pH Meter/Conductometer

912 Conductometer | 913 pH Meter | 914 pH/Conductometer

Manual

8.912.8001EN / 2016-11-11

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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.

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Table of figures

1 Introduction

This manual gives you a comprehensive overview of the installation, functioning and operation of pH Meter/Conductometer.

NOTE

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

pH Meter/Conductometers are designed for use both outdoors and indoors as well as for stationary use in the laboratory.

The instruments come in four 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.

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

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.

The pH/Conductometers are equipped with a permanently installed accumulator for mobile use.

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

1.1.1 Instrument and sales versions

pH Meter/Conductometers 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
2.914.0010	914 pH/Conductometer (pH digital)	Instrument with standard accessories
2.914.0020	914 pH/Conductometer (pH analog)	Instrument with standard accessories
2.914.0110	914 pH/Conductometer (pH digital)	Mobile version with accessories case
2.914.0120	914 pH/Conductometer (pH analog)	Mobile version with accessories case
2.914.0210	914 pH/Conductometer (pH digital)	Laboratory version with stand plate
2.914.0220	914 pH/Conductometer (pH analog)	Laboratory version with stand plate

NOTE

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 Power supply

The instrument is powered either by a built-in accumulator or, for stationary use, by 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.

NOTE

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 making measurements in chemicals and flammable samples. Therefore, using the pH Meter/Conductometer requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge of the application of the fire protection 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

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has 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.

Accumulator / 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 accumulator or the power supply unit has been damaged, have it checked by a service center. Do not use damaged accumulators or power supply units.

Do not use the power supply unit outdoors.

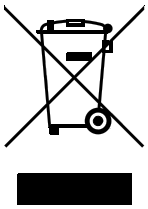
1.4.3 Flammable solvents and chemicals

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 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

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

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

2 Overview of the instrument

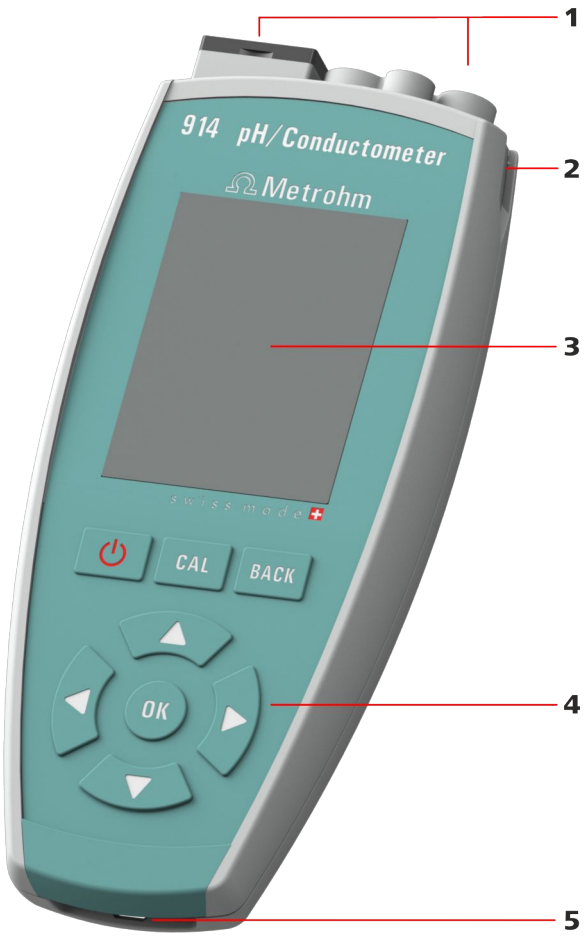


Figure 1 pH Meter/Conductometer - front

1 **Connectors / interfaces** With a cover cap for the USB interface and the digital interface.	**2** **Sensor holder slot** For mobile applications, a sensor holder may be inserted here.
3 **Display** For measured values and menus *(see Chapter 4.2, page 20)*.	**4** **Keypad** With a total of eight keys to operate the instrument *(see Chapter 4.4, page 24)*.
5 **Eyelet for carrying strap** As accessory for mobile applications.	

2.1 Instrument connectors

2.1.1 912 Conductometer

Figure 2 912 Conductometer - connectors

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

2.1.2 913 pH Meter

Figure 3 913 pH Meter - connectors

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

2.1.3 914 pH/Conductometer IS

Figure 4 914 pH/Conductometer (digital) - connectors

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

2.1.4 914 pH/Conductometer

Figure 5 914 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 power supply, data transmission and printing.

2.2 Application environment

pH Meter/Conductometer 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 protection marking. 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, **pH Meter/Conductometer** instruments can be placed in an instrument base console.

