912/913/914 Meter



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912/913/914 Meter

Manual

Technical Communication Metrohm AG CH-9100 Herisau

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Table of contents

Table of contents

1	Introductio	n	1
	1.1 1.1.1 1.1.2 1.1.3	Product description Energy supply Interfaces Sensors	2 2
	1.2	Product versions	2
	1.3	Symbols and conventions	3
	1.4	Displaying accessories	4
2	Safety		5
	2.1	Intended use	5
	2.2	Responsibility of the operator	5
	2.3	Requirements for operating personnel	5
	2.4 2.4.1 2.4.2 2.4.3	Safety instructions General notes on safety Electrical safety Flammable solvents and chemicals	6 6
3	Overview o	of the instrument	8
	3.1 3.1.1 3.1.2 3.1.3 3.1.4	Instrument connectors 912 Conductometer 913 pH Meter 913 pH/DO Meter 914 pH/DO/Conductometer 914 pH/Conductometer	8 9 9
	3.2	Application environment	
	3.2.1 3.2.2	Laboratory use	
4	Installation	···	13
	4.1 4.1.1 4.1.2 4.1.3	Unpacking and inspecting the device Packaging Checks Application area	13 13
	4.2 4.2.1 4.2.2 4.2.3	Energy supply Charging the battery Operation with power supply unit Operation via USB connector (PC)	15 16
	4.3	Connecting the instrument to the power grid	17
	4.4	Connecting sensors	18

	4.5	Disconnecting sensors	18
	4.6	Connecting a printer	19
	4.7	Initial configuration	20
	4.7.1	Setting the Language	
	4.7.2	Setting the date and time	21
5	Operation		23
	5.1	Switching the instrument on and off	23
	5.2	Displays	23
	5.3	Status displays	27
	5.3.1	Rechargeable battery status	
	5.3.2	User rights	
	5.3.3	Sensor quality for pH electrodes	27
	5.3.4	Sensor status for DO sensors	28
	5.4	Control keys	28
	5.5	Basic operation	
	5.5.1	Main dialog with two measuring channels	
	5.5.2	Main dialog with one measuring channel	
	5.5.3	Operation in the main dialog	
	5.5.4 5.5.5	Menu dialog Editing dialog	
	5.5.6	Selection dialog	
	5.5.7	Changing the user	
	5.6	Menu structures	
	5.6.1	912 Conductometer	
	5.6.2	913 pH Meter	
	5.6.3	913 pH/DO Meter	
	5.6.4	914 pH/Conductometer	42
	5.6.5	914 pH/DO/Conductometer	43
	5.7	Menu dialogs	
	5.7.1	Parameters pH/U/T and Parameters pH/U/T IS	
	5.7.2	Parameters K/TDS/Sal/ρ/T	
	5.7.3	Parameters DO	
	5.7.4	Measured values	
	5.7.5 5.7.6	Sensors Report	
	5.7.7	Configuration	
	5.7.8	User	
	5.8	pH measurement	60
	5.8.1	pH electrode calibration	
	5.8.2	Measurement	61
	5.9	Conductivity measurement	63
	5.9.1	Determination of the cell constant (calibration)	
	5.9.2	Measurement	64

Table of contents

	5.10 5.10.1	Oxygen measurement Calibration	65
	5.10.2	Measurement	
	5.11	Issuing reports/measured values	
	5.11.1 5.11.2	Printing out PC/LIMS and CSV data transfer	
	5.11.2	r C/ Liivis and Csv data transfer	00
6	Operation a	and maintenance	71
	6.1	General notes	
	6.1.1	Care	
	6.1.2 6.1.3	Maintenance by Metrohm Service Sensor care	
_			
7	Troublesho		72
	7.1	General	
	7.2	Problems	
	7.2.1	Troubleshooting	73
	7.3	Restarting/resetting the device	
	7.3.1 7.3.2	Device reset	
	7.4	Messages	76
_			
8	Recycling a	nd disposal	77
8 9	Appendix	nd disposal	77 78
	, ,	nd disposal Saved buffer series	78
	Appendix 9.1 9.1.1	Saved buffer series Metrohm	78 78 79
	Appendix 9.1 9.1.1 9.1.2	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015)	78 78 79 80
	Appendix 9.1 9.1.1 9.1.2 9.1.3	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012)	78 78 79 80 81
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012)	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker Hamilton DURACAL	78
	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker	78
9	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11 9.1.12	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker Hamilton DURACAL	78
9	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11 9.1.12	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker Hamilton DURACAL Honeywell Fluka	7879818284848586868788
9	9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11 9.1.12 Technical sp	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker Hamilton DURACAL Honeywell Fluka	78798182848586878889
9	Appendix 9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11 9.1.12 Technical spanning and and an arrangements are also as a second and arrangements are also as a second arrangement are a	Saved buffer series Metrohm NIST (according to DIN standard 19266, 2015) DIN (according to DIN standard 19267, 2012) Fisher Mettler Toledo Merck CertiPUR 20 / Titrisol Merck CertiPUR 25 Beckmann Radiometer Analytical Baker Hamilton DURACAL Honeywell Fluka Decifications Measuring inputs	78798082848485868788899192

Table of contents

	10.5	Runtime with rechargeable battery	94
	10.6	TFT screen	94
	10.7	Interfaces	94
	10.8	Ambient conditions	95
	10.9	Reference conditions	95
	10.10	Dimensions/material	95
Glossa	ary		96
Index			97

Table of figures

Table of figures

Figure 1	912 Conductometer - connectors	8
Figure 2	913 pH Meter - Connectors	
Figure 3	pH/DO/Conductometer (digital) - Connectors	
Figure 4	914 pH/Conductometer (analog) - connectors	
Figure 5	912/913/914 Meter in a laboratory setup	11
Figure 6	912/913/914 Meter for mobile application	12
Figure 7	USB Y cable	20
Figure 8	View - Main dialog	24
Figure 9	View - Menu dialog	25
Figure 10	View - Editing dialog	25
Figure 11	View - Selection dialog	26
Figure 12	View - Standby display	26
Figure 13	Operation - Main dialog, two-channel pH and conductivity	30
Figure 14	Operation - Main dialog, two-channel pH and conductivity	31
Figure 15	Operation - Main dialog, one-channel pH	32
Figure 16	Operation - menu dialog	34
Figure 17	Operation - editing dialog	35
Figure 18	Operation - selection dialog	36
Figure 19	Example of a message	76

912/913/914 Meter VII

1 Introduction

1 Introduction

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



NOTE

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

1.1 Product description

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

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

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

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

913 pH Meter With an analog and a digital measuring channel each for measuring pH,

potential and temperature.

913 pH/DO Meter With an analog and a digital measuring channel each for measuring pH,

potential, temperature and oxygen.

914 pH/Conductome-

ter

With an analog measuring channel for measuring pH, potential and temperature and a measuring channel for measuring conductivity, TDS, salinity

and temperature.

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

TDS, salinity and temperature.

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

1.2 Product versions

1.1.1 Energy supply

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

1.1.2 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.

1.1.3 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 Product versions

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

Table 1 Produ	act versions	
2.912.0010	912 Conductometer	Device 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)	Device with standard accessories
2.913.0110	913 pH Meter (digital/analog)	Mobile version with accessories case
2.913.0210	913 pH Meter (digital/analog)	Laboratory version with stand plate
2.913.0020	913 pH/DO Meter (digital/analog)	Device with standard accessories
2.913.0120	913 pH/DO Meter (digital/analog)	Mobile version with accessories case
2.913.0220	913 pH/DO Meter (digital/analog)	Laboratory version with stand plate
2.914.0020	914 pH/Conductometer (pH analog)	Device with standard accessories
2.914.0120	914 pH/Conductometer (pH analog)	Mobile version with accessories case
2.914.0220	914 pH/Conductometer (pH analog)	Laboratory version with stand plate
2.914.0030	914 pH/DO/Conductometer (pH digital)	Device with standard accessories
2.914.0130	914 pH/DO/Conductometer (pH digital)	Mobile version with accessories case
2.914.0230	914 pH/DO/Conductometer (pH digital)	Laboratory version with stand plate

 1 Introduction

1.3 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
	Perform the steps one after the other.
Method	Dialog text , parameter in the software
File ► New	Menu or menu item
[Continue]	Button or key
	WARNING
	This symbol draws attention to a possible life-threat- ening hazard or risk of injury.
	WARNING
77	This symbol draws attention to a possible hazard due to electrical current.
	WARNING
<u></u>	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.
	WARNING
秦	Warning of optical radiation
Ω	CAUTION
	This symbol draws attention to possible damage to instruments or instrument parts.
f	NOTICE
	This symbol highlights additional information and tips.

