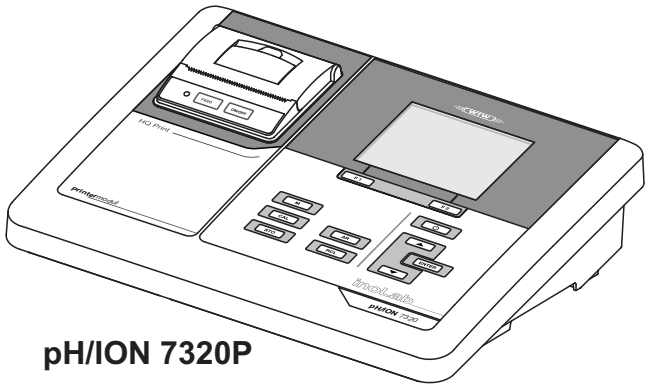
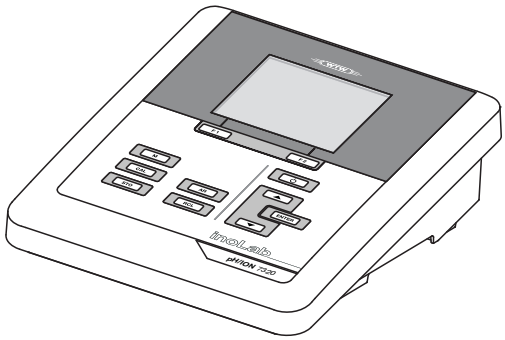


pH/ION 7320P



pH/ION 7320

OPERATING MANUAL

ba75935e05 01/2018

pH/ION 7320 (P)

PH/ION METER

WTW

a xylem brand

pH/ION 7320 - Contents

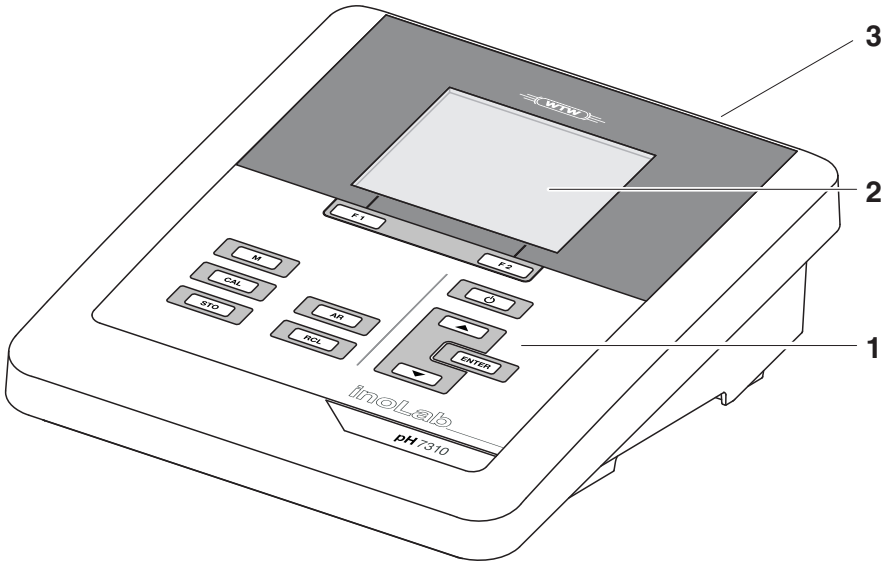
1 Overview

1.1 pH/ION 7320 meter

The compact precision pH meter pH/ION 7320 enables you to carry out pH measurements, ORP measurements and ion selective measurements quickly and reliably.

The pH/ION 7320 provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.

The USB interface can be used for data transmission to a PC and for software updates of the meter.

