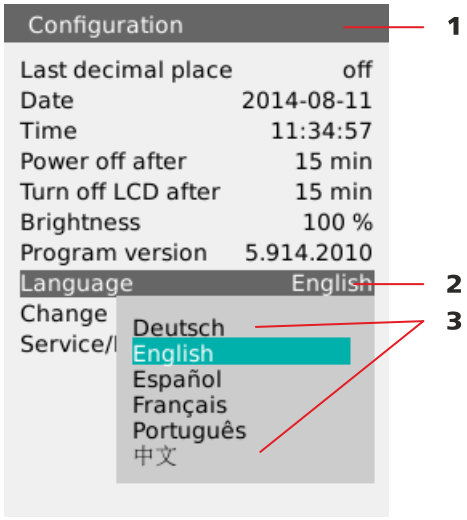


Figure 18 Operation - selection dialog

1 Menu title	**2 Menu line**
3 Selectable data values	

Changing data values

The data values of the corresponding menu function can be selected, if required.

1 On the corresponding menu function, open the selection window with the OK key.

2 Select the required data value with the ▼ or ▲ arrow keys.

3 Apply the data value and exit the selection window with the OK key.

4.5.7 Changing the user

The user can be set to two different dialog types in the instrument *(see chapter 4.7.8, page 57)*.

Routine

Changing the instrument to the User **Routine**:

1 Switch to the selection dialog **Menu ► User ► Dialog type**

2 Select the Dialog type **Routine**.

The instrument's functions are limited for the user and the key icon is displayed in the main menu.

Expert

Changing the instrument to the User **Expert**:

1 Switch to the selection dialog **Menu ► User ► Dialog type**

2 Select the Dialog type **Expert**.

3 Switch to the selection dialog **Menu ► User ► Password**

4 Enter the **Password** set on the instrument and confirm with the icon.

The instrument's functions are fully accessible and the key icon is no longer displayed in the main menu.

4.6 Menu structures

912/913/914 Meter instruments contain different menu structures depending on the instrument version. These structures are represented in an overview in the following tables:

- **912 Conductometer**
  (see chapter 4.6.1, page 37)
- **913 pH Meter**
  (see chapter 4.6.2, page 38)
- **913 pH/DO Meter**
  (see chapter 4.6.3, page 39)
- **914 pH/Conductometer**
  (see chapter 4.6.4, page 40)
- **914 pH/DO/Conductometer**
  (see chapter 4.6.5, page 41)

NOTICE

Menu dialogs

The menu dialogs and the corresponding menu lines are described in more detail in the next chapter *(see chapter 4.7, page 42)*.

4.6.1 912 Conductometer

Table 2 912 Conductometer – menu structures

Menu		
	Parameters K/TDS/Sal/ρ/T *(see chapter 4.7.2, page 43)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see chapter 4.7.4, page 46)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see chapter 4.7.5, page 48)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see chapter 4.7.6, page 55)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see chapter 4.7.7, page 56)*	▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see chapter 4.7.8, page 57)*	▪ User ▪ Dialog type

4.6.2 913 pH Meter

Table 3 913 pH Meter – Menu structures

Menu	**Parameters pH/U/T** **Parameters pH/U/T IS** *(see chapter 4.7.1, page 42)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see chapter 4.7.4, page 46)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see chapter 4.7.5, page 48)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see chapter 4.7.6, page 55)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see chapter 4.7.7, page 56)*	▪ Last decimal place ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see chapter 4.7.8, page 57)*	▪ User ▪ Dialog type

4.6.3 913 pH/DO Meter

Table 4 913 pH/DO Meter – Menu structures

Menu	**Parameters pH/U/T** **Parameters pH/U/T IS** *(see chapter 4.7.1, page 42)*	▪ Measuring parameters ▪ Calibration param.
	Parameters DO *(see chapter 4.7.3, page 44)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see chapter 4.7.4, page 46)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see chapter 4.7.5, page 48)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see chapter 4.7.6, page 55)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see chapter 4.7.7, page 56)*	▪ Last decimal place ▪ Signal intensity DO ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see chapter 4.7.8, page 57)*	▪ User ▪ Dialog type

4.6.4 914 pH/Conductometer

Table 5 914 pH/Conductometer – Menu structures

Menu	**Parameters pH/U/T** *(see chapter 4.7.1, page 42)*	▪ Measuring parameters ▪ Calibration param.
	Parameters K/TDS/Sal/ρ/T *(see chapter 4.7.2, page 43)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see chapter 4.7.4, page 46)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see chapter 4.7.5, page 48)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see chapter 4.7.6, page 55)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see chapter 4.7.7, page 56)*	▪ Last decimal place ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see chapter 4.7.8, page 57)*	▪ User ▪ Dialog type

4.6.5 914 pH/DO/Conductometer

Table 6 914 pH/DO/Conductometer – Menu structures

Menu	**Parameters pH/U/T IS** *(see chapter 4.7.1, page 42)*	▪ Measuring parameters ▪ Calibration param.
	Parameters K/TDS/Sal/ρ/T *(see chapter 4.7.2, page 43)*	▪ Measuring parameters ▪ Calibration param.
	Parameters DO *(see chapter 4.7.3, page 44)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see chapter 4.7.4, page 46)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see chapter 4.7.5, page 48)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see chapter 4.7.6, page 55)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see chapter 4.7.7, page 56)*	▪ Last decimal place ▪ Signal intensity DO ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language ▪ Change password ▪ Service/Diagnosis
	User *(see chapter 4.7.8, page 57)*	▪ User ▪ Dialog type

4.7 Menu dialogs

4.7.1 Parameters pH/U/T and Parameters pH/U/T IS

The **Parameters pH/U/T** menu dialog for the parameters **Measurement** and **Calibration** is shown below with the structure and the description.

4.7.1.1 Measuring parameters

Measuring parameters ►	*Menu dialog* for the **Measuring parameters**.
Measuring mode	*Selection dialog* for selecting the measuring mode. ▪ **pH** The pH value is output. ▪ **U** The potential value is output in **mV**. ▪ **T** The temperature is output in **°C**.
Sensor name	*Selection dialog* for selecting a sensor from the sensor list. In instruments with **iTrodes**, this is only a *display field*.
Order number	*Display field* with the sensor's **Order number**.
Serial number	*Display field* with the sensor's **Serial number**.
Temperature	*Editing dialog* for the manual entry of the measuring temperature. ▪ Default value: **25.0 °C** / input range: –999.9 - +999.9 °C Does not apply for instruments with **iTrodes**.
Delta measurement mV	*Selection dialog* ▪ **on**: with the input field for the **Reference** with default value: **0.0 mV** / input range: –1500.0 - +1500.0 mV ▪ **off**: is the default value

4.7.1.2 Calibration parameters

Calibration param. ►	*Menu dialog* for the **Calibration param.**.
Temperature	*Editing dialog* for manually entering the calibration temperature. ▪ Default value: **25.0 °C** / input range: 0.0 - 99.9 °C
Report	*Selection dialog* ▪ **on** ▪ **off**: is the default value

Number of buffers	*Selection dialog* for the **Number of buffers** that are used for calibration. ▪ Default value: **2** / input range: 1 - 5
Buffer type	*Selection dialog* for selecting the buffer type. ▪ Available **buffers** and their values *(see chapter 7.1, page 76)* ▪ If required, the preset values may be adjusted for the **Special** buffer type. Default value: **7** / input range: –19.999 - +19.999

4.7.2 Parameters K/TDS/Sal/ρ/T

The **Parameters K/TDS/Sal/ρ/T** menu dialog for the parameters **Measurement** and **Calibration** is shown below with the structure and the description.

4.7.2.1 Measuring parameters

Measuring parameters ►	*Menu dialog* for the **Measuring parameters**.
Measuring mode	*Selection dialog* for selecting the **Measuring mode**. ▪ **Cond. K** The conductivity of the sample is output. ▪ **TDS** (Total Dissolved Solids) ▪ **Salinity** The salinity is output. ▪ **ρ** The resistance value is output. ▪ **T** The temperature is output.
Sensor name	*Selection dialog* for a sensor from the sensor list.
Order number	*Display field* for the **Order number** of the selected sensor.
Serial number	*Display field* for the **Serial number** of the selected sensor.
Temperature	*Editing dialog* for entering the measuring temperature. ▪ Default value: **25.0 °C** / input range: –999.9 - +999.9 °C
Reference temp.	*Editing dialog* for entering the reference temperature of the calibration standard. ▪ Default value: **25.0 °C** / input range: 0 - 99.9 °C
Temp. compens.	*Editing dialog* for entering the temperature compensation value. ▪ Default value: **2.00%/°C** / input range: 0.00 - 9.99%/°C ▪ If no temperature compensation is to be applied, enter 0.0%/°C.