1.4 Displaying accessories

1.4 Displaying accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1 Searching for a product on the website

- Go to https://www.metrohm.com.
- Click on Q.
- Enter the article number of the product (e.g. **2.1001.0010**) into the search field and press **[Enter]**.

The search result is displayed.

2 Displaying product information

- To display the products matching the search term, click on **Product models**.
- Click on the desired product.

Detailed information regarding the product is displayed.

3 Displaying accessories and downloading the accessories list

- To display the accessories, scroll down to Accessories and more.
 - The **scope of delivery** is displayed.
 - Click on **[Optional parts]** for the optional accessories.
- To download the accessories list, click on [Download accessories PDF] under Accessories and more.



NOTE

Metrohm recommends keeping the accessories list for reference purposes.

4 •••••• 912/913/914 Meter

2 Safety

2 Safety

2.1 Intended use

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

2.2 Responsibility of the operator

The operator must ensure that basic regulations on occupational safety and accident prevention in chemical laboratories are observed. The operator has the following responsibilities:

- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train staff on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. protective glasses, gloves).
- Provide suitable tools and equipment to carry out the work safely.

The product may be used only when it is in perfect condition. The following measures are required to ensure the safe operation of the product:

- Check the condition of the product before use.
- Remedy defects and malfunctions immediately.
- Maintain and clean the product regularly.

2.3 Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention for chemical laboratories are known and complied with.
- Knowledge of handling hazardous chemicals is present. Personnel have the ability to recognize and avoid potential dangers.
- Knowledge of how to apply fire prevention measures for laboratories is available.
- Safety-relevant information is communicated and understood. The personnel can operate the product safely.

2.4 Safety instructions

 The user documentation has been read and understood. The personnel operate the product according to the instructions in the user documentation.

2.4 Safety instructions

2.4.1 General notes on safety



WARNING

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

This device left the factory in a flawless state in terms of technical safety. The following instructions must be observed carefully to preserve this status and ensure non-hazardous operation of the device.

2.4.2 Electrical safety

Electrical safety when working with the device is ensured as part of the 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.

 2 Safety

Rechargeable battery / power supply unit



WARNING

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

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

Do not use the power supply unit outdoors.

2.4.3 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.

3.1 Instrument connectors

3 Overview of the instrument

3.1 Instrument connectors

3.1.1 912 Conductometer



Figure 1 912 Conductometer - connectors

1 Conductivity measuring cell Connection socket for conductivity measuring cells.

2 Type B mini USB connectorConnection socket for energy supply, data transmission and printing.

8 ======= 912/913/914 Meter

3 Overview of the instrument

3.1.2 913 pH Meter | 913 pH/DO Meter



Figure 2 913 pH Meter - Connectors

- 1 pH/mV electrode Connection socket for analog pH/mV electrodes.
- 3 pH/mV electrode | O₂ Lumitrode Connection socket for connecting iTrodes with 854 iConnect or the O₂ Lumitrode.
- 2 Temperature sensor / reference
- **4 Type B mini USB connector**Connection socket for energy supply, data transmission and printing.

3.1.3 914 pH/DO/Conductometer



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

- Conductivity measuring cell Connection socket for conductivity measuring cells.
- **3 Type B mini USB connector**Connection socket for energy supply, data transmission and printing.
- 2 pH/mV electrode | O₂ Lumitrode Connection socket for connecting iTrodes with 854 iConnect or the O₂ Lumitrode.

912/913/914 Meter **912**/913/914

1

3.1.4 914 pH/Conductometer



Figure 4 914 pH/Conductometer (analog) - connectors

1 pH/mV electrode

Connection socket for analog pH/mV electrodes.

3 Conductivity measuring cell

Connection socket for conductivity measuring cells.

2 Temperature sensor / reference

4 Type B mini USB connector

Connection socket for energy supply, data transmission and printing.

3.2 Application environment

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

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

3.2.1 Laboratory use

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

10 ----- 912/913/914 Meter

3 Overview of the instrument

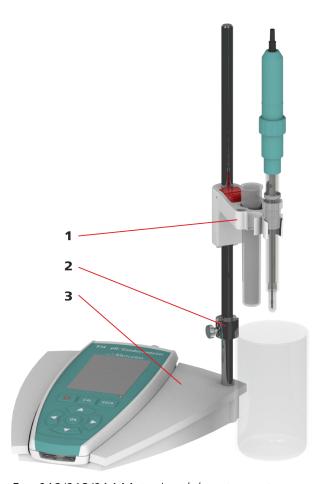


Figure 5 912/913/914 Meter in a laboratory setup

1 Electrode holder

2 Clamping ring

3 Stand plate

Consisting of receptacle base and support rod.

3.2.2 Mobile application

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



Figure 6 912/913/914 Meter for mobile application

1 Electrode holder

The holders can be inserted from both sides (left/right) of the instrument.

2 Eyelet for carrying strap

4 Installation

4 Installation

4.1 Unpacking and inspecting the device

4.1.1 Packaging

The product and accessories are supplied in protective special packaging. Keep this packaging to ensure safe transportation of the product. If a transport lock is present, keep this as well for future reuse.

4.1.2 Checks

Inspect the delivery immediately upon receipt:

- Check the delivery against the delivery note to ensure completeness.
- Check the product for damage.
- If the delivery is incomplete or damaged, contact your regional Metrohm representative.

4.1.3 Application area

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



CAUTION

Influence of weather conditions

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

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

4.2 Energy supply

4.2 Energy supply

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



NOTE

First charging of the device

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



CAUTION

Unauthorized manipulations

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

- For charging, only use the supplied power supply unit (6.2166.100) or the optional 12V USB adapter (6.2166.500), which have been approved as accessories for use with this device.
- Your device's rechargeable battery cannot be removed.
- Do not attempt to remove the rechargeable battery from the device.
 To replace the rechargeable battery, take the device to your nearest authorized Metrohm Service.
- Unauthorized replacement of the battery 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 5.4, page 28).



NOTE

Device in rechargeable battery operation

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

14 ----- 912/913/914 Meter

4 Installation

4.2.1 Charging the battery



NOTE

Charging capacity

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

- Power supply unit (6.2166.100), supplied
- USB connector on the computer (PC) or USB hub with external power supply
- 12 V USB adapter (6.2166.500) from Metrohm accessories
- Connect the USB cable to the supplied power supply unit or to the 12 V USB adapter.
- **2** Connect the power supply unit to the power outlet or the 12 V USB adapter to the 12 volt socket.

or

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

- **3** Connect the USB cable (mini USB connector) to the device.
 - The device starts and goes into standby mode.
 - The device battery is charged.
- As soon as the battery is fully charged, disconnect the power supply unit first from the device and then from the power outlet or from the USB connector of the computer (PC).



NOTE

Battery condition

The rechargeable battery performance may deteriorate over time.

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

912/913/914 Meter ----- 15

4.2 Energy supply

4.2.2 Operation with power supply unit

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



CAUTION

Measuring with power supply unit connected

Inappropriate power supply units interfere with the measuring signal. Use only the supplied power supply unit (6.2166.100) for measuring.



NOTE

Charging the battery with energy supply

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

4.2.3 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 912/913/914 Meter and PC before the measurement.

Operating the device with power supplied via a USB connector requires a minimum capacity of 500 mAh (see chapter 4.2.1, page 15).

16 ----- 912/913/914 Meter

4 Installation

4.3 Connecting the instrument to the power grid



WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 1.0 mm² / 18 AWG
- Power plug:
 - according to customer requirement (6.2122.XX0)
 - min. 10 A



NOTE

Do not use a not permitted power cord!

1 Plugging in the power cord

- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

912/913/914 Meter ----- 17

4.4 Connecting sensors

4.4 Connecting sensors



NOTE

Connecting the sensor

Sensors can be connected while the device is running.



NOTE

Parameter setting

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



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

4.5 **Disconnecting sensors**



CAUTION

Cable damage

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

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

18 ----- 912/913/914 Meter

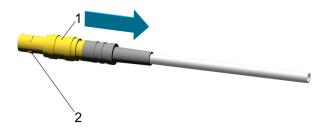
4 Installation



NOTE

Sensor cable with HF plug

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



1 Plug sleeve

2 Connector lock

4.6 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 **912/913/914 Meter** is connected to the power grid with 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 "Custom" there is no interference.
- Only use printers with a grounded power supply unit.