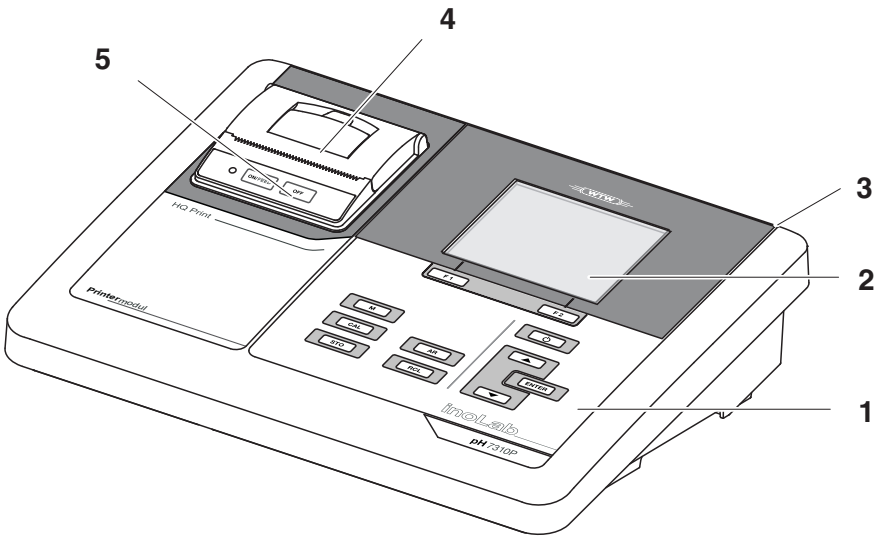


1 Keypad
2 Display
3 Socket field

1.2 pH/ION 7320P meter

The integrated printer of the pH/ION 7320 P enables to document measurements according to GLP requirements.

The information concerning the printer of the pH/ION 7320 P is given in a separate chapter (see section 4 PRINTER (ONLY PH/ ION 7320 P), page 14).



1 Keypad
2 Display
3 Socket field
4 Printer
5 Control panel of the printer

1.3 Sensors

A measuring system ready to measure consists of the pH/ION 7320 meter and a suitable sensor.

Suitable sensors are pH electrodes, ORP electrodes and ion selective electrodes (ISE).

Information on available sensors is given on the Internet and in the WTW catalog, "Laboratory and field instrumentation".

2 Safety

2.1 Safety information

2.1.1 Safety information in the operating manual

This operating manual provides important information on the safe operation of the meter. Read this operating manual thoroughly and make yourself familiar with the meter before putting it into operation or working with it. The operating manual must be kept in the vicinity of the meter so you can always find the information you need.

Important safety instructions are highlighted in this operating manual. They are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "Caution") indicates the level of danger:

WARNING
indicates a possibly dangerous situation that can lead to serious (irreversible) injury or death if the safety instruction is not followed.

CAUTION
indicates a possibly dangerous situation that can lead to slight (reversible) injury if the safety instruction is not followed.

NOTE
indicates a possibly dangerous situation where goods might be damaged if the actions mentioned are not taken.

2.1.2 Safety signs on the meter

Note all labels, information signs and safety symbols on the meter and in the battery compartment. A warning symbol (triangle) without text refers to safety information in this operating manual.

2.1.3 Further documents providing safety information

The following documents provide additional information, which you should observe for your safety when working with the measuring system:

- Operating manuals of sensors and other accessories
- Safety datasheets of calibration or maintenance accessories (such as buffer solutions, electrolyte solutions, etc.)

2.2 Safe operation

2.2.1 Authorized use

This meter is authorized exclusively for pH, ORP and ISE concentrations measurements in the laboratory.

Only the operation and running of the meter according to the instructions and technical specifications given in this operating manual is authorized (see section 14 TECHNICAL DATA, page 92).

Any other use is considered unauthorized.

2.2.2 Requirements for safe operation

Note the following points for safe operation:

- The meter may only be operated according to the authorized use specified above.
- The meter may only be supplied with power by the energy sources mentioned in this operating manual.
- The meter may only be operated under the environmental conditions mentioned in this operating manual.
- The meter may only be opened if this is explicitly described in this operating manual (example: Inserting the batteries).