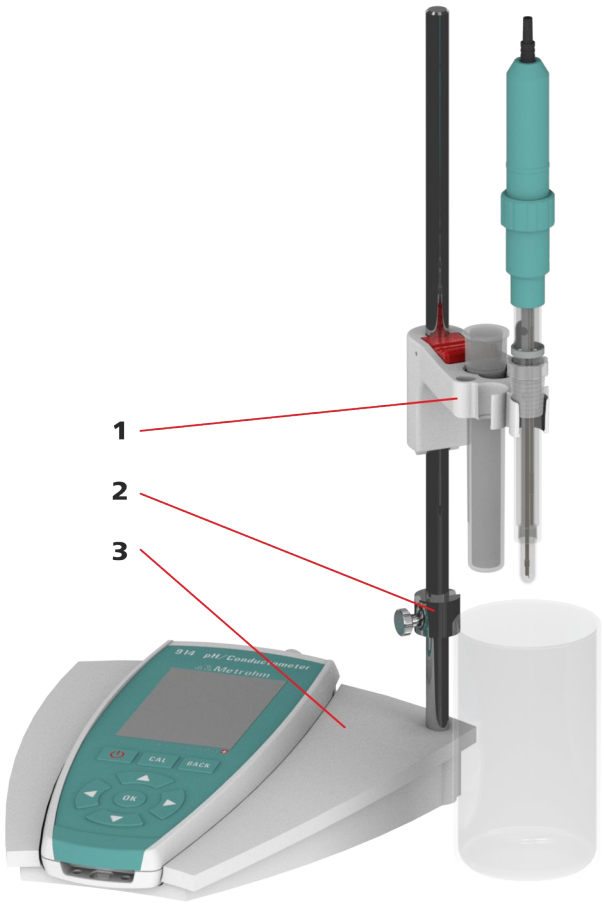


Figure 6 pH Meter/Conductometer in a laboratory setup

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

2.2.2 Mobile application

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

Figure 7 pH Meter/Conductometer 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

pH Meter/Conductometers 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 Power supply

The **pH Meter/Conductometer** is equipped with a built-in accumulator 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.

NOTE

Accumulator state of charge

You receive the accumulator in a partially charged state. However, you may have to charge it again before you can use the instrument for the first time.

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 car charger adapter (6.2166.500), which have been approved as accessories for use with this instrument.
- Your instrument's accumulator cannot be removed.
- Do not attempt to remove the accumulator from the instrument. To replace the accumulator, take the instrument to your nearest authorized Metrohm Service.
- Unauthorized replacement of the accumulator may result in a loss of the warranty.

NOTE

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 24)*.

3.2.1 Charging the accumulator

NOTE

Charge accumulator

The accumulator is charged **only** when the instrument is switched on.

Please observe the following procedure:

1. First, connect the USB cable to the supplied power supply unit, then the power supply unit to the socket, and then finally the mini USB connector of the cable to your instrument.
2. Switch on the instrument with the  .
3. When the accumulator is fully charged, disconnect the power supply unit first from the instrument and then from the socket.

or

If no power socket is available, you can also charge your instrument via the USB interface of a computer (PC) or a car charger adapter.

NOTE

Charging capacity

The charging process requires a minimum capacity of 500 mAh.

- Use a USB hub with external power supply or a suitable USB connector on the computer (PC).
- For mobile charging of the accumulator, use a car charger adapter from the Metrohm accessories (6.2166.500).

1. Connect the USB cable first to the computer and then to your instrument.
2. Then switch on the instrument.
3. As soon as the accumulator is fully charged, disconnect the USB cable first from the instrument and then from the computer.

NOTE

Accumulator condition

The accumulator 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 accumulator replaced.

3.2.2 Operation with power supply unit

You can operate the **pH Meter/Conductometer** 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.

NOTE

Charging the accumulator with a power supply

The accumulator 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 accumulator.

3.2.3 Operation via USB connector (PC)

NOTE

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 pH Meter/Conductometer 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 13)*.

3.3 Connecting sensors

Sensors can be connected while the instrument is running.

NOTE

Parameter setting

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

NOTE

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 Connecting a printer

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

NOTE

Printer function

The connected printer will only work if the **pH Meter/Conductometer** is connected to the power supply unit.

NOTE

Measuring signal interference

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

- With the Metrohm USB printer "Neos" (2.141.0100) there is no interference.
- Only use printers with a grounded power supply unit.

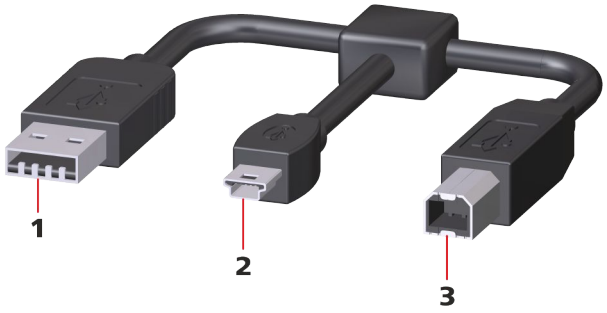


Figure 8 USB Y cable

1	**USB type A** Power supply unit connector for power supply.
2	**USB type B mini** Instrument connector **pH Meter/ Conductometer**.
3	**USB type B** Printer connector.

3.5 Initial configuration

3.5.1 Setting the Language

NOTE

"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 26)* on the main screen.