	▪ **DIN** Permanently saved function for temperature compensation for natural groundwater, spring water or surface water in accordance with DIN EN 27888.
TDS factor	*Editing dialog* for entering the factor value for the TDS calculation. ▪ Default value: **0.40** / input range: 0.40 - 1.00 °C

4.7.2.2 Calibration parameters

Calibration param. ►	*Menu dialog* for the **Calibration param.**.
Temperature	*Editing dialog* for manually entering the calibration temperature. ▪ Default value: **25.0 °C** / input range: 0.0 - 99.9 °C
Reference temp.	*Editing dialog* for entering the reference temperature of the calibration standard. ▪ Default value: **25.0 °C** / input range: 0.0 - 99.9 °C
Stand. conduct.	*Editing dialog* for entering the calibration standard value. ▪ Default value: **12.870 mS/cm** / input range: 0.0000 - 2000.0 mS/cm
Temp. compens.	*Editing dialog* for entering the temperature compensation. ▪ Default value: **1.90%/°C** / input range: 0.00 - 9.99%/°C ▪ If no temperature compensation is to be applied, enter 0.0%/°C.
Report	*Selection dialog* ▪ **on** ▪ **off**: is the default value

4.7.3 Parameters DO

The **Parameters DO** menu dialog for the parameters **Measurement** and **Calibration** is shown below with the structure and the description.

4.7.3.1 Measuring parameters

Measuring parameters ►	*Menu dialog* for the **Measuring parameters**.
Measuring mode	*Selection dialog* for selecting the measuring mode. ▪ **% air sat** The oxygen saturation in **[% air sat]** is output. ▪ **mg/LDO** The mass concentration **[mg/L]** is output. ▪ **ppm DO** The ppm by mass is output.

	▪ **µmol/LDO** The concentration **[µmol/L]** is output. ▪ **mbar DO** The partial pressure **[mbar]** is output. ▪ **Torr DO** The partial pressure **[Torr]** is output. ▪ **dphi** The phase angle **[°]** is output.
Sensor name	*Display field* with the name of the connected sensor.
Order number	*Display field* with the sensor's **Order number**.
Serial number	*Display field* with the sensor's **Serial number**.
Order no. cap	*Display field* with the sensor's **Order no. cap**.
Serial no. cap	*Display field* with the sensor's **Serial no. cap**.
Temp. compens.	*Editing dialog* for automatically or manually selecting and entering the temperature compensation. ▪ Default value: **Auto** / input range: –9.9 - +60.0 °C
Sal. compens.	*Editing dialog* for automatically or manually selecting and entering the salinity compensation. ▪ Default value: **0.0** / input range: Auto / 0.0 - 70.0 PSU
Air press. comp.	*Editing dialog* for automatically or manually selecting and entering the atmospheric pressure compensation. ▪ Default value: **Auto** / input range: 300 - 1,200 mbar

4.7.3.2 Calibration parameters

Calibration param. ►	*Menu dialog* for the **Calibration param.**.
Calibration points	*Selection dialog* for the **Calibration points**. ▪ **0%, 100%**: default value ▪ **100%**
Temp. compens.	*Editing dialog* for automatically or manually selecting and entering the temperature compensation. ▪ Default value: **Auto** / input range: –9.9 - +60.0 °C
Air press. comp.	*Editing dialog* for automatically or manually selecting and entering the atmospheric pressure compensation. ▪ Default value: **Auto** / input range: 300 - 1,200 mbar

Report	*Selection dialog* ▪ **on** ▪ **off**: is the default value

4.7.4 Measured values

The **Measured values** menu dialog is shown below with the structure and the description.

Values	1. *Selection dialog* for viewing and deleting the **Values** on the instrument. 2. *Selection dialog* to indicate how the **Values** are to be saved on the instrument for output. ▪ **view** The measured values are shown individually on the display and can be toggled individually with the arrow keys. In addition, you can navigate in the measured value list as follows using the OK key: – If you push the key **briefly**, then the **last** measured value will be displayed. – If you hold the key for **longer**, then the **first** measured value will be displayed. ▪ **delete all** All measured values on the instrument will be irreversibly deleted. ▪ **delete last** The latest (newest) measured value will be irreversibly deleted. ▪ **save as CSV** The currently saved measured values will be saved on the instrument as a CSV file *(see "CSV file", page 68)*. ▪ **save as PC/LIMS** The currently saved measured values will be saved on the instrument as PC/LIMS file *(see "PC/LIMS report", page 67)*.
Data	*Selection dialog* to indicate whether the **Data** are to be printed and/or saved. ▪ **print**:  ▪ **save**:  ▪ **print+save**: 
Criterion	*Selection dialog* to indicate when the **Measured values** are applied during the measurement. ▪ **immediately** The displayed measured value will be immediately applied.

- **time-dependent**
  The measured value will be applied during a **Time interval** that can be set.
  For the PC/LIMS report, the individual measured values are grouped in a data group.
  The interval ends after the **Stop time** has been achieved.
  The parameters are as follows:
  - **Time interval** in seconds
    Default value: **4 s** / input range: 1 - 999999 s
  - **Stop time** in seconds
    Default value: **off** / input range: 1 - 999999 s
- **when changed**
  The subsequent measured value will only be applied automatically if the deviation from the previous measured value is greater than the value **delta pH/T/mV/K** defined here.
  - Delta pH
    Default value: **0.50 pH** / input range: 0.10 - 16.00 pH
  - Delta T(pH)
    Default value: **0.5 °C** / input range: 0.1 - 100.0 °C
  - Delta mV
    Default value: **30.0 mV** / input range: 0.1 - 999.9 mV
  - Delta κ
    Default value: **0.1 mS/cm** / input range: 0.0001 - 10 mS/cm
  - Delta T(κ)
    Default value: **0.5 °C** / input range: 0.1 - 100.0 °C
  - Stop time
    Default value: **off** / input range: 1 - 999999 s
  - Primary channel
    Selection dialog for selecting the measuring channel that has to fulfill the change criterion.
  - Delta DO
    Default value: **0.5 mg/L** / input range: 0.1 - 99 mg/L
  - Delta % air sat
    Default value: **10%** / input range: 1 - 500%

	▪ **drift-dependent** The measured value will be applied when the value is stable according to the drift criterion. The drift thresholds are preset and cannot be changed: – pH measurement: 0.028 pH/min – Potential measurement U/mV: 1.875 mV/min – Temperature measurement T/°C: 0.974 °C/min – Oxygen measurement DO 0.24 mg/L/min For the conductivity, various drift thresholds are stored (depending on the measuring range): – 0.005 mS/cm/min in the measuring range up to 16 µS/cm – 0.5 mS/cm/min in the measuring range from 16 µS/cm to 1 mS/cm – 10 mS/cm/min in the measuring range from 1 mS/cm For instruments with two measuring channels, the primary measuring channel for the fulfillment of the drift criterion has to be selected. – Primary channel *Selection dialog* for selecting the measuring channel that has to fulfill the drift criterion. **pH/mV** **pH/mV IS** **Cond.** **DO IS**
Output date/time	*Selection dialog* for selecting whether a time stamp is to be assigned to a measured value. ▪ **on**: Measured values contain a time stamp on the report. ▪ **off**: Measured values do not contain a time stamp on the report. Default value: **off**
Output headers	*Selection dialog* for selecting how the headers are output. ▪ **once** ▪ **always**: is the default value ▪ **off**
Calibration data	*Selection dialog* for selecting whether the main Calibration data is assigned for the output of the measured values. ▪ **on** ▪ **off**: is the default value

4.7.5 Sensors

The **Sensors** menu dialog is shown below with the structure and the description.

NOTICE

Extent of the menu dialog

Depending on the instrument version and the sensor type, not all or only the specific menu lines are available in the instrument's menu dialog.

The overview below includes a description of all menu lines.

- Menu lines that are available only for pH measurement are marked with the **[pH]** icon.
- Menu lines that are available only for conductivity are marked with the **[K]** icon.
- Menu lines that are available only for oxygen measurement are marked with the **[DO]** icon.

NOTICE

iTrodes and **O_2 Lumitrode**

Sensors of the **iTrodes** product line and the **O_2 Lumitrode** contain their own data in the data memory which becomes available directly in the sensor data when the sensors are connected to the instrument.