2.2.3 Unauthorized use

The meter must not be put into operation if:

- it is visibly damaged (e.g. after being transported)
- it was stored under adverse conditions for a lengthy period of time (storing conditions, see section 14 TECHNICAL DATA, page 92).

3 Commissioning

3.1 Scope of delivery

- pH meter pH/ION 7320
- 4 batteries 1.5 V Mignon type AA
- Power pack
- USB cable (A plug on mini B plug)
- Stand
- Stand holder
- Comprehensive operating manual
- Short instructions
- CD-ROM with
  - USB drivers
  - detailed operating manual
  - Software MultiLab Importer

3.2 Power supply

The pH/ION 7320 is supplied with power in the following ways:

- Mains operation with the supplied power pack
- Battery operation (4 x alkaline manganese batteries, type AA)
- USB operation via a connected USB-B cable

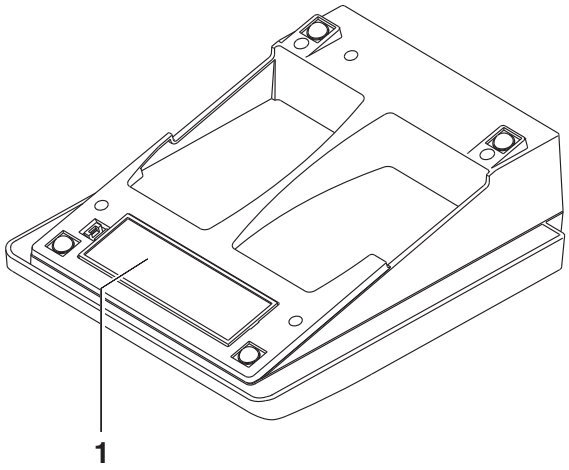
3.3 Initial commissioning

Perform the following activities:

- Insert the supplied batteries
- For mains operation: Connect the power pack
- If necessary, mount a stand
- Switch on the meter
  (see section 5.2 SWITCHING ON THE METER, page 19)
- Set the date and time
  (see section 5.4.6 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 25)

3.3.1 Inserting the batteries

You can operate the meter either with normal batteries or with rechargeable batteries (Ni-MH). In order to charge the batteries, an external charging device is required.



1 Battery compartment

1. Open the battery compartment (1) on the underside of the meter.

CAUTION
Make sure that the poles of the batteries are positioned correctly.
The ± signs on the batteries must correspond to the ± signs in the battery compartment.

2. Place four batteries (type Mignon AA) in the battery compartment.
3. Close the battery compartment (1).
4. Set the date and time
(see section 5.4.6 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 25).

3.3.2 Connecting the power pack

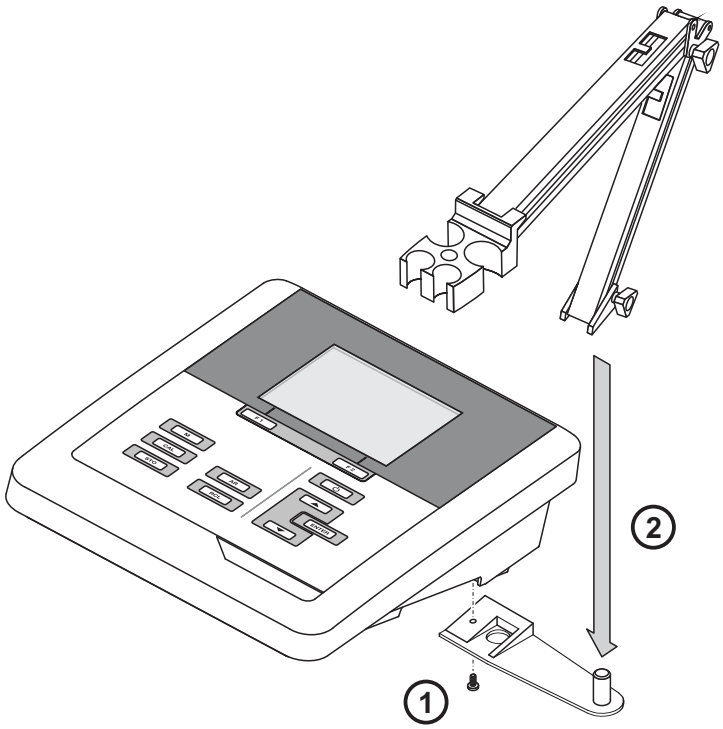
CAUTION
The line voltage at the operating site must lie within the input voltage range of the original power pack (see section 14 TECHNICAL DATA, **page 92).**