1 Use the or arrow key to select the entry point.

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

3 Use the arrow key to select the **Configuration** menu structure and use the OK key to change to the menu structure.

4 Use the arrow key to select the **Language** menu dialog and use the OK key to change to the selection dialog.

5 Use the or arrow key to select the required language and confirm with the OK key.

3.5.2 Setting the date and time

NOTE

"Date and time" factory setting

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

If the accumulator is deeply discharged, the system time will be reset to the default value.

Setting the date and time

You can access the menu structures via the **Menu** item *(see Figure 13, page 26)* on the main screen.

1 Use the or arrow key to select the entry point.

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

3 Use the arrow key to select the **Configuration** menu structure and use the OK key to change to the menu structure.

4 Use the  arrow key to select the **Date** or **Time** menu dialog and use the  key to change to the editing dialog.

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

5 Use the  ,  ,  and  arrow keys to select the required characters and confirm with the  key in each case.

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

4 Operation

4.1 Switching the instrument on and off

Switching on the instrument

Please 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.

4.2 Displays

The **pH Meter/Conductometer** has a total of four display types containing specific displays and/or operating functions.

- Main dialog
- Menu dialog
- Editing dialog
- Selection dialog

NOTE

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.

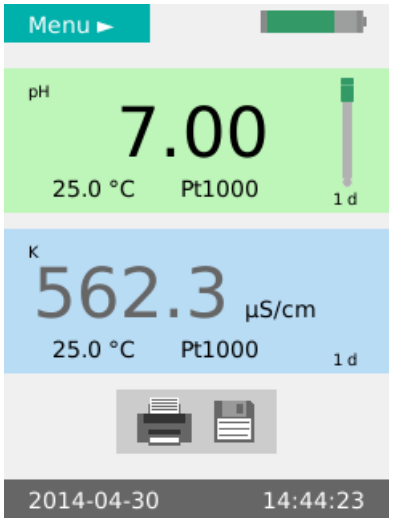


Figure 9 View - main dialog

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.

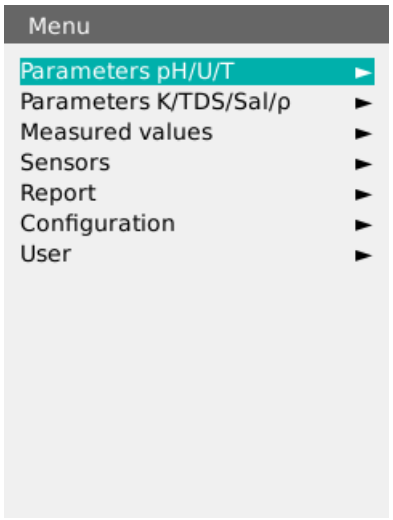


Figure 10 View - menu dialog

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.

NOTE

Capital letters and special characters

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

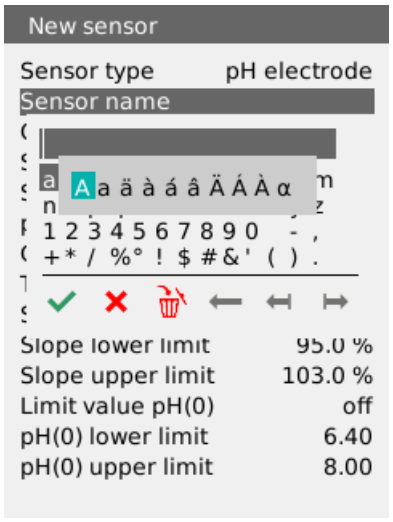


Figure 11 View - editing dialog

Selection dialog

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

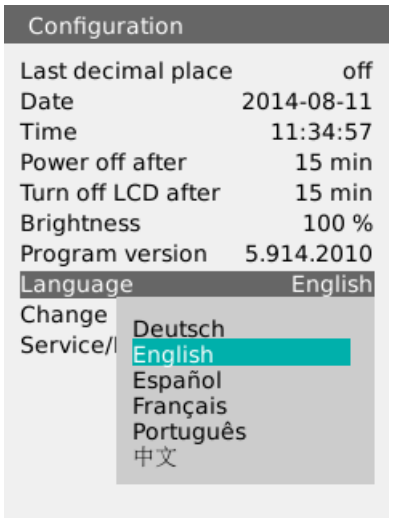


Figure 12 View - selection dialog

4.3 Status displays

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

4.3.1 Accumulator status

The accumulator status is displayed in five stages with colored graphical elements.

The accumulator is fully charged and charging is complete.

The accumulator is nearly fully charged but still charging.

The accumulator is 75% charged.

The accumulator is 50% charged.

The accumulator is 25% charged.

The accumulator is flat.

NOTE

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** 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 (at the 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 three colored graphical elements.

The criteria for the display status are set in the calibration parameters *(see Chapter 4.7.4, page 42)*.

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

The electrode is close to the limit value range.