Some of this data cannot be edited.

NOTICE

Sensor data

The sensor data of the O_2 Lumitrode can only be edited when the sensor is connected.

4.7.5.1 Sensors

Sensors ▶	An available sensor can be selected in **Sensors**. The individual menu lines are then also available corresponding to the selected sensor.
Selection	*Selection dialog* for selecting an identified sensor for editing and displaying the individual data. ▪ **k default** ▪ **metal def.** ▪ **pH default** ▪ **temp default**

	▪ **etc.** Additional sensors entered by the user.
Sensor name	*Editing dialog* for changing the sensor name.
Sensor type	*Display field* for the sensor type. ▪ **pH electrode** ▪ **Conductivity** ▪ **Metal electrode** ▪ **Oxygen sensor** ▪ **Temp. sensor** ▪ **Other sensor...**
Order number	*Editing dialog* for entering/modifying the **Order number**. Only displayed for **iTrodes** and Oxygen sensor.
Serial number	*Editing dialog* for entering/modifying the **Serial number**. Only displayed for **iTrodes** and Oxygen sensor.
DO **Order no. cap**	*Editing dialog* for entering/modifying the **Order no. cap**.
DO **Serial no. cap**	*Editing dialog* for entering/modifying the **Serial no. cap**.
DO **Firmware module**	*Display field* indicating the firmware version of the oxygen sensor.
pH **Slope**	*Editing dialog* for entering/modifying the **Slope**. ▪ Default value: **100.00** / input range: 0.10 - 990.00%
pH **pH(0)**	*Editing dialog* for entering/modifying **pH(0)**. ▪ Default value: **7.000** / input range: –99.999 - +99.999
K **Cell constant**	*Editing dialog* for entering/modifying the **Cell constant**. ▪ Default value: **1.00 /cm** / input range: 0.001 - 500.0 /cm
Calibration temp.	*Display field* indicating the temperature in **°C** from the last calibration.
K **Reference temp.**	*Display field* indicating the reference temperature in **°C**.
K **Temp. compens.**	*Display field* indicating the value for temperature compensation of the last calibration. ▪ Default value: **2.07%/°C** / input range: 0.00 - 9.99%/°C

Temp. calibration	*Display field* indicating the measurement method for temperature measurement of the last calibration.
DO **Cal. dphi 100 %**	*Editing dialog* for entering/modifying the **Cal. dphi 100 %**. ▪ Input range: 15.000 - 30.000
DO **Cal. dphi 0 %**	*Editing dialog* for entering/modifying the **Cal. dphi 0 %**. ▪ Input range: 45.000 - 60.000
DO **Cal. temp. 100 %**	*Editing dialog* for entering/modifying the **Cal. temp. 100 %**. ▪ Input range: 0.000 - 99.999 °C
DO **Cal. temp. 0 %**	*Editing dialog* for entering/modifying the **Cal. temp. 0 %**. ▪ Input range: 0.000 - 99.999 °C
DO **Calibr. press.**	*Editing dialog* for entering/modifying the **Cal. dphi 100 %**. ▪ Input range: 300.000 - 1200.000 mbar
Calibration date	*Display field* for the last **Calibration date**.
Calibration time	*Display field* for the last **Calibration time**.
Calibration interval	*Editing dialog* for entering time in days for the Calibration interval. ▪ Default value: **off** / input range: 1 - 999 d ▪ **off** disables the **Calibration interval**.
Temp. sensor	*Selection dialog* to indicate the temperature sensor type for the respective sensor. ▪ **Pt1000**: is the default value ▪ **NTC** – **R(25°C)** *Editing dialog* Default value: **30000 Ω** / input range: 10000 - 100000 Ω – **B value** *Editing dialog* Default value: **4100 K** / input range: 1000 - 9999 K
pH **Slope limit value**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on**: is the default value ▪ **off**
pH **Slope lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **95.0** / input range: 1.0 - 999.9%

pH **Slope upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **103.0** / input range: 1.0 - 999.9%
pH **Limit value pH(0)**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on** ▪ **off**: is the default value
pH **pH(0) lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **6.40** / input range: 0.00 - 99.99
pH **pH(0) upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **8.00** / input range: 0.00 - 99.99
K **Limit value c**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on** ▪ **off**: is the default value
K **c lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **0.400 /cm** / input range: 0.001 - 500 /cm
K **c upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **0.550 /cm** / input range: 0.001 - 500 /cm
DO **Temperature offset**	*Editing dialog* for entering/modifying the **Temperature offset**. ▪ Default value: **0.0 °C** ▪ Input range: –5.0 - +5.0 °C
DO **LED intensity (%)**	*Selection dialog* for selecting the **LED intensity (%)**. ▪ **10 %** ▪ **20 %**: is the default value ▪ **30 %**
DO **Cap type**	*Display field* for the **Cap type**. ▪ e.g. MA7-530-200
DO **Limit value dphi 100 %**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on**: is the default value ▪ **off**
DO **lower limit**	*Editing dialog* for the **lower limit**. ▪ Default value: **15** ° / input range: 15.0 - 30.0 °

DO **upper limit**	*Editing dialog* for the **upper limit**. ▪ Default value: **30** ° / input range: 15.0 - 30.0 °
DO **Limit value dphi 0 %**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on**: is the default value ▪ **off**
DO **lower limit**	*Editing dialog* for the **lower limit**. ▪ Default value: **45** ° / input range: 45.0 - 60.0 °
DO **upper limit**	*Editing dialog* for the **upper limit**. ▪ Default value: **60** ° / input range: 45.0 - 60.0 °

4.7.5.2 New sensor

New sensor ►	*Menu dialog* with the individual menu lines for entering a new sensor.
Sensor type	*Selection dialog* for the sensor type. ▪ **pH electrode** ▪ **Conductivity** ▪ **Metal electrode** ▪ **Temp. sensor** ▪ **Other sensor...**
Sensor name	*Editing dialog* for entering the sensor name.
Order number	*Editing dialog* for entering the **Order number**.
Serial number	*Editing dialog* for entering the **Serial number**.
pH **Slope**	*Editing dialog* for entering/modifying the **Slope**. ▪ Default value: **100.00** / input range: 0.10 - 999.99%
pH **pH(0)**	*Editing dialog* for entering/modifying **pH(0)**.
K **Cell constant**	*Editing dialog* for entering/modifying the **Cell constant**. ▪ Default value: **1.00 /cm** / input range: 0.001 - 500 /cm
Calibration interval	*Editing dialog* for entering time in days for the Calibration interval. ▪ Default value: **off** / input range: 1 - 999 d ▪ **off** disables the **Calibration interval**.
Temp. sensor	*Selection dialog* to indicate the temperature sensor type for the respective sensor.

	▪ **Pt1000** ▪ **NTC** – **R(25°C)** *Editing dialog* Default value: **30000 Ω** / input range: 10000 - 100000 Ω – **B value** *Editing dialog* Default value: **4100 K** / input range: 1000 - 9999 K
pH **Slope limit value**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on** ▪ **off**: is the default value
pH **Slope lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **95.0** / input range: 1.0 - 999.9%
pH **Slope upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **103.0** / input range: 1.0 - 999.9%
pH **Limit value pH(0)**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on** ▪ **off**: is the default value
pH **pH(0) lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **6.40** / input range: 0.00 - 99.99
pH **pH(0) upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **8.00** / input range: 0.00 - 99.99
K **Limit value c**	*Selection dialog* for selecting whether the limit value is to be applied. ▪ **on** ▪ **off**: is the default value
K **c lower limit**	*Editing dialog* for entering the lower limit value. ▪ Default value: **0.400 /cm** / input range: 0.001 - 500 /cm
K **c upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **0.550 /cm** / input range: 0.001 - 500 /cm

4.7.5.3 Delete sensor

Delete sensor	*Selection dialog* for deleting a sensor. The data will be irreversibly deleted.

4.7.6 Report

The **Report** menu dialog is shown below with the structure and the description.

NOTICE

Printer

912/913/914 Meter instruments support various printer types for report output. If your printer is not listed, please use the printer **Universal (ESC-POS)**, which has appropriate setting parameters.