CAUTION
Use original power packs only (see section 14 TECHNICAL DATA, **page 92).**

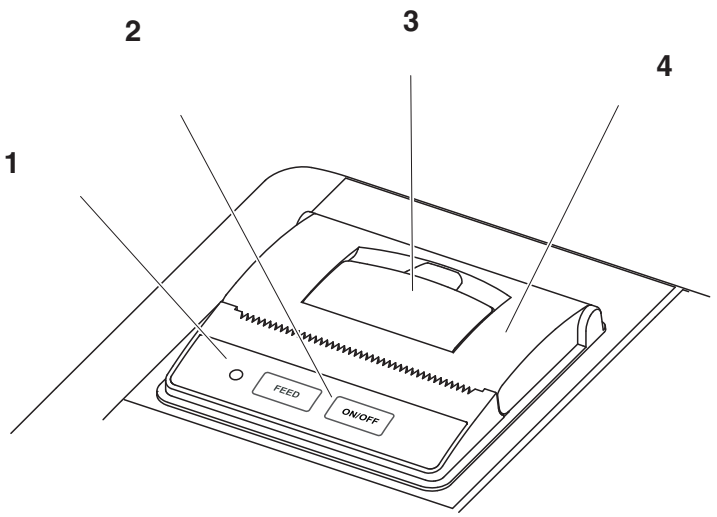
1. Connect the plug of the power pack to the socket for the power pack on the pH/ION 7320.
2. Connect the original power pack to an easily accessible power outlet.

3.3.3 Mounting the stand

The stand base can be mounted at the right side of the meter.



4 Printer (only pH/ION 7320 P)



1 Operating LED
- – Is illuminated: Printer is switched on
- – Flashes: Printer is switched off

2 Control panel with the keys **<FEED>** and **<ON/OFF>**

3 Lever to open the paper compartment

4 Lid of the paper compartment

4.1 Commissioning / switching the printer on or off

Switching on the printer

1. Connect the power pack to the pH/ION 7320 P.
   The LED lights up green. The printer is ready for operation.
   or
   When the printer had been switched off (LED flashing):
   Switch on the printer with **<ON/OFF>**.
   The LED lights up green. The printer is ready for operation.

If there is a USB-B connection at the same time (e.g. to a PC), the data are output to the PC only.

Switching off the printer

1. Switch off the printer with **<ON/OFF>**.
   The LED flashes. The printer is switched off.

4.2 Operation / printing

Data are only output to the printer if the following requirements are met

- Data are transmitted manually or automatically (see section 11.1 OPTIONS FOR DATA TRANSMISSION, page 83)
- The printer is switched on (LED illuminated)
- There is no USB connection.

4.3 Printer settings

To open the *Storage & config* menu, press the **<ENTER_>** key in the measured value display. After completing the settings, switch to the measured value display with **<M>**.

Default settings are printed in **bold**.

Menu item	Possible setting	Description
System / *Printer* / *Font size*	***12x20*** *8x16* *7x16*	Select the font size for the printer A print sample (font of the printer) to view the available font sizes can be output with **<ON/OFF_>**.
System / *Printer* / *Print test page*	-	The printer prints the meter information from the menu, *System* / *Service information*. The current printer settings are used for the printout.

4.4 Maintenance

4.4.1 Changing the roll of paper (thermal paper)

1. Pull the lever (3) until the lid (4) of the paper compartment opens.
2. If necessary, remove any remains of the old roll of paper.
3. Insert the new roll of paper. The start of the paper should poke out of the paper compartment.
4. Close the lid (4) of the paper compartment so that it clicks into place.
5. If necessary, move the printer paper forward with **<FEED>**.