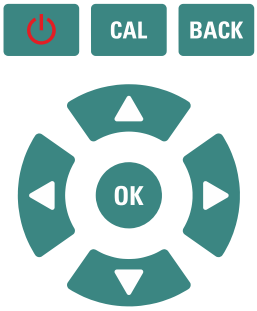
The limit value range is defined as follows.

- **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.

4.4 Control keys

Keypad



Switching the instrument on or off.

- To switch on, **briefly** press the pushbutton. The instrument starts.
- To switch off, **briefly** press the pushbutton. A message appears and the instrument switches off.

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

NOTE

Calibration

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

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

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.

NOTE

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

NOTE

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.

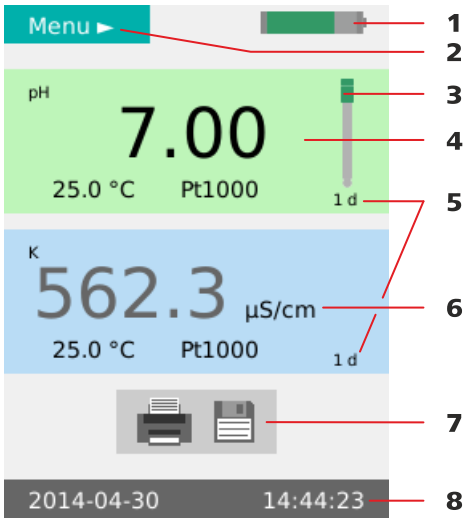


Figure 13 Operation - main dialog, two-channel

1 **Battery state of charge** *(see Chapter 4.3.1, page 23).*	**2** **Menu access** *(see "Accessing the menu structures", page 27).*
3 **Sensor condition** *(see Chapter 4.3.3, page 24).*	**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**

NOTE

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 27).*
- *(see "Toggling from one-channel to two-channel view", page 28).*

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.

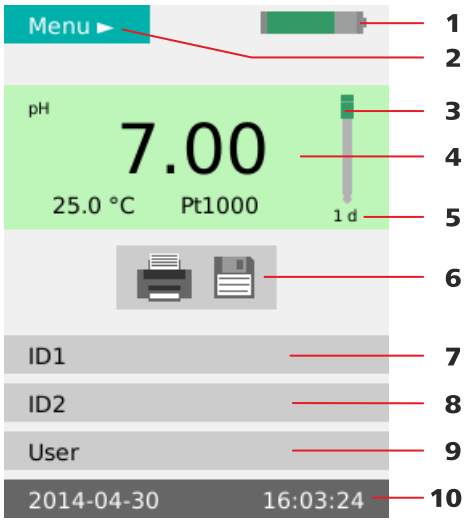


Figure 14 Operation - main dialog, one-channel

1 **Battery state of charge** *(see Chapter 4.3.1, page 23).*	**2** **Menu access** *(see "Accessing the menu structures", page 27).*
3 **Sensor condition** *(see Chapter 4.3.3, page 24).*	**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 **User** Input option for the user name or display of the preset value from the **User** menu dialog *(see Chapter 4.7.7, page 49).*	**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 *(14-**2**)* in the main dialog.

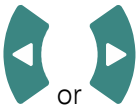
1 Select the entry point with the  or  arrow keys.

2 Use the OK 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 4.7.3, page 40).

4.5.4 Menu dialog

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

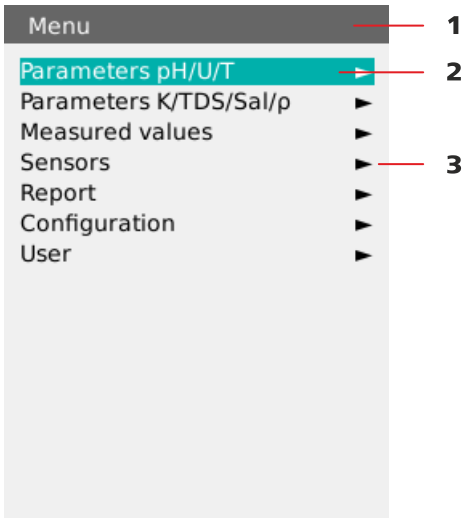


Figure 15 Operation - menu dialog

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 *(14-**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.

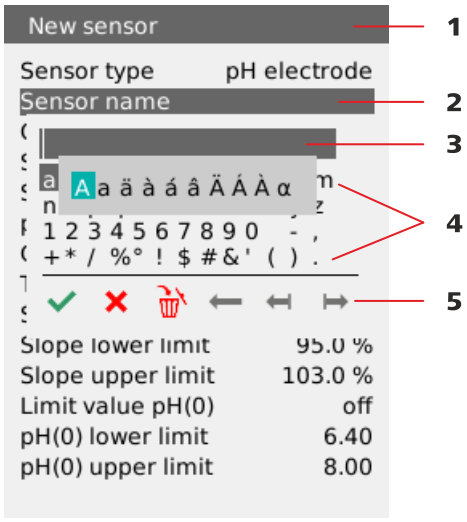


Figure 16 Operation - editing dialog

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.

NOTE

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.