Report	*Selection dialog* for data output in the **Report**. ▪ **Calibration pH** ▪ **Calibration pH IS** ▪ **Calibration κ** ▪ **Calibration DO** ▪ **Sensors** ▪ **Configuration** ▪ **Parameters pH** ▪ **Parameters pH IS** ▪ **Parameters κ** ▪ **Parameters DO** ▪ **Meas. values** ▪ **All reports**
Line feed	*Editing dialog* to indicate the lines to be inserted at the end of the report. ▪ Default value: **2 lines** / input range: 0 - 99 lines
Printer	*Selection dialog* to indicate the printer for report output. ▪ **HP Officejet Pro** Page printer with paper size A4 ▪ **HP Laserjet Pro** Page printer with paper size A4 ▪ **Epson (ESC-POS)** Roll printer with paper width 80 mm ▪ **Seiko (ESC-POS)** Roll printer with paper width 110 mm ▪ **Citizen (ESC-POS)** Roll printer with paper width 80 mm

	▪ **Custom (ESC-POS)** Roll printer with paper width 60 mm ▪ **Epson TM-U220B** Roll printer with paper width 76 mm ▪ **Universal (ESC-POS)** Universal roll printer with variable settings: – **Paper width** 50 - 200 mm – **Print resolution** 100 - 600 dpi – **Print type** Line or Matrix

4.7.7 Configuration

The **Configuration** menu dialog for all instrument settings is shown below with the structure and the description.

Last decimal place	*Selection dialog* for selecting whether the **Last decimal place** is displayed for the **pH measured values** with three digits at most. Drift value monitoring is not influenced by this setting. ▪ **on**: Last decimal place is displayed. ▪ **off**: Last decimal place is not displayed.
Signal intensity DO	▪ **on**: default value ▪ **off**
Date	*Editing dialog* for entering the system date. Date format: YYYY-MM-DD
Time	*Editing dialog* for entering the system time. Time format: hh:mm:ss
Power off after	*Editing dialog* for entering the time for the function **Power off after** x minutes. After this time, the instrument shuts down automatically or goes into standby mode. This function is disabled during time-dependent recording of measured values with a set time interval. ▪ Default value: **15** / input range: 1 - 60, or ▪ **off** for continuous operation.
Turn off LCD after	*Editing dialog* for entering the time for the function **Turn off LCD after** x minutes. The display turns off after this time and can be turned back on again with any key other than the  key. ▪ Default value: **15** / input range: 1 - 60, or ▪ **auto** for dimming after 20 seconds and switching off the display after another 60 seconds.

	▪ **off** for continuous operation.
Brightness	*Selection dialog* for the display **Brightness**. ▪ **100 %** ▪ **80 %** ▪ **60 %** ▪ **40 %** ▪ **20 %**
Program version	*Display field* for the current **Program version**.
Language	*Selection dialog* for selecting the instrument **Language**. ▪ **German** ▪ **English**: default factory setting ▪ **Español** ▪ **Français** ▪ **Português** ▪ 中文
Change password	*Editing dialog* for customizing the password for the **Expert** user rights. The default setting ex works is **Expert**. 1. Old password 2. New password 3. Confirm
Service/Diagnosis ►	*Menu dialog* with password-protected access for Metrohm Service.
Password	Password entry for the **Service/Diagnosis** menu functions.

4.7.8 User

The **User** menu dialog for setting user restrictions and user data is shown below with the description.

User	*Editing dialog* for entering the user name. The entered value is only displayed in the one-channel main screen.
Dialog type	*Selection dialog* for the Dialog type. ▪ **Expert** In the Dialog type **Expert**, all functions are unlocked. When changing from **Routine** to **Expert**, you have to enter a **Password** to unlock the locked menu structure. ▪ **Routine** In the Dialog type **Routine**, the following sections in the menu are disabled: – Sensors – Configuration

4.8 pH measurement

This chapter describes the required steps to carry out a simple pH measurement with calibration. The description is limited to only the indispensable steps and will enable you to carry out first measurements with the instrument directly.

4.8.1 pH electrode calibration

NOTICE

Measuring channel selection

In order to perform the calibration, you have to select the corresponding measuring channel in the main dialog.

You cannot perform a calibration in the two-channel view in the main dialog.

pH calibration

By default, the calibration parameters are set for calibration with two Metrohm buffer solutions *(see chapter 4.7.1, page 42)*. If you would like to use other buffers, you have to select the corresponding buffer type and the number of buffer solutions.

If the **Report** selection dialog is set to **on** in the **Calibration param.** menu dialog, then the calibration data will be output immediately.

1 Starting the calibration with the first buffer solution

- Start the calibration with the CAL key.
- Rinse the pH electrode with water and immerse it in the first buffer solution and then confirm with the CAL key.
- The calibration temperature is measured with the connected temperature sensor and added to the calibration data.
  If no temperature sensor is connected, then the temperature has to be entered manually.
- The first buffer solution is measured.

2 Continuing the calibration with second buffer solution

- Remove the pH electrode from the first buffer solution and rinse with water.

- Immerse the pH electrode in the second buffer solution and continue the calibration procedure with the CAL key.
- The second buffer solution is measured.

NOTICE

Buffer exchange

If the buffer solution was not exchanged, then the message **912-181 Same buffer** will appear.

Exchange the buffer solution and continue the calibration with the OK key.

3 Result of the calibration

- The result of the calibration is displayed in a diagram.
- Finish the calibration with the OK key.
  (The instrument will automatically change to the main dialog after 30 seconds.)

NOTICE

Limit values exceeded

If the calibration data is outside the limits defined as calibration parameters, a corresponding message will be displayed.

You can then accept this calibration data nevertheless with the OK key, or you can reject it with the BACK key and use the existing calibration data.

4.8.2 Measurement

NOTICE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows *(see chapter 4.7.4, page 46)*:

1 Selecting the printout criterion

- If the measured value found is to be directly printed out as a measured value report, then you have to set the required printout criterion *(see chapter 4.5.3, page 31)*.

2 Selecting the measured value criterion

- This criterion defines the conditions as to when the measured value is saved on the instrument and/or printed out.

3 Carrying out the measurement

- Rinse the sensor with water and immerse it in the sample.
- Select the **Print/save measured value** button with the  keys.
- Trigger printing and/or saving of the measured value with the 

key.

NOTICE

Measured value recording

Depending on the settings of the measured value criterion, the recording of the measured value may take some time. During the measurement, hold the sensor steady and do not touch the sample vessel with it.

For measurements that take longer, we recommend using a stand to secure the sensor in place.

Finishing measurements

After the last measurement, rinse the sensor and follow the storage instructions for the sensor.

4.9 Conductivity measurement

This chapter describes the required steps to carry out a simple conductivity measurement with calibration. The description is limited to only the indispensable steps and will enable you to carry out first measurements with the instrument directly.

4.9.1 Determination of the cell constant (calibration)

NOTICE

Measuring channel selection

In order to perform the calibration, you have to select the corresponding measuring channel in the main dialog.

You cannot perform a calibration in the two-channel view in the main dialog.

Determination of the cell constant

The calibration parameters are set to default values *(see chapter 4.7.2, page 43)*.

If the **Report** selection dialog is set to **on** in the **Calibration param.** menu dialog, then the calibration data will be output immediately.

1 Starting the calibration

- Start the calibration with the CAL key.
- Rinse the conductivity sensor with water and immerse it in the first standard solution and then confirm with the CAL key.
- The calibration temperature is measured with the connected temperature sensor and added to the calibration data.
  If no temperature sensor is connected, then the temperature has to be entered manually.
- Enter the reference temperature for the standard solution.
- Enter the conductivity value of the standard solution at the reference temperature.
- Enter the coefficient for the current temperature and the selected reference temperature for temperature compensation.
- Trigger the calibration with the standard solution with the CAL key.

2 Result of the calibration

- The result of the calibration (cell constant) is recorded and stored for the respective sensor.
- Calibration is completed and the instrument will automatically change back to the main dialog after 30 seconds.

NOTICE

Limit values exceeded

If the calibration data is outside the limits defined as calibration parameters, a corresponding message will be displayed.

You can then accept this calibration data nevertheless with the OK key, or you can reject it with the BACK key.

4.9.2 Measurement

NOTICE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows *(see chapter 4.7.4, page 46)*:

1 Selecting the printout criterion

- If the measured value found is to be directly printed out as a measured value report, then you have to set the required printout criterion *(see chapter 4.5.3, page 31)*.

2 Selecting the measured value criterion

- This criterion defines the conditions as to when the measured value is saved on the instrument and/or printed out.

3 Carrying out the measurement

- Rinse the sensor with water and immerse it in the sample.
- Select the **Print/save measured value** button with the  keys.
- Trigger printing and/or saving of the measured value with the  key.