Use original WTW rolls of paper only.

You will find information on this in the WTW catalog LABORATORY AND FIELD INFORMATION or on the Internet.

The thermal paper will remain legible for at least 7 years if stored appropriately.

4.5 What to do if... / printer

Integrated printer does not print

Cause	Remedy
– Printer switched off (LED flashing)	– Switch on the printer (LED illuminated)
– No power pack connected	– Connect the power pack
– USB cable connected	– Disconnect the USB cable from the meter
– Function "store automatically at intervals" with long intervals is switched on	– Switch off the function (see section 10.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 78)
– No paper available	– Insert a roll of paper

Printer operating - paper not being printed

Cause	Remedy
– Paper inserted the wrong way up	– Turn the roll of paper around and insert it with the other side upwards

Integrated printer prints automatically

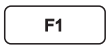
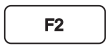
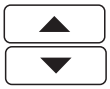
Cause	Remedy
– The function "store automatically at intervals" or "transmit data automatically at intervals" is switched on	– Switch off the functions (see section 10.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 78 or section 11.1 OPTIONS FOR DATA TRANSMISSION, page 83)

5 Operation

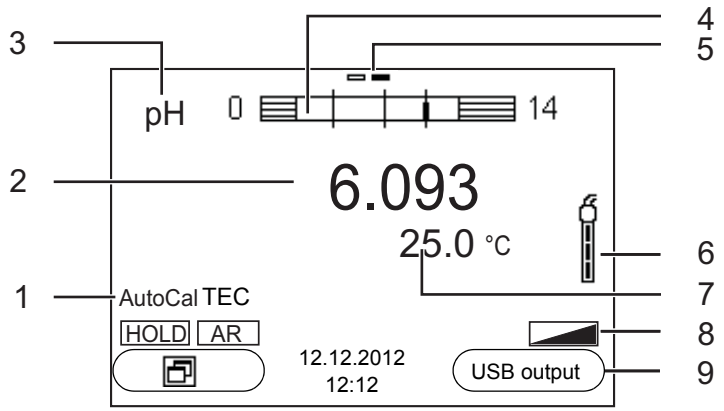
5.1 General operating principles

5.1.1 Keypad

In this operating manual, keys are indicated by brackets <..> .
The key symbol (e.g. **<ENTER>**) generally indicates a short keystroke (under 2 sec) in this operating manual. A long keystroke (approx. 2 sec) is indicated by the underscore behind the key symbol (e.g. **<ENTER__>**).

 	**<F1>**: **<F1__>**: **<F2>**: **<F2__>**:	Softkeys providing situation dependent functions, e.g.: **<F2>**/[USB output]: Outputs data to the USB interface **<F2__>**/[USB output]: Configures the automatic data output to the USB interface
	**<On/Off>**:	Switches the meter on or off
	**<M>**:	Selects the measured parameter / Quits the settings
	**<CAL>**: **<CAL__>**:	Calls up the calibration procedure Displays the calibration data
	**<STO>**: **<STO__>**:	Saves a measured value manually Opens the menu for the automatic save function
	**<RCL>**: **<RCL__>**:	Displays the manually stored measured values Displays the automatically stored measured values
	**<▲><▼>**: **<▲__><▼__>:**	Menu control, navigation Increments, decrements values Increments, decrements values continuously
	**<ENTER>**: **<ENTER__>**:	Opens the menu for measurement settings / confirms entries Opens the menu for system settings
	**<AR>**	Freezes the measured value (HOLD function) Switches the AutoRead measurement on or off