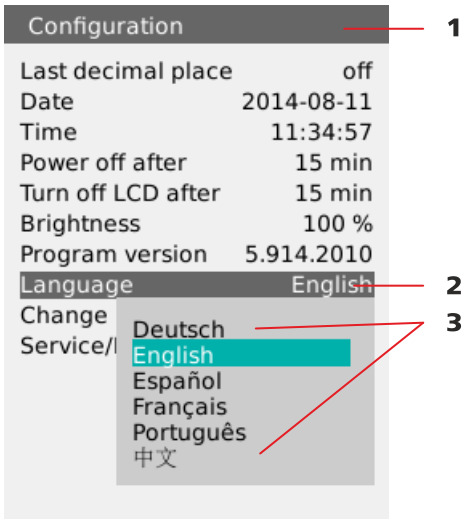


Figure 17 Operation - selection dialog

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 4.7.7, page 49)*.

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

pH Meter/Conductometer 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 34)
- **913 pH Meter**
  (see Chapter 4.6.2, page 35)
- **914 pH/Conductometer IS**
  (see Chapter 4.6.3, page 36)
- **914 pH/Conductometer**
  (see Chapter 4.6.4, page 37)

NOTE

Menu dialogs

The menu dialogs and the corresponding menu lines are described in more detail in the next chapter *(see Chapter 4.7, page 38)*.

4.6.1 912 Conductometer

Table 2 912 Conductometer – menu structures

Menu		
	Parameters K/TDS/Sal/ρ/T *(see Chapter 4.7.2, page 39)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see Chapter 4.7.3, page 40)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see Chapter 4.7.4, page 42)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see Chapter 4.7.5, page 47)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see Chapter 4.7.6, page 48)*	▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see Chapter 4.7.7, page 49)*	▪ 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 38)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see Chapter 4.7.3, page 40)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see Chapter 4.7.4, page 42)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see Chapter 4.7.5, page 47)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see Chapter 4.7.6, page 48)*	▪ Last decimal place ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see Chapter 4.7.7, page 49)*	▪ User ▪ Dialog type

4.6.3 914 pH/Conductometer IS

Table 4 914 pH/Conductometer IS – menu structures

Menu	**Parameters pH/U/T IS** *(see Chapter 4.7.1, page 38)*	▪ Measuring parameters ▪ Calibration param.
	Parameters K/TDS/Sal/ρ/T *(see Chapter 4.7.2, page 39)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see Chapter 4.7.3, page 40)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see Chapter 4.7.4, page 42)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see Chapter 4.7.5, page 47)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see Chapter 4.7.6, page 48)*	▪ Last decimal place ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see Chapter 4.7.7, page 49)*	▪ 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 38)*	▪ Measuring parameters ▪ Calibration param.
	Parameters K/TDS/Sal/ρ/T *(see Chapter 4.7.2, page 39)*	▪ Measuring parameters ▪ Calibration param.
	Measured values *(see Chapter 4.7.3, page 40)*	▪ Values ▪ Data ▪ Criterion ▪ Output date/time ▪ Output headers ▪ Calibration data
	Sensors *(see Chapter 4.7.4, page 42)*	▪ Sensor list ▪ New sensor ▪ Delete sensor
	Report *(see Chapter 4.7.5, page 47)*	▪ Report ▪ Line feed ▪ Printer
	Configuration *(see Chapter 4.7.6, page 48)*	▪ Last decimal place ▪ Date ▪ Time ▪ Power off after ▪ Turn off LCD after ▪ Brightness ▪ Program version ▪ Language **Service/Diagnosis**
	User *(see Chapter 4.7.7, page 49)*	▪ 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.

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: –1,500.0 - +1,500.0 mV ▪ **off**: is the default setting
Calibration param. ▸	*Menu dialog* for the **Calibration param.**.
Temperature	*Editing dialog* for the manual entry of the calibration temperature. ▪ Default value: **25.0 °C** / input range: 0.0 - 99.9 °C
Report	*Selection dialog* ▪ **on** ▪ **off**: is the default setting
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 66)* ▪ 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.

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, well water or surface water in accordance with DIN 38404-C8.
TDS factor	*Editing dialog* for entering the factor value for the TDS calculation.

	▪ Default value: **0.40** / input range: 0.40 - 1.00°C
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 - 99.9°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
Stand. conduct.	*Editing dialog* for entering the calibration standard value. ▪ Default value: **12.870 mS/cm** / input range: 0.0000 - 2,000.0 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 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 57)*.

- **save as PC/LIMS**
  The currently saved measured values will be saved on the instrument as PC/LIMS file *(see "PC/LIMS report", page 57)*.

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 - 999,999 s
  - **Stop time** in seconds
    Default value: **off** / input range: 1 - 999,999 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 - 999,999 s
  - Primary channel
    Selection dialog for selecting the measuring channel that has to fulfill the change criterion.

	▪ **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 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** or **Cond.**
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 setting ▪ **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 setting

4.7.4 Sensors

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

NOTE

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

NOTE

iTrodes

iTrodes sensors 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.