4.7 Initial configuration

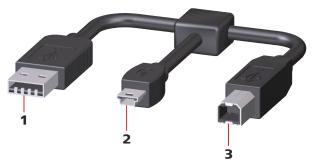


Figure 7 USB Y cable

1 USB type A

Power supply unit connector for energy supply.

3 USB type B

Printer connector.

2 USB type B mini

Device connector 912/913/914 Meter.

4.7 Initial configuration

The steps for switching the device on and off are described in the Operation chapter (see chapter 5.1, page 23).

4.7.1 Setting the Language



NOTE

"Language" factory setting

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

The following languages are available on the device:

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

Setting the Language

You can access the menu structures via the **Menu** item (see figure 13, page 30) in the main screen.

Select the entry point with the or arrow keys.

20 -----912/913/914 Meter

4 Installation



- Select the **Configuration** menu structure with the arrow key and change to the menu structure with the key.
- Select the **Language** menu dialog with the arrow key and change to the selection dialog with the key.
- Select the required language with the or arrow keys and confirm with the key.

4.7.2 Setting the date and time



NOTE

"Date and time" factory setting

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

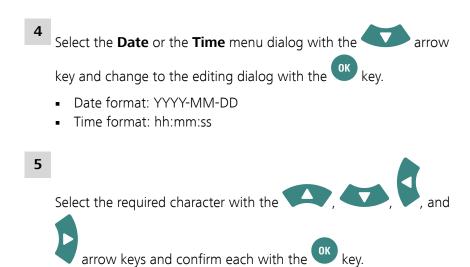
In case of deep discharge of the battery, the system time is reset to the default value.

Setting the date and time

You can access the menu structures via the **Menu** item (see figure 13, page 30) in the main screen.

- 1 Select the entry point with the or arrow keys.
- Use the key to change to the menu structures.
- Select the **Configuration** menu structure with the arrow key and change to the menu structure with the key.

4.7 Initial configuration



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

22 •••••• 912/913/914 Meter

5 Operation

5 Operation

5.1 Switching the instrument on and off

Switching on the instrument

Proceed as follows:



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

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

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

Switching off the instrument

1 Press the key.

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

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

5.2 Displays

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

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

5.2 Displays



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.

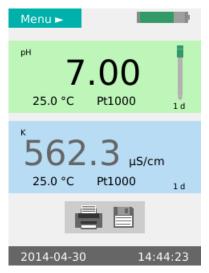


Figure 8 View - Main dialog

Menu dialog

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

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

24 ••••• 912/913/914 Meter

5 Operation

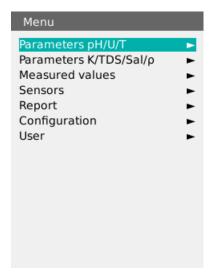
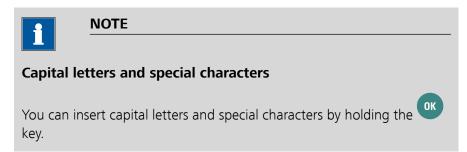


Figure 9 View - Menu dialog

Editing dialog

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

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



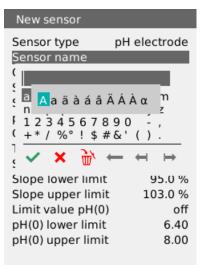


Figure 10 View - Editing dialog

Selection dialog

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

5.2 Displays



Figure 11 View - Selection dialog

Standby display

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

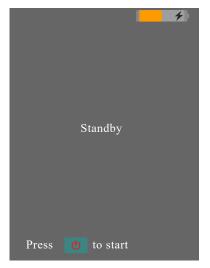


Figure 12 View - Standby display

5.3 Status displays

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

5.3.1 Rechargeable battery status

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



The battery is nearly full but still charging.

The battery is charged to 75%.

The battery is charged to 50%.

The battery is charged to 25%.

The battery is empty.



NOTE

Flash icon

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

5.3.2 User rights

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

1. Expert

Use of the instrument is unrestricted. All functions are available.

2. Routine

The **Configuration** and **Sensors** menu structures are locked.



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

5.3.3 Sensor quality for pH electrodes

The sensor quality is indicated with 3 colored graphical elements.

The criteria for the display status are set in the calibration parameters (see chapter 5.7.5, page 50).

5.4 Control keys

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.

5.3.4 Sensor status for DO sensors

The sensor quality is indicated with 3 colored graphical elements.

The criteria for the display status are specified in the system as function of the signal intensity (see chapter 5.7.5, page 50).

The signal intensity is in the correct range.

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

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

5.4 Control keys

Keypad



Switching the instrument on or off.

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

28 ------ 912/913/914 Meter

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

CAL

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



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.

5.5 Basic operation

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

5.5.1 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.

5.5 Basic operation



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.

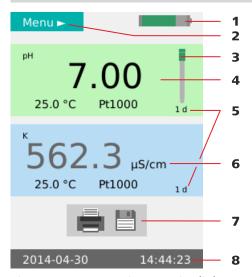


Figure 13 Operation - Main dialog, two-channel pH and conductivity

- **1** Battery state of charge (see chapter 5.3.1, page 27).
- **3** Sensor condition (see chapter 5.3.3, page 27).
- **5 Calibration interval display**Time in days until the next calibration is due.
- **7 Print/save measured value**Button for the functions **print, save** or **print+save**.

Both measured values are printed and/or saved.

- **2** Menu access (see "Accessing the menu structures", page 33).
- 4 Display measuring channel 1
- 6 Display measuring channel 2
- 8 Date/time display

30 •••••• 912/913/914 Meter

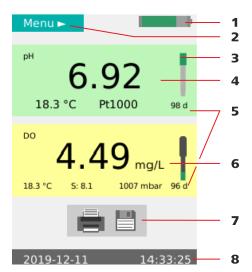


Figure 14 Operation - Main dialog, two-channel pH and conductivity

- **1** Battery state of charge (see chapter 5.3.1, page 27).
- **3 Sensor condition** (see chapter 5.3.3, page 27). (see chapter 5.3.4, page 28).
- **5 Calibration interval display**Time in days until the next calibration is due.
- 7 Print/save measured value
 Button for the functions print, save or
 print+save.

Both measured values are printed and/or saved.

- **Menu access**(see "Accessing the menu structures", page 33).
- 4 Display measuring channel 1
- 6 Display measuring channel 2
- 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 33).
- (see "Toggling from one-channel to two-channel view", page 33).

5.5 Basic operation

5.5.2 Main dialog with one measuring channel

The corresponding measuring channel is displayed according to the selection.

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

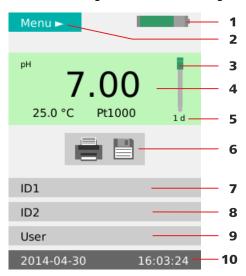


Figure 15 Operation - Main dialog, one-channel pH

1 Battery state of charge (see chapter 5.3.1, page 27).

3 Sensor condition (see chapter 5.3.3, page 27). (see chapter 5.3.4, page 28).

5 Calibration interval display

Time in days until the next calibration is due.

7 ID1

Input option for sample designation/identification (e.g. name, number, etc.).

9 Users

Input option for the user name or display of the preset value from the **User** menu dialog (see chapter 5.7.8, page 59).

2 Menu access

(see "Accessing the menu structures", page

4 Measuring channel display

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.

8 ID2

Input option for sample designation/identification (e.g. batch number, lot number, etc.).

10 Date/time display

32 •••••• 912/913/914 Meter

5.5.3 Operation in the main dialog

Accessing the menu structures

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

1 Select the entry point with the or arrow keys.

Use the key to change to the menu structures.

Toggling from one-channel to two-channel view

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

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

1

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

Printing and/or saving measured values

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

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

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

- Menu ► Measured values ► Values and
- Menu ► Measured values ► Data (see chapter 5.7.4, page 48).

5.5 Basic operation

5.5.4 Menu dialog

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

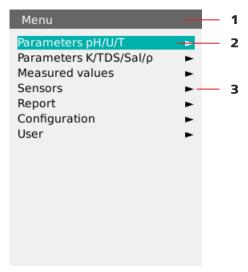


Figure 16 Operation - menu dialog

1 Menu title

The menu title indicates which menu structure is currently open.

3 Arrow icon

The arrow icon indicates that there are further substructures.

2 Menu line selected

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

Navigation in the menu structures

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

Select the desired menu line with the or arrow keys.

Change into the next substructure with the key.