5.1.2 Display

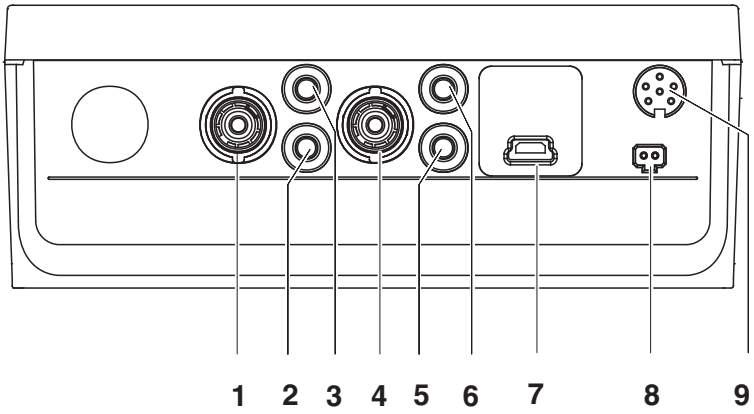


1 Status information (sensor)
2 Measured value (with unit)
3 Measured parameter
4 Continuous measurement control (CMC function)
5 Channel display: Plug position of the sensor
6 Sensor symbol (calibration evaluation, calibration interval)
7 Measured temperature (with unit)
8 Status information (meter)
9 Softkeys and date + time

5.1.3 Status information (meter)

AR	Stability control (AutoRead) is active
HOLD	Measured value is frozen (**<AR>** key)
	Batteries are almost empty

5.1.4 Socket field

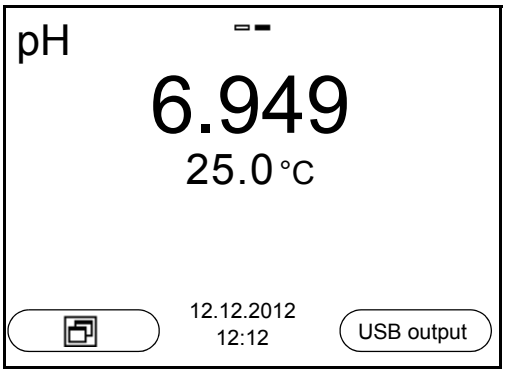


1 pH electrode or ion selective electrode 1
2 Reference electrode 1
3 Temperature sensor 1
4 pH electrode or ion selective electrode 2
5 Reference electrode 2
6 Temperature sensor 2
7 Mini USB-B interface
8 Power pack
9 Service interface

CAUTION
Only connect sensors to the meter that cannot return any voltages or currents that are not allowed (> SELV and > current circuit with current limiting).
Almost all customary sensors fulfill these conditions.

5.2 Switching on the meter

1. Switch the meter on with **<On/Off>**.
   The meter performs a self-test.
   The display shows the manufacturer's logo while the self-test is being performed.
   The measured value display appears.



5.3 Switching off

1. Switch the meter off with **<On/Off>**.

Automatic switch-off

The instrument has an automatic switch-off function in order to save the batteries (see section 9.3.1 SYSTEM, page 74). The automatic switchoff switches off the measuring instrument if no key is pressed for an adjustable period.

The automatic switchoff is not active

- if the communication cable is connected
- if the *Automatic data storage* function is active, or with *automatic data transmission*
- if the power pack is connected

Display illumination

The meter automatically switches off the display illumination if no key is pressed for 30 seconds. The illumination is switched on with the next keystroke again.

You can also generally switch the display illumination on or off (see section 9.3.1 SYSTEM, page 74).

5.4 Navigation

The principles of navigation in menus and dialogs are explained in the following sections.

5.4.1 Operating modes

The meter has the following operating modes:

Operating mode	Description
Measuring	The measurement data of the connected sensor are shown in the measured value display
Calibration	The course of a calibration with calibration information, functions and settings is displayed
Storage in memory	The meter stores measuring data automatically or manually
Transmitting data	The meter transmits measuring data and calibration records to a USB-B interface automatically or manually
Setting	The system menu or a sensor menu with submenus, settings and functions is displayed

Only those displays and functions are available in the active operating mode that are currently being required.

5.4.2 Measured value display

In the measured value display, open the setting menus with **<MENU/ENTER>**. The current functions of the softkeys are shown on the display.