NOTICE

Measured value recording

Depending on the settings of the measured value criterion, the recording of the measured value may take some time. During the measurement, hold the sensor steady and do not touch the sample vessel with it.

For measurements that take longer, we recommend using a stand to secure the sensor in place.

Finishing measurements

After the last measurement, rinse the sensor and follow the storage instructions for the sensor.

4.10 Oxygen measurement

This chapter describes the required steps to carry out a simple oxygen measurement with calibration. The description is limited to only the indispensable steps and will enable you to carry out first measurements with the instrument directly.

4.10.1 Calibration

NOTICE

Measuring channel selection

In order to perform the calibration, you have to select the corresponding measuring channel in the main dialog.

You cannot perform a calibration in the two-channel view in the main dialog.

Calibration

The calibration parameters are set to default values *(see chapter 4.7.3, page 44)*.

If the **Report** selection dialog is set to **on** in the **Calibration param.** menu dialog, then the calibration data will be output immediately.

1 Starting a calibration with 100% air saturation

- Start the calibration with the CAL key.
- Rinse the oxygen sensor with water and dab it dry. Moisten the sponge in the calibration vessel and screw the calibration vessel onto the sensor. Confirm with the CAL key.
- Enter the temperature compensation for the calibration.
- Enter the atmospheric pressure compensation for the calibration.
- Trigger the calibration with 100% air saturation with the CAL key.

2 Continuing the calibration with 0% oxygen standard

- Remove the sensor from the calibration vessel.
- Immerse the sensor up to over the metal ring in 0% oxygen standard and swirl to remove adhering air bubbles.
- Press the CAL key to continue the calibration.

3 Result of the calibration

- The result of the calibration (phase angle) is recorded and stored for the respective sensor.
- Calibration is completed and the instrument will automatically change back to the main dialog after 30 seconds.

NOTICE

Limit values exceeded

If the calibration data is outside the limits defined as calibration parameters, a corresponding message will be displayed.

4.10.2 Measurement

NOTICE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows *(see chapter 4.7.4, page 46)*:

1 Selecting the printout criterion

- If the measured value found is to be directly printed out as a measured value report, then you have to set the required printout criterion *(see chapter 4.5.3, page 31)*.

2 Selecting the measured value criterion

- This criterion defines the conditions as to when the measured value is saved on the instrument and/or printed out.

3 Carrying out the measurement

- Rinse the sensor with water and immerse it in the sample.
- Select the **Print/save measured value** button with the  keys.
- Trigger printing and/or saving of the measured value with the 

key.

NOTICE

Measured value recording

Depending on the settings of the measured value criterion, the recording of the measured value may take some time. During the measurement, hold the sensor steady and do not touch the sample vessel with it.

For measurements that take longer, we recommend using a stand to secure the sensor in place.

Finishing measurements

After the last measurement, rinse the sensor and follow the storage instructions for the sensor.

4.11 Issuing reports/measured values

The **912/913/914 Meter** supports the output of various printouts and data transfers for displaying the calibration and measured values.

4.11.1 Printing out

The printouts are divided into various groups:

- Printing out values directly after generation:
  - Calibration data
    Calibration data can be printed out if **on** is selected under:
    Menu ► Parameters X ► Calibration param. ► Report
  - Measured values
    Direct printing of the measured values can be done with the  or  buttons.
- Printing out saved values in the following areas as reports:
  - Calibration
  - Sensors
  - Configuration
  - Parameters
  - Measured values

  Report data can be printed using the **Report** selection dialog under:
  Menu ► Report

NOTICE

The value "dpH" indicates the difference between nominal value of the buffer (by interpolating between two values from the buffer table) and the pH value resulting from the measured voltage from the calibration lines.

4.11.2 PC/LIMS and CSV data transfer

NOTICE

USB cable

Data can be transferred to a PC connected using the supplied USB cable (6.2151.110).

The optional USB Y cable (6.2151.140) cannot be used.

NOTICE

Data output

For data output, the setting **save** or **print+save** is required when recording measured values so that this data is saved on the instrument.

Data generation

The measured value data has to be re-generated before every data transfer.

The data on the instrument memory can be saved in two data formats:

PC/LIMS report

Data in PC/LIMS format can be imported into and processed in the Metrohm program **tiBase** for evaluation.

NOTICE

DO sensor

The measured values of the DO sensor are not output in the PC/LIMS format.

NOTICE

Data collision

Transferring data from several instruments can lead to a data collision in **tiBase**.

- You should create an individual database for each measuring instrument in **tiBase**.

CSV file

CSV data can be imported as text data in **MS Excel** and processed for evaluation.

The following parameters are required for text conversion:

- Data type = separated with a semicolon
- Data source = Unicode (UTF-8)
- Data format of the columns = standard

Generating/transferring report data

NOTICE

USB interface

If the report data is to be generated while the instrument is connected to the PC, then the connection is briefly interrupted.

After the report data has been generated, the connection will be automatically established again.

1 Generating report data

You can generate the report data by selecting:

save as PC/LIMS or **save as CSV**

under **Menu ► Measured values ► Values**.

2 Connecting the instrument to the PC

Connect the instrument to the PC using the supplied USB cable (6.2151.110).

The instrument is automatically recognized as a removable drive.

3 Transferring report data

The generated files are stored on the instrument as follows and can be transferred to the computer for evaluation and report generation:

- **PCLIMS_X.UTF8** is in the **PCLIMS** directory
- **MEASREPORT.CSV** is in the **CSV** directory

5 Operation and maintenance

5.1 General notes

5.1.1 Care

912/913/914 Meter instruments require appropriate care. Excess contamination of the instruments may result in functional disruptions and a reduction in the service life of the otherwise sturdy mechanics and electronics.

Spilled chemicals and solvents should be removed immediately. In particular, the plug connections should be protected from contamination.

CAUTION

Although this is largely prevented by design measures, Metrohm Service should immediately be notified if aggressive media have found their way into the instrument.

5.1.2 Maintenance by Metrohm Service

Maintenance of the **912/913/914 Meter** is best carried out as part of annual service, which is performed by specialist personnel from Metrohm. A shorter maintenance interval may be necessary if you frequently work with caustic and corrosive chemicals.

Metrohm Service offers every form of technical advice for maintenance and service of all Metrohm instruments.

5.1.3 Sensor care

Sensors are sensitive and require appropriate handling and care.

NOTICE

Sensor leaflet

Handling, care and storage are important factors for the correct and accurate functioning of sensors.

Therefore, please note the specific information on the respective sensor leaflets.

You can download the leaflets from the Internet at *http://www.metrohm.com*.

6 Troubleshooting

6.1 General

If you experience problems during measurements, then you can check the following aspects to eliminate them:

Application

Difficult sample matrices or interfering influences may render accurate measurements impossible (e.g. insufficient ionic strength, presence of interfering ions, etc.).

Our **Application Bulletins** and **Application Notes** will support you in choosing the appropriate analysis conditions and configuring the instrument method.

Buffer solutions / standard solutions

The precision of the measurements mainly depends on the correct calibration of the sensors. To do so, you should use clean and fresh buffer solutions or standard solutions.

A common cause of incorrect calibrations is, for example, the use of an old pH 10 or pH 12 buffer. Its pH value may markedly deviate from the certified pH value of a new buffer as a result of the introduction of CO_2 from the air.

Sensors

The sensors are the most important component in the entire measuring system.

For the correct handling of sensors, please read the corresponding leaflets.

Instrument

If the **912/913/914 Meter** might be the cause of a measuring problem, check all configuration and parameter settings first.

The **912/913/914 Meter** will notify you of problems with respective messages directly during operation.

You can find an explanation of these messages in the chapter **Messages**.

(see chapter 6.4, page 75)

6.2 Problems

The following list describes some general problems that might occur during measurements. Furthermore, the possible causes and solution approaches are described.

NOTICE

Sensor treatment

Follow the instructions given in the respective leaflets for sensors cleaning and maintenance.