Change back to the higher structure with the BACK key.

34 ••••• 912/913/914 Meter

5.5.5 Editing dialog

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

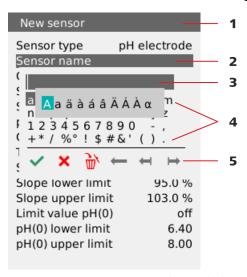


Figure 17 Operation - editing dialog

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



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



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



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



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



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



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

5.5 Basic operation -----



NOTE

Capital letters / special characters

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



5.5.6 **Selection dialog**

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

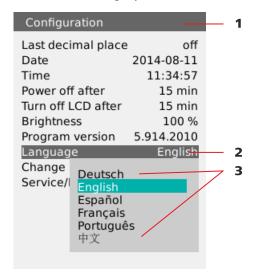


Figure 18 Operation - selection dialog

Menu title 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.
- Select the required data value with the or arrow keys.

36 -----912/913/914 Meter -----5 Operation

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



5.5.7 **Changing the user**

The user can be set to two different dialog types in the instrument (see chapter 5.7.8, page 59).

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.

5.6 Menu structures

5.6 Menu structures

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

- 912 Conductometer (see chapter 5.6.1, page 39)
- 913 pH Meter (see chapter 5.6.2, page 40)
- 913 pH/DO Meter (see chapter 5.6.3, page 41)
- 914 pH/Conductometer (see chapter 5.6.4, page 42)
- 914 pH/DO/Conductometer (see chapter 5.6.5, page 43)



NOTE

Menu dialogs

The menu dialogs and the corresponding menu lines are described in more detail in the next chapter (see chapter 5.7, page 44).

38 •••••• 912/913/914 Meter

5.6.1 912 Conductometer

Table 2 912 Conductometer – menu structures

Menu	Parameters K/TDS/Sal/ρ/T (see chapter 5.7.2, page 45)	Measuring parametersCalibration param.
	Measured values (see chapter 5.7.4, page 48)	 Values Data Criterion Output date/time Output headers Calibration data
	Sensors (see chapter 5.7.5, page 50)	Sensor listNew sensorDelete sensor
	Report (see chapter 5.7.6, page 57)	ReportLine feedPrinter
	Configuration (see chapter 5.7.7, page 58)	 Date Time Power off after Turn off LCD after Brightness Program version Language
	User	Service/Diagnosis User
	(see chapter 5.7.8, page 59)	 Dialog type

5.6 Menu structures

5.6.2 913 pH Meter

Table 3 913 pH Meter – Menu structures

Menu	Parameters pH/U/T	 Measuring parameters
	Parameters pH/U/T IS	 Calibration param.
	(see chapter 5.7.1, page 44)	
	Measured values	Values
	(see chapter 5.7.4, page 48)	DataCriterion
		 Output date/time
		Output headersCalibration data
	Sensors	 Sensor list
	(see chapter 5.7.5, page 50)	New sensorDelete sensor
	Report	■ Report
	(see chapter 5.7.6, page 57)	Line feedPrinter
	Configuration	Last decimal place
	(see chapter 5.7.7, page 58)	DateTime
		Power off after
		Turn off LCD afterBrightness
		Program version
		Language
		Service/Diagnosis
	User	 User
	(see chapter 5.7.8, page 59)	Dialog type

5.6.3 913 pH/DO Meter

Table 4 913 pH/DO Meter – Menu structures

Menu	Parameters pH/U/T	 Measuring parameters
	Parameters pH/U/T IS	 Calibration param.
	(see chapter 5.7.1, page 44)	
	Parameters DO	 Measuring parameters
	(see chapter 5.7.3, page 46)	 Calibration param.
	Measured values	Values
	(see chapter 5.7.4, page 48)	DataCriterionOutput date/timeOutput headersCalibration data
	Sensors (see chapter 5.7.5, page 50)	Sensor listNew sensorDelete sensor
	Report (see chapter 5.7.6, page 57)	ReportLine feedPrinter
	Configuration (see chapter 5.7.7, page 58)	 Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language
		Service/Diagnosis
	User (see chapter 5.7.8, page 59)	UserDialog type

5.6 Menu structures

5.6.4 914 pH/Conductometer

Table 5 914 pH/Conductometer – Menu structures

Menu	Parameters pH/U/T	 Measuring parameters
	(see chapter 5.7.1, page 44)	 Calibration param.
	Parameters K/TDS/Sal/ρ/T	Measuring parameters
	(see chapter 5.7.2, page 45)	 Calibration param.
	Measured values	Values
	(see chapter 5.7.4, page 48)	DataCriterion
		Output date/time
		Output headers
		 Calibration data
	Sensors	Sensor list
	(see chapter 5.7.5, page 50)	New sensorDelete sensor
	Report	ReportLine feed
	(see chapter 5.7.6, page 57)	Printer
	Configuration	■ Last decimal place
	(see chapter 5.7.7, page 58)	■ Date
		TimePower off after
		Turn off LCD after
		Brightness
		Program version
		Language
		Service/Diagnosis
	User	■ User
	(see chapter 5.7.8, page 59)	Dialog type

5.6.5 914 pH/DO/Conductometer

Table 6 914 pH/DO/Conductometer – Menu structures

Calibration param.	Menu	Parameters pH/U/T IS	 Measuring parameters
Parameters K/TDS/Sal/p/T (see chapter 5.7.2, page 45) Parameters DO (see chapter 5.7.3, page 46) Measured values (see chapter 5.7.4, page 48) Measured values (see chapter 5.7.4, page 48) Sensors (see chapter 5.7.5, page 50) Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration Configurat	Wicha	·	<u> </u>
Calibration param.		(see chapter 5.7.1, page 44)	<u>'</u>
Measuring parameters		Parameters K/TDS/Sal/ρ/T	
Calibration param.		(see chapter 5.7.2, page 45)	 Calibration param.
Values Data Criterion Output date/time Output headers Calibration data		Parameters DO	
(see chapter 5.7.4, page 48) Data Criterion Output date/time Output headers Calibration data Sensors (see chapter 5.7.5, page 50) Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User Dialog type		(see chapter 5.7.3, page 46)	 Calibration param.
Criterion Output date/time Output headers Calibration data Sensors (see chapter 5.7.5, page 50) Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Configuration Configuration See chapter 5.7.7, page 58) Configuration Configuration See chapter 5.7.7, page 58) Configuration See chapter 5.7.7, page 58) Configuration Configuration See chapter 5.7.7, page 58) Configuration Service/Diagnosis User Dialog type		Measured values	Values
- Output date/time - Output headers - Calibration data Sensors - Sensor list - New sensor - Delete sensor - Delete sensor - Line feed - Printer Configuration - (see chapter 5.7.7, page 58) Configuration - Last decimal place - Signal intensity DO - Date - Time - Power off after - Turn off LCD after - Brightness - Program version - Language - Change password - Service/Diagnosis User - Dialog type		(see chapter 5.7.4, page 48)	
- Output headers - Calibration data Sensors (see chapter 5.7.5, page 50) Report - Report - Report - Report - Line feed - Printer Configuration - Last decimal place - Signal intensity DO - Date - Time - Power off after - Turn off LCD after - Brightness - Program version - Language - Change password - Service/Diagnosis User - Dialog type			
Sensors (see chapter 5.7.5, page 50) Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Configuration Configuration Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User			·
 (see chapter 5.7.5, page 50) Report (see chapter 5.7.6, page 57) Report (see chapter 5.7.6, page 57) Line feed Printer Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User 			·
Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User Delete sensor Report Line feed Printer		Sensors	 Sensor list
Report (see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Configuration (see chapter 5.7.7, page 58) Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User Dialog type		(see chapter 5.7.5, page 50)	
 Line feed Printer Configuration (see chapter 5.7.7, page 58) Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User Dialog type 			 Delete sensor
(see chapter 5.7.6, page 57) Configuration (see chapter 5.7.7, page 58) Last decimal place Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User		Report	•
 (see chapter 5.7.7, page 58) Signal intensity DO Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User 		(see chapter 5.7.6, page 57)	
 Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User Dialog type 		Configuration	 Last decimal place
 Date Time Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User Dialog type 		(see chapter 5.7.7, page 58)	_
 Power off after Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User User Dialog type 			
 Turn off LCD after Brightness Program version Language Change password Service/Diagnosis User Dialog type 			
 Program version Language Change password Service/Diagnosis User Dialog type 			
 Language Change password Service/Diagnosis User Dialog type 			Brightness
 Change password Service/Diagnosis User Dialog type 			· ·
User User			 Language
User • User			<u> </u>
- Dialog type			
(see chapter 5.7.8 page 59) • Dialog type		User	
(see chapter s.r.o, page ss)		(see chapter 5.7.8, page 59)	 Dialog type

5.7 Menu dialogs

5.7.1 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.