- Use **<MENU/ENTER>** (short pressure) to open the menu for calibration and measurement settings for the displayed measured parameter.
- Use **<MENU/ENTER__>** (long keystroke (approx. 2 s) to open the *Storage & config* menu with the sensor-independent settings.

Use the keys of the keypad to carry out further functions such as storage or calibration (see section 5.1.1 KEYPAD, page 17). These functions are not available in other operating situations.

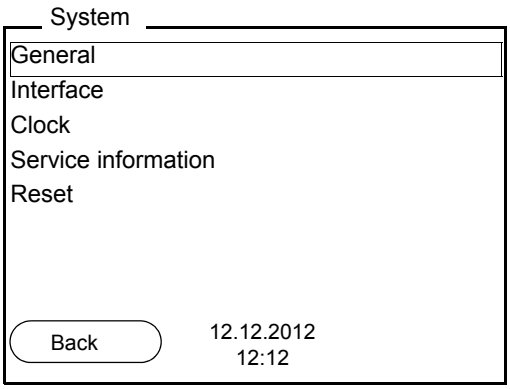
5.4.3 Menus and dialogs

The menus for settings and dialogs in procedures contain further submenus.

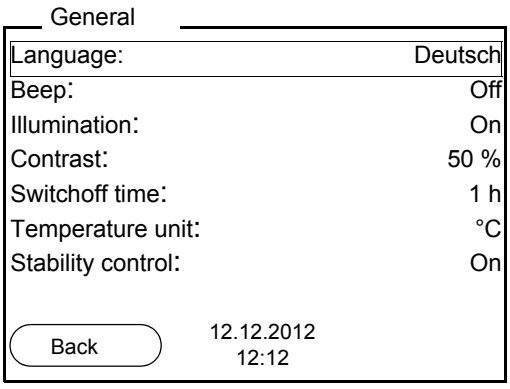
- To select a subelement, use the **<▲><▼>** keys. The current selection is displayed with a frame.
- To make further settings, switch to the next higher menu level with **<F1>**[Back].
- Use **<M>** to return to the measured value display.

5.4.4 Elements in menus and dialogs

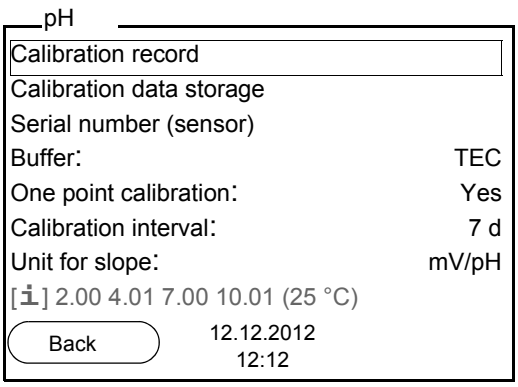
- Submenus
  The name of the submenu is displayed at the upper edge of the frame. Submenus are opened by confirming with **<MENU/ENTER>**. Example:



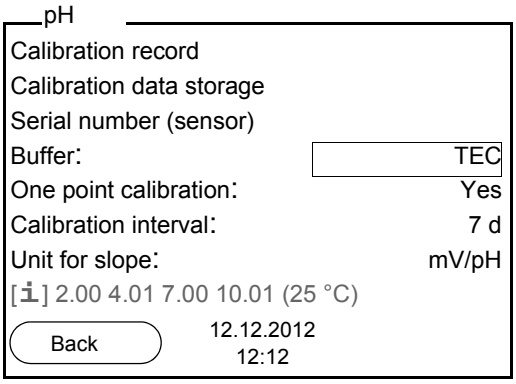
- Settings
  Settings are indicated by a colon. The current setting is displayed on the right-hand side. The setting mode is opened with **<MENU/ENTER>**. Subsequently, the setting can be changed with **<▲><▼>** and **<MENU/ENTER>**. Example:



- Functions
  Functions are designated by the name of the function. They are immediately carried out by confirming with **<MENU/ENTER>**.
  Example: Display the *Calibration record* function.