6.2.1 Troubleshooting

Problem	Cause	Remedy
Measured value setting is sluggish.	*The glass membrane or the diaphragm is contaminated.*	▪ Clean the electrode following the instructions in the leaflet.
No measuring signal.	*The sensor is not connected.*	▪ Connect the sensor.
	Wrong measuring channel is selected.	▪ Select the correct measuring channel.
	The sensor is defective.	▪ Replace the sensor.
	The cable is defective.	▪ Replace the cable.
	The electrode's reference system contains air.	▪ Perform an electrode maintenance as described in the leaflet.
	The measuring input and/or the measuring channel is defective.	▪ Send the measuring instrument to the Metrohm Service for inspection and, if necessary, repair.
The instrument does not start.	*The instrument battery is not charged.*	▪ Connect the instrument to the power supply unit to charge it. The battery is only charged when the instrument is on. (total charging time: approx. 9 hours)
The measured value drift criterion is not fulfilled.	*The glass membrane or the diaphragm is contaminated.*	▪ Clean the electrode following the instructions in the leaflet.

Problem	Cause	Remedy
	The pH value or the temperature of the measuring solution is not stable.	▪ Measure under exclusion of air. ▪ Regulate the measuring solution's temperature.
	Conductivity is too low because of an unsuitable sensor.	▪ Use a suitable sensor.
	Measurement takes place in an organic solution.	▪ Use a suitable sensor.
	Non-Metrohm power supply unit used for charging the battery.	▪ Use only the supplied power supply unit during measurement operation.
	O_2 cap is worn out.	▪ Use a new O_2 cap.
The measured value is evidently wrong.	*pH calibration is faulty.*	▪ Check/repeat calibration. ▪ Check/replace the buffer. ▪ Check the buffer selection in the settings.
	Conductivity calibration is faulty.	▪ Check/repeat calibration. ▪ Check the value for the standard. ▪ Check the value for the reference temperature. ▪ Check the value for temperature compensation.
	DO calibration is faulty.	▪ Check/repeat calibration. ▪ Check the value for temperature compensation. ▪ Check the value for the atmospheric pressure compensation.
	The temperature input is wrong.	▪ Enter the correct measuring temperature.
	The wrong temperature sensor type is selected.	▪ Check the temperature sensor type (Pt1000 or NTC) and select the correct one, if necessary.
	The glass membrane or the diaphragm is contaminated.	▪ Clean the membrane or the diaphragm following the instructions in the corresponding leaflet.
	The electrolyte is overaged.	▪ Replace the electrolyte.

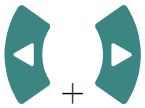
Problem	Cause	Remedy
	The sensor is defective.	▪ Replace the sensor.
The slope is insufficient during calibration.	*The glass membrane or the diaphragm is contaminated.*	▪ Clean the electrode following the instructions in the leaflet.
	No hydrated layer is present on the glass membrane after measurements in water-free solutions.	▪ Hydrate the electrode between the measurements.
	The buffer solutions are not OK.	▪ Replace the buffer solutions.
	The sensor is "worn out".	▪ Replace the sensor.

6.3 Restarting/resetting the instrument

6.3.1 Instrument reset

In case of a malfunction, the instrument might not work correctly anymore and not be switched off.

You need to press the following key combination for at least 2 seconds to switch off the instrument:



The instrument can be switched on again.

NOTICE

Data storage

The currently measured data and modified settings cannot be saved if the instrument is reset.

6.3.2 Resetting the instrument to factory settings

This function deletes all user data on the instrument. Afterwards, the instrument will be in the state as delivered from the manufacturer with the default settings.

CAUTION

User data

The user data will be irreversibly deleted.

During the startup of the instrument, the following key combination can be used for resetting the instrument (instrument reset):

Afterwards, a message will be displayed saying that the user data has been deleted.

6.4 Messages

The instruments notify you of possible errors or operation problems with various specific messages. A message as shown in the following example will appear on the current display:

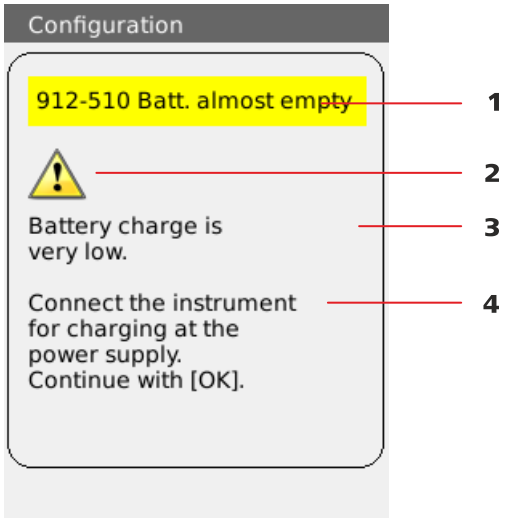


Figure 19 Example of a message

1	**Message number and message**	**2**	**Symbol**
3	**Message text**	**4**	**Remedy**

NOTICE

Message number

Each message contains a message number in the top left-hand corner. Please indicate this number in the case of queries or complaints.

7 Appendix

7.1 Saved buffer series

The displayed buffer series are available in the instrument starting with firmware version 5.913.0021, 5.913.2021, 5.914.1021, 5.914.2021, 5.914.3021.

The temperature-dependent pH values of the most important commercially available pH buffer solutions are stored in **912/913/914 Meter** instruments for automatic buffer recognition during pH calibration.

In addition to the Metrohm buffer solutions, other reference buffers are also included in the tables.

CAUTION

Buffer quality

The precision of pH measurements mainly depends on the correct calibration of the measuring chain. To do so, you should use clean and fresh buffer solutions. A common cause of incorrect calibration is, for example, the use of an old pH 10 or pH 12 buffer. The pH value of a buffer solution may markedly deviate from the certified pH value of a new buffer solution as a result of the introduction of CO_2 from the air.

The following tables provide an overview of the stored pH(T) series:

NOTICE

pH values printed in **bold** are the values for the reference temperature of the respective buffer set.

pH values highlighted in *italics* are interpolated or extrapolated values. The other pH values correspond to the manufacturer's specifications.

7.1.1 Metrohm

Table 7 Metrohm buffer solutions

Temp. (°C)	Metrohm pH 4.00	Metrohm pH 7.00	Metrohm pH 9.00
0	3.99	7.11	9.27
5	3.99	7.08	9.18
10	3.99	7.06	9.13
15	3.99	7.04	9.08
20	3.99	7.02	9.04
25	**4.00**	**7.00**	**9.00**
30	4.00	6.99	8.96
35	4.01	6.98	8.93
40	4.02	6.98	8.90
45	4.03	6.97	8.87
50	4.04	6.97	8.84
55	4.06	6.97	8.81
60	4.07	6.97	8.79
65	4.09	6.98	8.76
70	4.11	6.98	8.74
75	4.13	6.99	8.73
80	4.15	7.00	8.71
85	4.18	7.00	8.70
90	4.20	7.01	8.68
95	4.23	7.02	8.67

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept up to date as far as possible.

However, they may be changed by the respective manufacturers.

7.1.2 NIST (according to DIN standard 19266, 2015)

Table 8 NIST buffer solutions

Temp. (°C)	NIST (according to DIN standard 19266, 2015-05)				
	pH 1.679	pH 4.005	pH 6.865	pH 9.180	pH 12.454
0	1.666	4.000	6.984	9.464	-
5	1.668	3.998	6.951	9.395	13.207
10	1.670	3.997	6.923	9.332	13.003
15	1.672	3.998	6.900	9.276	12.810
20	1.675	4.000	6.881	9.225	12.627
25	**1.679**	**4.005**	**6.865**	**9.180**	**12.454**
30	1.683	4.011	6.853	9.139	12.289
35	1.688	4.018	6.844	9.102	12.133
40	1.694	4.027	6.838	9.068	11.984
45	*1.700*	*4.038*	*6.836*	*9.040*	11.841
50	1.707	4.050	6.833	9.011	11.705
55	1.715	4.075	6.834	8.985	11.574
60	1.723	4.091	6.836	8.962	11.449
65	*1.733*	*4.108*	*6.841*	*8.942*	-
70	1.743	4.126	6.845	8.921	-
75	*1.754*	*4.145*	*6.852*	*8.903*	-
80	1.766	4.164	6.859	8.885	-
85	*1.779*	*4.184*	*6.868*	*8.868*	-
90	1.792	4.205	6.877	8.850	-
95	1.806	4.227	6.886	8.833	-

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

The NIST buffers are identical to the buffer solutions that are used in Chinese pharmacopoeia.