5.7.1.1 Measuring parameters

Measuring parameters ►	Menu dialog for the Measuring parameters .
Measuring mode	Selection dialog for selecting the measuring mode.
	 pH The pH value is output. U The potential value is output in mV.
	T 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 measure-	Selection dialog
ment mV	 on: with the input field for the Reference with default value: 0.0 mV / input range: -1500.0 - +1500.0 mV off: is the default value

5.7.1.2 Calibration parameters

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

44 ••••• 912/913/914 Meter

Number of buf- fers	 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 9.1, page 78) If required, the preset values may be adjusted for the Special buffer type. Default value: 7 / input range: -19.999 - +19.999

5.7.2 Parameters K/TDS/Sal/ρ/T

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

5.7.2.1 Measuring parameters

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

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

5.7.2.2 Calibration parameters

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

5.7.3 Parameters DO

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

5.7.3.1 Measuring parameters

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

µmol/LDO
 The concentration [µmol/L] is output.
mbar DO
 The partial pressure [mbar] is output.
Torr DO
 The partial pressure [Torr] is output.
dphi
 The phase angle [°] is output.
Display field with the name of the connected sensor.
Display field with the sensor's Order number.
Display field with the sensor's Serial number.
Display field with the sensor's Order no. cap.
Display field with the sensor's Serial no. cap.
Editing dialog for automatically or manually selecting and entering the temperature compensation.

Temp. compens. Editi

■ Default value: **Auto** / input range: -9.9 - +60.0 °C

Sal. compens.

Sensor name

Order number

Serial number

Order no. cap

Serial no. cap

Editing dialog for automatically or manually selecting and entering the salinity compensation.

■ Default value: **0.0** / input range: Auto / 0.0 - 70.0 PSU

Air press. comp.

Editing dialog for automatically or manually selecting and entering the atmospheric pressure compensation.

Default value: Auto / input range: 300 - 1,200 mbar

5.7.3.2 Calibration parameters

Calibration param. ►

Calibration points

Selection dialog for the Calibration points.

• 0%, 100%: default value
• 100%

Temp. compens.

Editing dialog for automatically or manually selecting and entering the temperature compensation.

• Default value: Auto / input range: -9.9 - +60.0 °C

Editing dialog for automatically or manually selecting and entering the atmospheric pressure compensation.

• Default value: Auto / input range: 300 - 1,200 mbar

Report

Selection dialog

- on
- **off**: is the default value

5.7.4 Measured values

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

Values

- 1. Selection dialog for viewing and deleting the **Values** on the instrument.
- 2. *Selection dialog* to indicate how the **Values** are to be saved on the instrument for output.

view

The measured values are shown individually on the display and can be toggled individually with the arrow keys.

In addition, you can navigate in the measured value list as follows using the



- 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

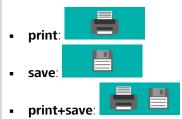
The currently saved measured values will be saved on the instrument as a CSV file (see "CSV file", page 69).

save as PC/LIMS

The currently saved measured values will be saved on the instrument as PC/LIMS file (see "PC/LIMS report", page 69).

Data

Selection dialog to indicate whether the **Data** are to be printed and/or saved.



Criterion

Selection dialog to indicate when the **Measured values** are applied during the measurement.

immediately

The displayed measured value will be immediately applied.

48 ------ 912/913/914 Meter

time-dependent

The measured value will be applied during a **Time interval** that can be set. For the PC/LIMS report, the individual measured values are grouped in a data group.

The interval ends after the **Stop time** has been achieved.

The parameters are as follows:

- **Time interval** in seconds

Default value: 4 s / input range: 1 - 999999 s

Stop time in seconds

Default value: off / input range: 1 - 999999 s

when changed

The subsequent measured value will only be applied automatically if the deviation from the previous measured value is greater than the value **delta pH/T/mV/K** defined here.

- Delta pH

Default value: **0.50 pH** / input range: 0.10 - 16.00 pH

Delta T(pH)

Default value: 0.5 °C / input range: 0.1 - 100.0 °C

Delta mV

Default value: 30.0 mV / input range: 0.1 - 999.9 mV

- Delta κ

Default value: **0.1 mS/cm** / input range: 0.0001 - 10 mS/cm

Delta T(κ)

Default value: 0.5 °C / input range: 0.1 - 100.0 °C

- Stop time

Default value: off / input range: 1 - 999999 s

Primary channel

Selection dialog for selecting the measuring channel that has to fulfill the change criterion.

- Delta DO

Default value: 0.5 mg/L / input range: 0.1 - 99 mg/L

- Delta % air sat

Default value: 10% / input range: 1 - 500%

drift-dependent

The measured value will be applied when the value is stable according to the drift criterion.

The drift thresholds are preset and cannot be changed:

- pH measurement: 0.028 pH/min
- Potential measurement U/mV: 1.875 mV/min
- Temperature measurement T/°C: 0.974 °C/min
- Oxygen measurement DO 0.24 mg/L/min

For the conductivity, various drift thresholds are stored (depending on the measuring range):

- 0.005 mS/cm/min in the measuring range up to 16 μ S/cm
- 0.5 mS/cm/min in the measuring range from 16 μ S/cm to 1 mS/cm
- 10 mS/cm/min in the measuring range from 1 mS/cm

For instruments with two measuring channels, the primary measuring channel for the fulfillment of the drift criterion has to be selected.

Primary channel
 Selection dialog for selecting the measuring channel that has to fulfill the drift criterion.

pH/mV pH/mV IS Cond. DO IS

Output date/time

Selection dialog for selecting whether a time stamp is to be assigned to a measured value.

- **on**: Measured values contain a time stamp on the report.
- **off**: Measured values do not contain a time stamp on the report.

Default value: off

Output headers

Selection dialog for selecting how the headers are output.

- once
- always: is the default value
- off

Calibration data

Selection dialog for selecting whether the main Calibration data is assigned for the output of the measured values.

- or
- **off**: is the default value

5.7.5 Sensors

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

50 ----- 912/913/914 Meter



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



NOTE

iTrodes and O2 Lumitrode

Sensors of the **iTrodes** product line and the **O₂ Lumitrode** contain their own data in the data memory which becomes available directly in the sensor data when the sensors are connected to the instrument.

Some of this data cannot be edited.



NOTE

Sensor data

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

5.7.5.1 Sensors

Sensors ▶

An available sensor can be selected in **Sensors**. The individual menu lines are then also available corresponding to the selected sensor.

Selection

Selection dialog for selecting an identified sensor for editing and displaying the individual data.

- k default
- metal def.
- pH default
- temp default

912/913/914 Meter ----- 51

	• etc. Additional sensors entered by the user.
Sensor name	Editing dialog for changing the sensor name.
Sensor type	Display field for the sensor type.
	 pH electrode Conductivity Metal electrode Oxygen sensor Temp. sensor Other sensor
Order number	Editing dialog for entering/modifying the Order number .
	Only displayed for iTrodes and Oxygen sensor.
Serial number	Editing dialog for entering/modifying the Serial number .
	Only displayed for iTrodes and Oxygen sensor.
DO Order no. cap	Editing dialog for entering/modifying the Order no. cap .
DO Serial no. cap	Editing dialog for entering/modifying the Serial no. cap .
Firmware mod DO ule	Display field indicating the firmware version of the oxygen sensor.
pH Slope	Editing dialog for entering/modifying the Slope .
	• Default value: 100.00 / input range: 0.10 - 990.00%
<mark>рН</mark> _{рН(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 tem	Display field indicating the reference temperature in °C.
K Temp. comper	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. calibra- tion	Display field indicating the measurement method for temperature measurement of the last calibration.
DO Cal. dphi 100 %	Editing dialog for entering/modifying the Cal. dphi 100 %. Input range: 15.000 - 30.000
DO Cal. dphi 0 %	Editing dialog for entering/modifying the Cal. dphi 0 %. Input range: 45.000 - 60.000
Cal. temp. 100 DO %	Editing dialog for entering/modifying the Cal. temp. 100 %. ■ Input range: 0.000 - 99.999 °C
DO Cal. temp. 0 %	Editing dialog for entering/modifying the Cal. temp. 0 %. ■ Input range: 0.000 - 99.999 °C
DO Calibr. press.	Editing dialog for entering/modifying the Cal. dphi 100 %. Input range: 300.000 - 1200.000 mbar
Calibration date	Display field for the last Calibration date.
Calibration time	Display field for the last Calibration time.
Calibration inter- val	 Editing dialog for entering time in days for the Calibration interval. Default value: off / input range: 1 - 999 d off disables the Calibration interval.
Temp. sensor	Selection dialog to indicate the temperature sensor type for the respective sensor. • Pt1000: is the default value • NTC • R(25°C) • Editing dialog • Default value: $30000 \ \Omega$ / input range: $10000 - 100000 \ \Omega$ • B value • Editing dialog • Default value: $4100 \ K$ / input range: $1000 - 9999 \ K$
PH Slope limit value	 Selection dialog for selecting whether the limit value is to be applied. on: is the default value off
PH Slope lower limit	Editing dialog for entering the lower limit value. ■ Default value: 95.0 / input range: 1.0 - 999.9%