Sensor list ▸	An available sensor can be selected in the **Sensor list**. 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** ▪ **Temp. sensor** ▪ **Other sensor...**
Order number	*Editing dialog* for entering/modifying the **Order number**.

	Only displayed for **iTrodes**.
Serial number	*Editing dialog* for entering/modifying the **Serial number**. Only displayed for **iTrodes**.
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.
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: **30,000 Ω** / input range: 10,000 - 100,000 Ω – **B value** *Editing dialog* Default value: **4,100 K** / input range: 1,000 - 9,999 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: **95.00** / input range: 1.0 - 999.9%
pH **Slope upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **103.00** / 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
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 sensor name.
Order number	*Editing dialog* for entering **Order number**.
Serial number	*Editing dialog* for entering **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: **30,000 Ω** / input range: 10,000 - 100,000 Ω – **B value** *Editing dialog* Default value: **4,100 K** / input range: 1,000 - 9,999 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: **95.00** / input range: 1.0 - 999.9%
pH **Slope upper limit**	*Editing dialog* for entering the upper limit value. ▪ Default value: **103.00** / 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
Delete sensor	*Selection dialog* for deleting a sensor. The data will be irreversibly deleted.

4.7.5 Report

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

NOTE

Printer

pH Meter/Conductometer 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** ▪ **Sensors** ▪ **Configuration** ▪ **Parameters pH** ▪ **Parameters pH IS** ▪ **Parameters κ** ▪ **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 ▪ **Universal (ESC-POS)** Universal roll printer with variable settings: – **Paper width** 50 - 200 mm – **Print resolution** 100 - 600 dpi – **Print type** Line or Matrix

4.7.6 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.
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. The instrument shuts down automatically after this time. This function is disabled while the instrument is charged and 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.

4.7.7 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

NOTE

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 38)*. 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.

NOTE

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.)

NOTE

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

NOTE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows *(see Chapter 4.7.3, page 40)*:

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 27)*.

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.

NOTE

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)

NOTE

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 39)*.

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.

NOTE

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

NOTE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows *(see Chapter 4.7.3, page 40)*:

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 27)*.

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.

NOTE

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 Issuing reports/measured values

The **pH Meter/Conductometer** supports output of various printouts and data transfers for displaying the calibration and measured values.

4.10.1 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
    You can print out the measured values directly using the  or  button.
- Printing out saved values in the following areas as reports:
  - Calibration
  - Sensors
  - Configuration
  - Parameter
  - Measured values

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

NOTE

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.

4.10.2 PC/LIMS and CSV data transfer

NOTE

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.

NOTE

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.

NOTE

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

NOTE

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 in the instrument as follows and can be transferred to the PC 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

pH Meter/Conductometer 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 **pH Meter/Conductometer** 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.

NOTE

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*.

5.2 Quality management and qualification with Metrohm

Quality management

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software.

Qualification

Please contact your local Metrohm representative for support in qualification of instruments and software. The **Installation Qualification** (IQ) and **Operational Qualification** (OQ) are offered by Metrohm representatives as a service. They are carried out by trained employees using standardized qualification documents and in accordance with the currently applicable requirements of the regulated industry.

Maintenance

The electronic and mechanical modules of Metrohm instruments can and should be checked by specialist personnel from Metrohm as part of a regular preventive maintenance schedule. Please ask your local Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement.

For detailed information on this topic, please visit *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 or standard solutions.

A common cause of incorrect calibrations is, for example, the use of an old pH 10 or pH 12 buffer. The pH value of such buffers 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.

Device

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

The **pH Meter/Conductometer** 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 65)

6.2 Problems

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

NOTE

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.
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.
	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.
	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.

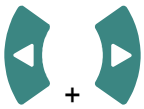
Problem	Cause	Remedy
	No hydrated layer is present on the glass membrane after measurements in water-free solutions.	▪ Hydrate the electrode between the measurements.
	The buffer solutions are not OK.	▪ Replace the buffer solutions.
	The sensor is "worn out".	▪ Replace the sensor.

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 can switch off the instrument using the following key combination for approx. two seconds:

-  +
- The instrument can be switched on again.

NOTE

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.

You can reset the instrument with the following key combination during startup:

-  +
- 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.

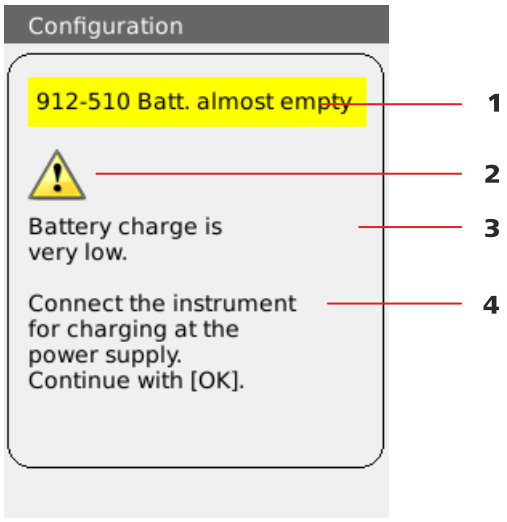


Figure 18 Example of a message

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

NOTE

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 temperature-dependent pH values of the most important commercially available pH buffer solutions are stored in **pH Meter/Conductometer** 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:

NOTE

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 6 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

NOTE

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, 2000)

Table 7 NIST buffer solutions

Temp. (°C)	NIST (according to DIN standard 19266, 2000)				
	pH 1,680	pH 4,008	pH 6,865	pH 9,184	pH 12,454
0	-	4,010	6,984	9,464	13,423
5	1,668	4,004	6,950	9,392	13,207
10	1,670	4,001	6,922	9,331	13,003
15	1,672	4,001	6,900	9,277	12,810
20	1,676	4,003	6,880	9,228	12,627
25	**1,680**	**4,008**	**6,865**	**9,184**	**12,454**
30	1,685	4,015	6,853	9,144	12,289
35	1,691	4,025	6,843	9,107	12,133
40	1,697	4,036	6,837	9,076	11,984
45	1,704	4,049	6,834	9,046	11,841
50	1,712	4,064	6,833	9,018	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	*1,732*	*4,108*	*6,840*	*8,941*	-
70	1,743	4,126	6,845	8,921	-
75	*1,754*	*4,145*	*6,852*	*8,902*	-
80	1,766	4,164	6,859	8,885	-
85	*1,778*	*4,185*	*6,867*	*8,867*	-
90	1,792	4,205	6,877	8,850	-
95	1,806	4,227	6,886	8,833	-

NOTE

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 8 DIN buffer solutions

Temp. (°C)	DIN (according to DIN standard 19267, 2012)					
	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*	*14.44*
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	-	-	-	-	-	-

NOTE

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.

7.1.4 Fisher

Table 9 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
65	-	*4.11*	*6.99*	*9.68*
70	-	*4.13*	*7.00*	*9.65*
75	-	*4.14*	*7.02*	*9.63*
80	-	*4.16*	*7.03*	*9.62*
85	-	*4.18*	*7.06*	*9.61*
90	-	*4.21*	*7.08*	*9.60*
95	-	*4.23*	*7.11*	*9.60*

NOTE

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.

7.1.5 Mettler Toledo

Table 10 Mettler Toledo buffer solutions

Temp. (°C)	Mettler Toledo pH 2.00	pH 4.01	pH 7.00	pH 9.21	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
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	-	*4.35*	*7.12*	*8.77*	-

NOTE

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.

7.1.6 Merck CertiPUR 20 / Titrisol

Table 11 Merck CertiPUR 20 / Titrisol buffer solutions

Temp.	Merck CertiPUR 20				
	pH	pH	pH	pH	pH
(°C)	2.000	4.000	7.000	9.000	12.000
0	2.010	4.050	7.130	9.240	12.580
5	2.010	4.040	7.070	9.160	12.410
10	2.010	4.020	7.050	9.110	12.260
15	2.000	4.010	7.020	9.050	12.100
20	**2.000**	**4.000**	**7.000**	**9.000**	**12.000**
25	2.000	4.010	6.980	8.950	11.880
30	2.000	4.010	6.980	8.910	11.720
35	2.000	4.010	6.960	8.880	11.670
40	2.000	4.010	6.950	8.850	11.540
45	*2.000*	*4.000*	*6.950*	*8.820*	*11.440*
50	2.000	4.000	6.950	8.790	11.330
55	*2.000*	*4.000*	*6.950*	*8.760*	*11.190*
60	2.000	4.000	6.960	8.730	11.040
65	*2.000*	*4.000*	*6.960*	*8.715*	*10.970*
70	2.010	4.000	6.960	8.700	10.900
75	*2.010*	*4.000*	*6.960*	*8.680*	*10.800*
80	2.010	4.000	6.970	8.660	10.700
85	*2.010*	*4.000*	*6.980*	*8.650*	*10.590*
90	2.010	4.000	7.000	8.640	10.480
95	-	*4.000*	*7.020*	-	-

NOTE

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 different manufacturers.

The CertiPUR 20 and Titrisol product lines have the identical values.

7.1.7 Merck CertiPUR 25

Table 12 Merck CertiPUR 25 buffer solutions

Temp. (°C)	Merck CertiPUR (25°C)			
	pH 4.00	pH 7.00	pH 9.00	pH 10.00
0	-	-	-	-
5	4.05	7.09	9.22	10.22
10	4.04	7.08	9.16	10.18
15	4.02	7.04	9.10	10.10
20	4.01	7.02	9.06	10.06
25	**4.00**	**7.00**	**9.00**	**10.00**
30	3.99	6.98	8.98	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
55	-	-	-	-
60	-	-	-	-
65	-	-	-	-
70	-	-	-	-
75	-	-	-	-
80	-	-	-	-
85	-	-	-	-
90	-	-	-	-
95	-	-	-	-

NOTE

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 different manufacturers.