7.1.3 DIN (according to DIN standard 19267, 2012)

Table 9 DIN buffer solutions

Temp. (°C)	DIN (according to DIN standard 19267, 2012-08)					
	pH 1.09	pH 3.06	pH 4.65	pH 6.79	pH 9.23	pH 12.75
0	1.08	-	4.67	6.89	9.48	-
5	*1.08*	-	*4.66*	*6.86*	*9.43*	-
10	1.09	3.10	4.66	6.84	9.37	13.37
15	*1.09*	*3.08*	*4.65*	*6.82*	*9.32*	*13.15*
20	1.09	3.07	4.65	6.80	9.27	12.96
25	**1.09**	**3.06**	**4.65**	**6.79**	**9.23**	**12.75**
30	1.10	3.05	4.65	6.78	9.18	12.61
35	*1.10*	*3.05*	*4.66*	*6.77*	*9.13*	*12.44*
40	1.10	3.04	4.66	6.76	9.09	12.29
45	*1.10*	*3.04*	*4.67*	*6.76*	*9.04*	*12.13*
50	1.11	3.04	4.68	6.76	9.00	11.98
55	*1.11*	*3.04*	*4.69*	*6.76*	*8.97*	*11.84*
60	1.11	3.04	4.70	6.76	8.92	11.69
65	*1.11*	*3.04*	*4.71*	*6.76*	*8.90*	*11.56*
70	1.11	3.04	4.72	6.76	8.88	11.43
75	*1.12*	*3.04*	*4.74*	*6.77*	*8.86*	*11.30*
80	1.12	3.05	4.75	6.78	8.85	11.19
85	*1.12*	*3.06*	*4.77*	*6.79*	*8.83*	*11.08*
90	1.13	3.07	4.79	6.80	8.82	10.99
95	-	-	-	-	-	-

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.4 Fisher

Table 10 Fisher buffer solutions

Temp. (°C)	Fisher pH 2.00	Fisher pH 4.00	Fisher pH 7.00	Fisher pH 10.00
0	-	4.01	7.13	10.34
5	1.98	3.99	7.10	10.26
10	1.98	4.00	7.07	10.19
15	2.02	3.99	7.05	10.12
20	2.00	4.00	7.02	10.06
25	**2.00**	**4.00**	**7.00**	**10.00**
30	2.00	4.01	6.99	9.94
35	2.02	4.02	6.98	9.90
40	2.01	4.03	6.97	9.85
45	2.01	*4.04*	*6.97*	*9.81*
50	2.01	4.06	6.97	9.78
55	-	*4.07*	*6.97*	*9.74*
60	-	4.09	6.98	9.70

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.5 Mettler Toledo

Table 11 Mettler Toledo buffer solutions

Temp. (°C)	Mettler Toledo pH 2.00	Mettler Toledo pH 4.01	Mettler Toledo pH 7.00	Mettler Toledo pH 9.21	Mettler Toledo pH 11.00
0	2.03	4.01	7.12	9.52	11.90
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54

Temp. (°C)	Mettler Toledo pH 2.00	pH 4.01	pH 7.00	pH 9.21	pH 11.00
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
25	**2.00**	**4.01**	**7.00**	**9.21**	**11.00**
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10
55	1.98	4.08	6.98	8.96	-
60	1.98	4.10	6.98	8.93	-
65	1.98	4.13	6.99	*8.90*	-
70	1.99	4.16	7.00	8.88	-
75	1.99	4.19	7.02	*8.85*	-
80	2.00	4.22	7.04	8.83	-
85	2.00	4.26	7.06	*8.81*	-
90	2.00	4.30	7.09	8.79	-
95	2.00	4.35	7.12	8.77	-

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.6 Merck CertiPUR 20 / Titrisol

Table 12 Merck CertiPUR 20 / Titrisol buffer solutions

	Merck CertiPUR 20 / Titrisol				
Article no.	**109433**	**109435**	**109477**	**109476**	**109462**
Temp. (°C)	**pH 2.00**	**pH 4.00**	**pH 7.00**	**pH 9.00**	**pH 11.00**
0	2.01	4.05	7.13	9.24	11.45
5	2.01	4.04	7.07	9.16	11.32
10	2.01	4.02	7.05	9.11	11.20
15	2.00	4.01	7.02	9.05	11.10
20	**2.00**	**4.00**	**7.00**	**9.00**	**11.00**
25	2.00	4.01	6.98	8.95	10.90
30	2.00	4.01	6.98	8.91	10.81
35	2.00	4.01	6.96	8.88	10.72
40	2.00	4.01	6.95	8.79	10.64
45	*2.00*	*4.00*	*6.95*	*8.82*	10.56
50	2.00	4.00	6.95	-	10.48

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible. However, they may be changed by the respective manufacturers.

7.1.7 Merck CertiPUR 25

Table 13 Merck CertiPUR 25 buffer solutions

	Merck CertiPUR (25°C)			
Article no.	**109445**	**109407**	**109408**	**109409**
Temp. (°C)	**pH 4.00**	**pH 7.00**	**pH 9.00**	**pH 10.00**
0	-	-	-	-

	Merck CertiPUR (25°C)			
Article no.	**109445**	**109407**	**109408**	**109409**
Temp. (°C)	**pH 4.00**	**pH 7.00**	**pH 9.00**	**pH 10.00**
5	4.05	7.09	9.22	10.22
10	4.04	7.08	9.16	10.16
15	4.02	7.04	9.10	10.10
20	4.01	7.02	9.05	10.05
25	**4.00**	**7.00**	**9.00**	**10.00**
30	3.99	6.98	8.96	9.94
35	3.98	6.98	8.93	9.90
40	3.98	6.97	8.89	9.86
45	3.98	6.97	8.86	9.80
50	3.98	6.97	8.84	9.73

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible. However, they may be changed by the respective manufacturers.

7.1.8 Beckmann

Table 14 Beckmann buffer solutions

	Beckmann		
Temp. (°C)	**pH 4.01**	**pH 7.00**	**pH 10.01**
0	4.00	7.12	10.32
5	4.00	7.09	10.25
10	4.00	7.06	10.18
15	*4.00*	*7.04*	*10.12*
20	4.00	7.01	10.06
25	**4.01**	**7.00**	**10.01**
30	4.01	6.99	9.97

Temp. (°C)	Beckmann pH 4.01	Beckmann pH 7.00	Beckmann pH 10.01
35	*4.02*	*6.99*	*9.93*
40	4.03	6.97	9.89
45	*4.05*	*6.97*	*9.86*
50	4.06	6.97	9.83

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.9 Radiometer Analytical

Table 15 Radiometer Analytical buffer solutions

Temp. (°C)	Radiometer Analytical pH 1.679	Radiometer Analytical pH 4.005	Radiometer Analytical pH 7.000	Radiometer Analytical pH 9.180
0	1.666	4.000	7.118	9.464
5	1.668	3.998	7.087	9.395
10	1.670	3.997	7.059	9.332
15	1.672	3.998	7.036	9.276
20	1.675	4.001	7.016	9.225
25	**1.679**	**4.005**	**7.000**	**9.180**
30	1.683	4.011	6.987	9.139
35	1.688	4.018	6.977	9.102
40	1.694	4.027	6.970	9.068
45	*1.700*	*4.038*	*6.965*	*9.038*
50	1.707	4.050	6.964	9.010
55	*1.715*	*4.064*	*6.965*	*8.985*
60	1.723	4.080	6.968	8.962
65	*1.732*	*4.097*	*6.974*	*8.941*

Temp. (°C)	Radiometer Analytical pH 1.679	pH 4.005	pH 7.000	pH 9.180
70	1.743	4.116	6.982	8.921
75	*1.754*	*4.137*	*6.992*	*8.900*
80	1.765	4.159	7.004	8.884
85	*1.778*	*4.183*	*7.018*	*8.867*
90	1.792	4.208	7.034	8.850

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.10 Baker

Table 16 Baker buffer solutions

Temp. (°C)	Baker pH 4.00	pH 7.00	pH 9.00	pH 10.00
0	4.00	7.13	9.23	10.30
5	*4.00*	*7.09*	*9.17*	*10.24*
10	4.00	7.05	9.10	10.17
15	*4.00*	*7.03*	*9.05*	*10.11*
20	**4.00**	**7.00**	**9.00**	10.05
25	*4.00*	*6.98*	*8.96*	**10.00**
30	4.01	6.98	8.91	9.96
35	*4.02*	*6.98*	*8.88*	*9.93*
40	4.03	6.97	8.84	9.89
45	*4.04*	*6.97*	*8.81*	*9.86*
50	4.05	6.96	8.78	9.82
55	*4.07*	*6.96*	*8.76*	*9.79*
60	4.08	6.96	8.73	9.76
65	*4.10*	*6.97*	*8.71*	*9.74*