Slope upper PH limit	Editing dialog for entering the upper limit value. Default value: 103.0 / input range: 1.0 - 999.9%
Limit value PH 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(0) upper pH 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
Temperature off- DO set	 Editing dialog for entering/modifying the Temperature offset. Default value: 0.0 °C Input range: -5.0 - +5.0 °C
LED intensity DO (%)	 Selection dialog for selecting the LED intensity (%). 10 % 20 %: is the default value 30 %
DO Cap type	Display field for the Cap type. ■ e.g. MA7-530-200
Limit value dphi DO 100 %	 Selection dialog for selecting whether the limit value is to be applied. on: is the default value off
DO lower limit	Editing dialog for the lower limit . Default value: 15 ° / input range: 15.0 - 30.0 °

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

5.7.5.2 New sensor

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

	 Pt1000 NTC R(25°C) Editing dialog Default value: 30000 Ω / input range: 10000 - 100000 Ω B value Editing dialog Default value: 4100 K / input range: 1000 - 9999 K
PH Slope limit value	 Selection dialog for selecting whether the limit value is to be applied. on off: is the default value
PH Slope lower limit	Editing dialog for entering the lower limit value.
	• Default value: 95.0 / input range: 1.0 - 999.9%
Slope upper PH limit	Editing dialog for entering the upper limit value.Default value: 103.0 / input range: 1.0 - 999.9%
Limit value PH 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(0) upper	Editing dialog for entering the upper limit value.
PH limit	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

5.7.5.3 Delete sensor

Delete sensor

Selection dialog for deleting a sensor.

The data will be irreversibly deleted.

5.7.6 Report

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



NOTE

Printer

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

Report

Selection dialog for data output in the Report.

- Calibration pH
- Calibration pH IS
- Calibration κ
- Calibration DO
- Sensors
- Configuration
- Parameters pH
- Parameters pH IS
- Parameters κ
- Parameters DO
- Meas. values
- All reports

Line feed

Editing dialog to indicate the lines to be inserted at the end of the report.

• Default value: 2 lines / input range: 0 - 99 lines

Printer

Selection dialog to indicate the printer for report output.

HP Officejet Pro

Page printer with paper size A4

HP Laserjet Pro

Page printer with paper size A4

Epson (ESC-POS)

Roll printer with paper width 80 mm

Seiko (ESC-POS)

Roll printer with paper width 110 mm

Citizen (ESC-POS)

Roll printer with paper width 80 mm

Custom (ESC-POS)

Roll printer with paper width 60 mm

Epson TM-U220B

Roll printer with paper width 76 mm

Universal (ESC-POS)

Universal roll printer with variable settings:

Paper width

50 - 200 mm

Print resolution

100 - 600 dpi

Print type

Line or Matrix

5.7.7 Configuration

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

Last decimal place

Selection dialog for selecting whether the **Last decimal place** is displayed for the **pH measured values** with three digits at most.

Drift value monitoring is not influenced by this setting.

• **on**: Last decimal place is displayed.

off: Last decimal place is not displayed.

Signal intensity DO

on: default value

off

Date

Editing dialog for entering the system date.

Date format: YYYY-MM-DD

Time

Editing dialog for entering the system time.

Time format: hh:mm:ss

Power off after

Editing dialog for entering the time for the function **Power off after** x minutes. After this time, the instrument shuts down automatically or goes into standby mode.

This function is disabled during time-dependent recording of measured values with a set time interval.

• Default value: 15 / input range: 1 - 60, or

• **off** for continuous operation.

Turn off LCD after

Editing dialog for entering the time for the function **Turn off LCD after** x minutes. The display turns of <u>after</u> 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.

58 ------ 912/913/914 Meter

	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 .
	 Old password New password Confirm
Service/Diagnosis ▶	Menu dialog with password-protected access for Metrohm Service.
Password	Password entry for the Service/Diagnosis menu functions.

5.7.8 User

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

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

5.8 pH measurement

5.8 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.

5.8.1 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 5.7.1, page 44). 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



key.

3 Result of the calibration

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

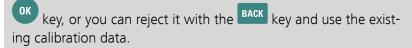


NOTE

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



5.8.2 Measurement



NOTE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows (see chapter 5.7.4, page 48):

1 Selecting the printout criterion

912/913/914 Meter ------ 61

5.8 pH measurement

• 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 5.5.3, page 33).

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.

62 •••••• 912/913/914 Meter

5 Operation

5.9 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.

5.9.1 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 5.7.2, page 45).

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 key.

912/913/914 Meter **----- 63**

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



key, or you can reject it with the RACK key.



5.9.2 Measurement



NOTE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows (see chapter 5.7.4, page 48):

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 5.5.3, page 33).

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.

64 -----912/913/914 Meter 5 Operation

Trigger printing and/or saving of the measured value with the kev.



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.

5.10 Oxygen measurement

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

5.10.1 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.

Calibration

The calibration parameters are set to default values (see chapter 5.7.3, page 46).

912/913/914 Meter **----- 65**

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

1 Starting a calibration with 100% air saturation

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

2 Continuing the calibration with 0% oxygen standard

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

3 Result of the calibration

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



NOTE

Limit values exceeded

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

5 Operation

5.10.2 Measurement



NOTE

Measured value criteria

You can set the various criteria for defining the measured value determination as follows (see chapter 5.7.4, page 48):

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 5.5.3, page 33).

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.

912/913/914 Meter **----- 67**

5.11 Issuing reports/measured values

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

5.11.1 Printing out

The printouts are divided into various groups:

- Printing out values directly after generation:
 - Calibration data

Calibration data can be printed out if **on** is selected under:

Menu ▶ Parameters X ▶ Calibration param. ▶ Report

buttons.

Measured values
 Direct printing of the measured values can be done with the



- Printing out saved values in the following areas as reports:
 - Calibration
 - Sensors
 - Configuration
 - Parameters
 - Measured values

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

Menu ► Report



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.

5.11.2 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.

5 Operation



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

DO sensor

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



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

912/913/914 Meter **----- 69**

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 on the instrument as follows and can be transferred to the computer for evaluation and report generation:

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

70 ----- 912/913/914 Meter

6 Operation and maintenance

6.1 General notes

6.1.1 Care

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

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



CAUTION

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

6.1.2 Maintenance by Metrohm Service

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

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

6.1.3 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.

7.1 General

7 Troubleshooting

7.1 General

If you experience problems during measurements, then their cause may be

found at different places:

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 device

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 solu-

tions or standard solutions.

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

from the air.

Sensors The sensors are the most important element in the entire measuring sys-

tem.

Please read the corresponding leaflets on how to handle sensors correctly.

Device If the 912/913/914 Meter may possibly be the cause of a measuring

problem, then start by checking all configuration settings and parameter

settings.

The **912/913/914 Meter** will notify you of problems with respective

messages directly during operation.

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

(see chapter 7.4, page 76)

72 ----- 912/913/914 Meter

7 Troubleshooting

7.2 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.

7.2.1 Troubleshooting

Problem	Cause	Remedy			
Measured value set- ting is sluggish.	The glass membrane or the diaphragm is contaminated.	 Clean the electrode following the instructions in the leaflet. 			
No measuring sig- nal.	The sensor is not connected.	 Connect the sensor. 			
	The incorrect measuring channel was selected.	 Select the corresponding measuring chan- nel. 			
	The sensor is defective.	Replace the sensor.			
	The cable is defective.	Replace the cable.			
	The electrode's reference system contains air.	 Repair the electrode following the instructions in the leaflet. 			
	The measuring input and/or the measuring channel is defective.	 Send the measuring device to your regional Metrohm service representative for checks and, if necessary, repair. 			
The instrument does not start.	The device battery is not charged.	 Connect the device to the power supply unit to charge it. The battery is charged only when the device 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. 			