7.1.8 Beckmann

Table 13 Beckmann buffer solutions

Temp. (°C)	Beckmann pH 4.00	Beckmann pH 7.00	Beckmann 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	7.02	10.06
25	**4.00**	**7.00**	**10.01**
30	4.01	6.99	9.97
35	4.02	6.99	9.93
40	4.03	6.98	9.89
45	4.05	6.98	9.86
50	4.06	6.97	9.83
55	4.08	6.98	-
60	4.09	6.98	-
65	4.11	6.99	-
70	4.12	6.99	-
75	4.14	7.00	-
80	4.16	7.00	-
85	4.18	7.01	-
90	4.19	7.02	-
95	4.21	7.03	-

NOTE

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.

7.1.9 Radiometer Analytical

Table 14 Radiometer Analytical buffer solutions

Temp. (°C)	Radiometer Analytical pH 1.679	pH 4.005	pH 7.000	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	9.011
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
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	8.885
85	1.778	4.183	7.018	8.867
90	1.792	4.210	7.034	8.850
95	-	4.240	-	-

NOTE

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.

7.1.10 Baker

Table 15 Baker buffer solutions

Temp. (°C)	Baker pH 4.00	Baker pH 7.00	Baker pH 9.00	Baker 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*
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
95	-	-	-	-

NOTE

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.

7.1.11 Hamilton DURACAL

Table 16 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
55	-	-	-	-
60	-	-	-	-
65	-	-	-	-
70	-	-	-	-
75	-	-	-	-
80	-	-	-	-
85	-	-	-	-
90	-	-	-	-
95	-	-	-	-

NOTE

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.

7.1.12 Fluka

Table 17 Fluka buffer solutions

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	9.970	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
95	4.000	*7.010*	*8.620*

NOTE

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.

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 18 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		T	x
2.914.010		pH/U/T	K/TDS/Sal[1)]/ρ/T		
2.914.020	pH/U/T		K/TDS/Sal[1)]/ρ/T	T	x

[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 19 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)
Supply voltage	–1200.0 mV - +1200.0 mV	0.1 mV	±0.2 mV
Conductance [3)]	0.1 µS - 500 mS	4 significant places	±0.5% at 0.1 µS - 16 µS ±0.5% at 16 µS - 1 mS ±1.0% at 1 mS - 500 mS

[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
- 10,000 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 million
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:
- Power supply
- Data transmission
  with USB cable (6.2151.110)
- Print
  with USB Y cable (6.2151.140)

8.5 Power supply

Lithium polymer accumulator	3.7 V, 3000 mAh The accumulator **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.

Car charger adapter	No. 6.2166.500 (optional accessories)
Nominal input voltage	12 V DC
Output voltage	5 V DC
Nominal output current	1,000 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 accumulator

NOTE

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 8.12, page 83)*.

Uptime	8 hours

8.8 Housing specification

Protection class IP 67 / DIN EN 60529 Dust-resistant and protected against temporary immersion in water

8.9 Safety specification

This instrument fulfills the following electrical safety requirements:

CE marking pursuant to the EU directive:
- 2014/35/EU (Low Voltage Directive, LVD)
- 2014/30/EU (EMC Directive, EMC)

Federal Inspectorate for Heavy Current Installations ESTI (Accreditation No. SCESp 033)
- Safety mark for certification type 2 in accordance with NEV (type testing with market monitoring, EMC conformity)

Design and testing According to EN/IEC/UL 61010-1, CSA-C22.2 No. 61010-1, protection class III, EN/IEC 60529, degree of protection IP67.

Safety instructions This document contains safety instructions which have to be followed by the user in order to ensure safe operation of the instrument.

8.10 Electromagnetic compatibility (EMC)

Emission Standards fulfilled:
- EN/IEC 61326-1
- EN/IEC 61000-6-3
- EN 55011 / CISPR 11

Immunity Standards fulfilled:
- EN/IEC 61326-1
- EN/IEC 61000-6-1
- EN/IEC 61000-4-2
- EN/IEC 61000-4-3
- EN/IEC 61000-4-4
- EN/IEC 61000-4-5
- EN/IEC 61000-4-6
- EN/IEC 61000-4-11
- EN/IEC 61000-4-14
- EN/IEC 61000-4-28

8.11 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)

8.12 Reference conditions

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

8.13 Dimensions/material

Dimensions	
Length	208 mm
Width	92 mm
Height	34 mm
Weight	400 g (net incl. accumulator)
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 on optional accessories for your instrument can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1 Type *http://partslists.metrohm.com* into your Internet browser.

The **Partslists** webpage will be displayed.

2 Select the desired output language.

3 Enter the article number (e.g. **Variable Produktnummer**) and click on the **Generate PDF** command.

The PDF file with the accessories data will be created in the language selected.

NOTE

When you receive your new instrument, 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 21)*.

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 21)*.

Menu dialog

Menu dialogs show an open menu structure with the corresponding menu lines *(see "Menu dialog", page 21)*.

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 33)*.

Selection dialog

In selection dialogs, you can select one option from a range of options *(see "Selection dialog", page 22)*.

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 4.10, page 56)*.

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