Temp. (°C)	Baker pH 4.00	pH 7.00	pH 9.00	pH 10.00
70	4.12	6.97	8.69	9.72
75	*4.14*	*6.98*	*8.68*	*9.70*
80	4.16	6.98	8.66	9.68
85	*4.19*	*6.99*	*8.64*	*9.66*
90	4.21	7.00	8.62	9.64

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.11 Hamilton DURACAL

Table 17 Hamilton DURACAL buffer solutions

Temp. (°C)	Hamilton DURACAL pH 4.01	pH 7.00	pH 9.21	pH 10.01
0	-	-	-	-
5	4.01	7.09	9.45	10.19
10	4.00	7.06	9.38	10.15
15	4.00	7.04	9.32	10.11
20	4.00	7.02	9.26	10.06
25	**4.01**	**7.00**	**9.21**	**10.01**
30	4.01	6.99	9.16	9.97
35	4.02	6.98	9.11	9.92
40	4.03	6.97	9.06	9.86
45	4.04	6.97	9.03	9.83
50	4.06	6.97	8.99	9.79

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

7.1.12 Honeywell Fluka

Table 18 Buffer solutions Honeywell Fluka

Temp. (°C)	Fluka pH 4.000	Fluka pH 7.000	Fluka pH 9.000
0	4.030	7.130	9.240
5	*4.025*	*7.090*	*9.175*
10	4.020	7.050	9.110
15	*4.010*	*7.020*	*9.055*
20	**4.000**	**7.000**	**9.000**
25	*4.000*	*6.990*	*8.965*
30	4.000	6.980	8.930
35	*4.000*	*6.975*	*8.895*
40	4.000	6.970	8.860
45	*4.000*	*6.965*	*8.830*
50	4.000	6.960	8.800
55	*4.000*	*6.960*	*8.775*
60	4.000	6.960	8.750
65	*4.000*	*6.965*	*8.730*
70	4.000	6.970	8.710
75	*4.000*	*6.975*	*8.690*
80	4.000	6.980	8.670
85	*4.000*	*6.990*	*8.655*
90	4.000	7.000	8.640

NOTICE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

8 Technical specifications

8.1 Measuring inputs

The four available instruments are each equipped with specific measuring inputs.

The following table lists the measuring inputs for each instrument and the corresponding measuring modes.

Table 19 Measuring inputs / instrument

Instrument	Measuring inputs / measuring modes				
	Electrode, analog	**Electrode, digital**	**Conductivity**	**Temperature**	**Reference**
2.912.010			K/TDS/Sal[1)]/ρ/T		
2.913.010	pH/U/T	pH/U/T		pH/U/T	x
2.913.020	pH/U/T	pH/U/T/DO		pH/U/T	x
2.914.020	pH/U/T		K/TDS/Sal[1)]/ρ/T	T	x
2.914.030		pH/U/T/DO	K/TDS/Sal[1)]/ρ/T		

[1)] The salinity (Sal) calculation is based on the specifications in the "Unesco technical papers in marine science 36" under the title "Tenth report of the joint panel on oceanographic tables and standards".

Input resistance > 1 * 10^{12} Ohm (under reference conditions)

Table 20 Specification of the measuring inputs

	Measuring range	**Resolution**	**Measuring accuracy [2)]**
pH value	–13.000 - +20.000	0.001 pH	±0.003 pH
Temperature:			
Pt1000	–150 °C - +250 °C	0.1 °C	±0.2 °C (–20 °C - +150 °C)
with iConnect	–150 °C - +250 °C	0.1 °C	±0.4 °C (–20 °C - +150 °C)
NTC 30 kΩ	–5 °C - +250 °C	0.1 °C	±0.6 °C (+10 °C - +40 °C)
Potential	–1200.0 mV - +1200.0 mV	0.1 mV	±0.2 mV
Conductance [3)]	0.1 µS - 500 mS	4 significant digits	±0.5% at 0.1 µS - 16 µS ±0.5% at 16 µS - 1 mS ±1.0% at 1 mS - 500 mS

	Measuring range	Resolution	Measuring accuracy [2]
Oxygen	0.0 - +500%	0.1%	in the range 0 - 8 mg/L: +/-0.1 mg/L
	0.00 - +50.00 mg/L	0.01 mg/L	in the range 8 - 20 mg/L: 0.15 mg/L
			in the range 20 - 50 mg/L: 10%

[2] ±1 digit, without sensor error, at reference conditions

[3] To obtain the conductivity, the corresponding value must be multiplied by the cell constant. The indicated values apply for c = 1/cm.

Display interval of the measurement = 1 s

8.2 Measured value memory

Memory size

- 10000 measured values, non-volatile memory
- 10 sensor entries in sensor list

8.3 TFT display

Resolution 320 x 240 pixels (RGB)

Display colors 16.7 millions

Display size 3.5 inches (70.08 x 52.56 mm)

8.4 Interfaces

USB connector Type A/B mini USB connector (USB 2.0) with the following functions:

- Energy supply
- Data transmission
  with USB cable (6.2151.110)
- Printing
  with USB Y cable (6.2151.140)

8.5 Energy supply

Lithium polymer battery	3.7 V, 3000 mAh The rechargeable battery **cannot** be replaced by the user.
USB connector	
Nominal input voltage	5 V ±5% DC
Power consumption	850 mA max.
Power consumption at PC-USB	500 mA
Power supply unit	No. 6.2166.100 (Accessories)
Nominal input voltage	100 - 240 V AC
Frequency	50 - 60 Hz
Output voltage	5.25 V DC
Nominal output current	1530 mA max.
12 V USB adapter	No. 6.2166.500 (optional accessories)
Nominal input voltage	12 V DC
Output voltage	5 V DC
Nominal output current	1000 mA

8.6 Charging time

Charging time with power supply unit	9 hours with original power supply unit (no. 6.2166.100) and original USB cable
Charging time on USB interface	15 hours
Charging time with USB Y cable	15 hours

8.7 Runtime with rechargeable battery

NOTICE

Runtimes

The runtimes may vary according to the configuration used and the usage habits.

The following values are based on operation under reference conditions *(see chapter 8.9, page 92)*.

Uptime	8 hours

8.8 Ambient temperature

Operation	0°C - +40°C (at a max. of 85% humidity)
Storage and transport	0°C - +45°C (at a max. of 85% humidity)

8.9 Reference conditions

Ambient temperature	+25 °C (±3 °C)
Relative humidity	≤ 60%
Instrument status	> 5 min. in operation
Validity of the data	After adjustment

8.10 Dimensions/material

Dimensions	
Length	208 mm
Width	92 mm
Height	34 mm
Weight	400 g (net incl. battery)
Material	
Housing	Acrylonitrile butadiene styrene (ABS)
Keyboard foil	Polyester (PES)
Screen cover	Polycarbonate (PC)
Interface cover	Thermoplastic elastomers (TPE-E)

9 Accessories

Up-to-date information on the scope of delivery and optional accessories for your product can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1. Enter *https://www.metrohm.com/* into your Internet browser.
2. Enter the article number (e.g. **912 | 913 | 914**) into the search field.
   The search result is displayed.
3. Click on the product.
   Detailed information regarding the product is shown on various tabs.
4. On the **Included parts** tab, click on **Download the PDF**.
   The PDF file with the accessories data is created.

NOTICE

Once you have received your new product, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

Glossary

Display field

Display fields are menu lines with a designation and a displayed value.

Editing dialog

In editing dialogs, you can enter or edit values *(see "Editing dialog", page 23)*.

IS

The abbreviation **IS** in instruments and menus stands for **I**ntelligent **S**ensor from the **iTrode** line of sensors.

A chip in the sensor head saves the data, which is automatically transmitted when the sensor is connected with the instrument by means of the **854 iConnect**. The measured data is transmitted digitally.

Main dialog

In the main dialog, measured values are displayed and you can trigger primary operations for measurements *(see "Main dialog", page 22)*.

Menu dialog

Menu dialogs show an open menu structure with the corresponding menu lines *(see "Menu dialog", page 22)*.

Menu line

Menu lines are positions in the menu dialog that can be selected or that display something.

Menu structure

The menu structure represents the navigation in the instrument through the menus *(see chapter 4.6, page 36)*.

Selection dialog

In selection dialogs, you can select one option from a range of options *(see "Selection dialog", page 24)*.

dpH

Difference between nominal value of the buffer (by interpolating between two values from the buffer table) and the pH value that results from the measured voltage from the calibration lines *(see chapter 4.11, page 66)*.

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