7.2 Problems

Problem	Cause	Remedy
	The pH value or the temperature of the measuring solution is not stable.	Measure under exclusion of air.Control the temperature of the measuring solution.
	The conductivity is too low because of an unsuitable sensor.	Use the correct sensor.
	The measurement takes place in an organic solution.	Use the correct sensor.
	A non-Metrohm power supply unit is connected for charging the battery.	 Use only the power supply unit provided during measurement operation.
	The O_2 cap is worn out.	■ Use a new O ₂ cap.
The measured value is evidently wrong.	The pH calibration is faulty.	 Check and/or repeat the calibration. Check and/or replace the buffer. Check the buffer selection in the settings.
	Conductivity calibration is faulty.	 Check and/or repeat the calibration. Check the default value. Check the value for the reference temperature. Check the value for temperature compensation.
	The DO calibration is faulty.	 Check and/or repeat the calibration. Check the value for temperature compensation. Check the value for atmospheric pressure compensation.
	The temperature input is wrong.	Enter the correct measuring temperature.
	The wrong temperature sensor type is selected.	 Check the temperature sensor type (Pt1000 or NTC) and select the correct one, if nec- essary.
	The glass membrane or the diaphragm is contaminated.	 Clean the membrane or the diaphragm fol- lowing the instructions in the correspond- ing leaflet.
	The electrolyte is overaged.	Replace the electrolyte.

74 ------ 912/913/914 Meter

7 Troubleshooting

Problem	Cause	Remedy
	The sensor is defective.	Replace the sensor.
The slope is insufficient during calibration.	The glass membrane or the diaphragm is contaminated.	 Clean the electrode following the instructions in the leaflet.
	The hydrated layer of the glass membrane is reduced by anhydrous solutions.	 Immerse the glass membrane in deionized water for 5 min to restore the hydrated layer.
	The buffer solutions are not OK.	Replace the buffer solutions.
	The sensor is "worn out".	Replace the sensor.

7.3 Restarting/resetting the device

7.3.1 Device reset

In case of a malfunction, it may happen that the device will no longer function correctly and will also not be able to be switched off.

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



The device can be switched on again.



NOTE

Data storage

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

7.3.2 Resetting the device to factory settings

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

7.4 Messages



CAUTION

User data

The user data will be irreversibly deleted.

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



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

7.4 Messages

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

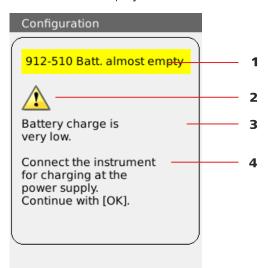


Figure 19 Example of a message

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



NOTE

Message number

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

76 ----- 912/913/914 Meter

8 Recycling and disposal

8 Recycling and disposal



Properly dispose of chemicals and of the product to reduce negative effects on the environment and public health. Local authorities, waste disposal companies or dealers provide more detailed information on disposal. Observe the WEEE EU directive (WEEE = Waste Electrical and Electronic Equipment) for the proper disposal of waste electronic equipment within the European Union.

9 Appendix

9.1 Saved buffer series

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

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

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



CAUTION

Buffer quality

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

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



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.

78 ----- 912/913/914 Meter

9 Appendix

9.1.1 Metrohm

Table 7 Metrohm buffer solutions

	Metrohm			
Temp.	рН	рН	рН	
(°C)	4.00	7.00	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.

9.1.2 NIST (according to DIN standard 19266, 2015)

Table 8 NIST buffer solutions

NIST (according to DIN standard 19266, 2015-05)					
рН	рН	рН	рН	рН	
1.679	4.005	6.865	9.180	12.454	
1.666	4.000	6.984	9.464	-	
1.668	3.998	6.951	9.395	13.207	
1.670	3.997	6.923	9.332	13.003	
1.672	3.998	6.900	9.276	12.810	
1.675	4.000	6.881	9.225	12.627	
1.679	4.005	6.865	9.180	12.454	
1.683	4.011	6.853	9.139	12.289	
1.688	4.018	6.844	9.102	12.133	
1.694	4.027	6.838	9.068	11.984	
1.700	4.038	6.836	9.040	11.841	
1.707	4.050	6.833	9.011	11.705	
1.715	4.075	6.834	8.985	11.574	
1.723	4.091	6.836	8.962	11.449	
1.733	4.108	6.841	8.942	-	
1.743	4.126	6.845	8.921	-	
1.754	4.145	6.852	8.903	-	
1.766	4.164	6.859	8.885	-	
1.779	4.184	6.868	8.868	-	
1.792	4.205	6.877	8.850	-	
1.806	4.227	6.886	8.833	-	
	pH 1.679 1.666 1.668 1.670 1.672 1.675 1.679 1.683 1.688 1.694 1.700 1.707 1.715 1.723 1.743 1.743 1.754 1.766 1.779 1.792	pH pH 1.679 4.005 1.666 4.000 1.668 3.998 1.670 3.997 1.672 3.998 1.675 4.000 1.679 4.005 1.683 4.011 1.688 4.018 1.694 4.027 1.700 4.038 1.707 4.050 1.715 4.075 1.723 4.091 1.733 4.108 1.743 4.126 1.754 4.145 1.766 4.164 1.779 4.184 1.792 4.205	pH pH pH 1.679 4.005 6.865 1.666 4.000 6.984 1.668 3.998 6.951 1.670 3.997 6.923 1.672 3.998 6.900 1.675 4.000 6.881 1.679 4.005 6.865 1.683 4.011 6.853 1.688 4.018 6.844 1.694 4.027 6.838 1.700 4.038 6.836 1.707 4.050 6.833 1.715 4.075 6.834 1.723 4.091 6.836 1.733 4.108 6.841 1.743 4.126 6.845 1.754 4.145 6.852 1.766 4.164 6.859 1.779 4.184 6.868 1.792 4.205 6.877	pH pH pH pH 1.679 4.005 6.865 9.180 1.666 4.000 6.984 9.464 1.668 3.998 6.951 9.395 1.670 3.997 6.923 9.332 1.672 3.998 6.900 9.276 1.675 4.000 6.881 9.225 1.679 4.005 6.865 9.180 1.683 4.011 6.853 9.139 1.688 4.018 6.844 9.102 1.694 4.027 6.838 9.068 1.700 4.038 6.836 9.040 1.707 4.050 6.833 9.011 1.715 4.075 6.834 8.985 1.723 4.091 6.836 8.962 1.733 4.108 6.841 8.942 1.754 4.145 6.852 8.903 1.766 4.164 6.859 8.885 1.779 4.184	



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.

80 ----- 912/913/914 Meter

9 Appendix

9.1.3 DIN (according to DIN standard 19267, 2012)

Table 9 DIN buffer solutions

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



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.

9.1.4 Fisher

Table 10 Fisher buffer solutions

	Fisher				
Temp.	рН	рН	рН	рН	
(°C)	2.00	4.00	7.00	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	



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.

9.1.5 Mettler Toledo

Table 11 Mettler Toledo buffer solutions

	Mettler Toledo				
Temp.	рН	рН	рН	рН	рН
(°C)	2.00	4.01	7.00	9.21	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

82 ••••• 912/913/914 Meter

9 Appendix

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



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.

9.1.6 Merck CertiPUR 20 / Titrisol

Table 12 Merck CertiPUR 20 / Titrisol buffer solutions

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



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.

9.1.7 Merck CertiPUR 25

Table 13 Merck CertiPUR 25 buffer solutions

	Merck CertiPUR (25°C)					
Article no.	109445 109407 109408 10940					
Temp.	рН	рН	рН	рН		
(°C)	4.00	7.00	9.00	10.00		
0	-	-	-	-		

84 ••••• 912/913/914 Meter

9 Appendix

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



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.

9.1.8 Beckmann

Table 14 Beckmann buffer solutions

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

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



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.

9.1.9 Radiometer Analytical

Table 15 Radiometer Analytical buffer solutions

		Radiomete	r Analytical	
Temp.	рН	рН	рН	рН
(°C)	1.679	4.005	7.000	9.180
0	1.666	4.000	7.118	9.464
5	1.668	3.998	7.087	9.395
10	1.670	3.997	7.059	9.332
15	1.672	3.998	7.036	9.276
20	1.675	4.001	7.016	9.225
25	1.679	4.005	7.000	9.180
30	1.683	4.011	6.987	9.139
35	1.688	4.018	6.977	9.102
40	1.694	4.027	6.970	9.068
45	1.700	4.038	6.965	9.038
50	1.707	4.050	6.964	9.010
55	1.715	4.064	6.965	8.985
60	1.723	4.080	6.968	8.962
65	1.732	4.097	6.974	8.941
70	1.743	4.116	6.982	8.921

9 Appendix

	Radiometer Analytical			
Temp.	pН	рН	рН	рН
(°C)	1.679	4.005	7.000	9.180
75	1.754	4.137	6.992	8.900
80	1.765	4.159	7.004	8.884
85	1.778	4.183	7.018	8.867
90	1.792	4.208	7.034	8.850



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.

9.1.10 Baker

Table 16 Baker buffer solutions

	Baker			
Temp.	рН	рН	рН	рН
(°C)	4.00	7.00	9.00	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

	Baker			
Temp.	pН	рН	рН	рН
(°C)	4.00	7.00	9.00	10.00
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



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.

9.1.11 Hamilton DURACAL

Table 17 Hamilton DURACAL buffer solutions

	Hamilton DURACAL			
Temp.	pН	рН	рН	рН
(°C)	4.01	7.00	9.21	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

88 •••••• 912/913/914 Meter

9 Appendix



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.

9.1.12 Honeywell Fluka

Table 18 Buffer solutions Honeywell Fluka

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



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.

90 ------ 912/913/914 Meter

10 Technical specifications

10 Technical specifications

10.1 Measuring inputs

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

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

Table 19 Measuring inputs / device

Device	Measuring inputs / measuring modes				
	Electrode, analog	Electrode, digital	Conductivity	Temperature	Reference
2.912.010			K/TDS/Sal ¹⁾ /ρ/T		
2.913.010	pH/U/T	pH/U/T		pH/U/T	Х
2.913.020	pH/U/T	pH/U/T/DO		pH/U/T	Х
2.914.020	pH/U/T		K/TDS/Sal ¹⁾ /ρ/T	Т	Х
2.914.030		pH/U/T/DO	K/TDS/Sal ¹⁾ /ρ/T		

¹⁾ The salinity (Sal) calculation is based on the specifications in the "Unesco technical papers in marine science 36" under the title

Input resistance $> 1 * 10^{12} \Omega$ (under reference conditions (see chapter 10.9, page 95))

Offset current $> 1 * 10^{-12} A$

Table 20 Specification of the measuring inputs

	Measuring range	Resolution	Measuring accuracy ²⁾
pH value	-13 to +20	0.001	±0.003
Temperature:		0.1 °C	
Pt1000	−150 to +250 °C		±0.2 °C (-20 to +150 °C)
with iConnect			±0.4 °C (-20 to +150 °C)
NTC 30 kΩ	−5 to +250 °C ³⁾		±0.6 °C (+10 to +40 °C)
with iConnect			±0.8 °C (+10 to +40 °C)
Voltage	-1,200 to +1,200 mV	0.1 mV	±0.2 mV

[&]quot;Tenth report of the joint panel on oceanographic tables and standards".

	Measuring range	Resolution	Measuring accuracy ²⁾
Conductance 4)			
Conductivity	0.1 µS-500 mS ⁵⁾	4 significant digits	±0.5% at 0.1–16 μS
			±0.5% at 16–1,000 μS
			±1% at 1–500 mS
Temperature:		0.1 °C	
Pt1000	−40 to +150 °C		
Oxygen	0 to +500%	0.1%	in the range 0–8 mg/L: ±0.1 mg/L
	0 to +50.00 mg/L	0.01 mg/L	in the range 8–20 mg/L: 0.15 mg/L
			in the range 20–50 mg/L: 10%

Display interval of the measurement for all measuring ranges= 1 s

 $^{2)}$ ±1 digit, without sensor error, at reference conditions (see chapter 10.9, page 95)

10.2 Measured value memory

Memory size

- 10,000 measured values, non-volatile memory
- 10 sensor entries in sensor list

10.3 Energy supply

Lithium polymer

3.7 V, 3000 mAh

rechargeable bat-

The rechargeable battery **cannot** be replaced by the user.

tery

USB connector

Nominal input

4.75-5.25 V

voltage

Power con-

850 mA max.

sumption

Power con-

500 mA

sumption at PC-

USB[°]

500 M

Power supply unit

No. 6.2166.100 (Accessories)

Nominal input

100-240 V AC

voltage

92 ------- 912/913/914 Meter

³⁾ R (25 °C) = 30,000 Ω , B25/50 = 4,100 K

⁴⁾ All conductance values refer to a cell constant of 1,000.

⁵⁾ Divided into 3 measuring ranges, automatic switch-over point

10 Technical specifications

Frequency 50–60 Hz
Output voltage 5.25 V DC
Nominal output 1,530 mA max.

current

12 V USB adapter No. 6.2166.500 (optional accessories)

Nominal input

12 V DC

voltage

Output voltage 5 V DC
Nominal output 1000 mA

current

10.4 Charging time

Charging time with power supply unit

8 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



NOTE

The charging time increases, depending on the maximum current that the USB socket can supply. If the current of the USB socket is less than the required charging current, then this will be indicated by a discontinuous charging symbol on the screen. In this case, use a different power supply.

10.5 Runtime with rechargeable battery



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 10.9, page 95).

Uptime 8 hours

10.6 TFT screen

Resolution 320 x 240 pixels (RGB)

Display colors 16.7 million

Display size 3.5 inches (70.08 x 52.56 mm)

10.7 Interfaces

USB connector

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

- Energy supply
- Data transmission

Type A-mini-B plug USB cable to PC

Print

Type A Y-cable to power supply unit, mini-A on the handheld meter, B plug on the printer

94 ------- 912/913/914 Meter

10 Technical specifications

10.8 Ambient conditions

Nominal function 0 to +40 °C (at max. 80% relative humidity, non-condensing)

range

Storage 0 to +45 °C (at max. 80% relative humidity, non-condensing)

Altitude / Pressure max. 3,000 m. above sea level / min. 700 mbar

range

Degree of protec-

tion

10.9 Reference conditions

IP67

Ambient temp- +25 °C (± 3 °C)

erature

Relative humidity ≤60%

Device status min. 5 min in operation

Validity of the

data

After adjustment

10.10 Dimensions/material

Dimensions

Length 208 mm
Width 92 mm
Height 34 mm

Weight 400 g (net incl. rechargeable battery)

Material

Housing Acrylonitrile butadiene styrene (ABS)

Keyboard foilPolyester (PES)Screen coverPolycarbonate (PC)

Interface cover Thermoplastic elastomers (TPE-E)

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 25).

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 24).

Menu dialog

Menu dialogs show an open menu structure with the corresponding menu lines (see "Menu dialog", page 24).

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 5.6, page 38).

Selection dialog

In selection dialogs, you can select one option from a range of options (see "Selection dialog", page 25).

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 5.11, page 68).

96 ------ 912/913/914 Meter

Index

Index

В	
Brightness	59
-	
<u>C</u>	
Calibration 60, 63, 0	65
Calibration param 44, 46,	
Concentration	47
Conductivity 1, 45, (63
Conductometer	8
Configuration	58
Connect	
Connect to power grid	17
Connector	
Control keys	
CSV file	
	-
D	
Date	58
Display	23
Editing dialog 25, 1	
Main dialog 24, 29, 1	
Menu dialog 24, 1	
Selection dialog 25, 3	
Stand by	
Status	
E	
Energy supply 2,	14
3, 11,	
I	
Initial configuration	20
_	21

Language	20
Instrument	
Switch off	
Switch on	
Interface	2
L	
Language	59
М	
Mass concentration	46
Measured values	48
Measuring parameters 44, 45,	46
Metrohm Service	71
N	
New sensor	55
0	
Overview of the instrument	. 8
Oxygen	65
P	
Partial pressure	47
Password 37,	59
PC/LIMS report	69
pH value	44
pH/Conductometer	
Analog	10
pH/DO/Conductometer	
Digital	. 9
Phase angle	47

Potential value 44 Power connection 17 ppm 46 Printer 57 Printing 68 Problems 72 Product version 2
R
Rechargeable battery 14
Report 57, 68
Resistance value 45
S
Safety instructions 6
Salinity 45
Sensor 2
Sensors 50, 51
Service 6
Switch off 23
Switch on 23
т
Temperature
Time
Total Dissolved Solids
U
User 37, 59