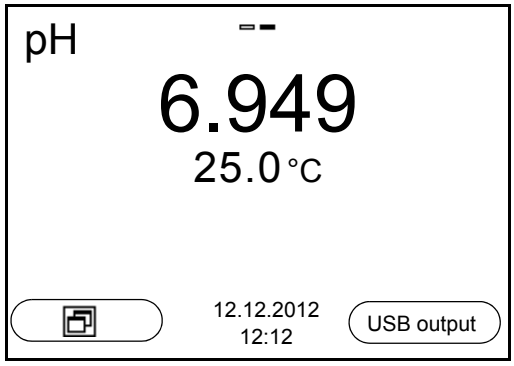


- Messages
  Information is marked by the **i** symbol. They cannot be selected. Example:

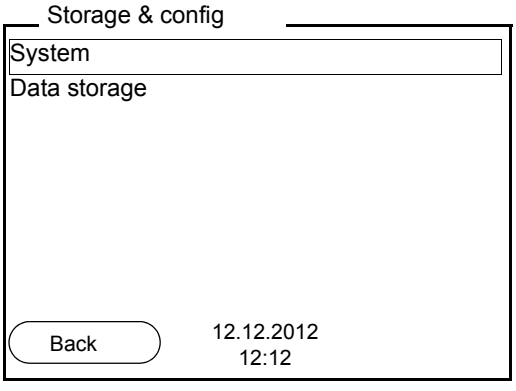


5.4.5 Example 1 on navigation: Setting the language

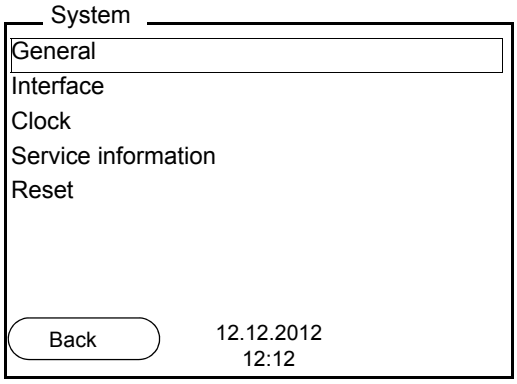
1. Press the **<On/Off>** key.
   The measured value display appears.
   The instrument is in the measuring mode.



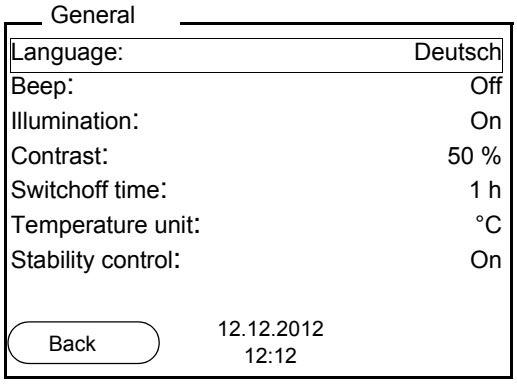
2. Using **<MENU/ENTER__>**, open the *Storage & config* menu.
   The instrument is in the setting mode.



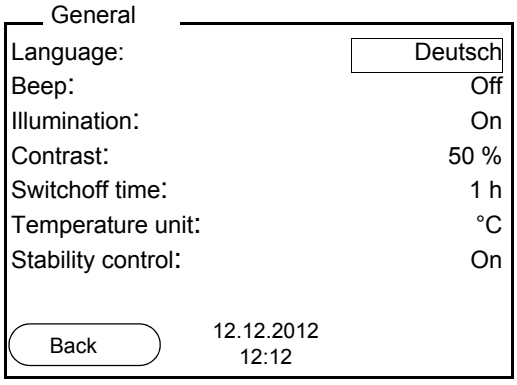
3. Select the *System* submenu with **<▲><▼>**.
   The current selection is displayed with a frame.
4. Open the *System* submenu with **<MENU/ENTER>**.



5. Select the *General* submenu with **<▲><▼>**.
   The current selection is displayed with a frame.
6. Open the *General* submenu with **<MENU/ENTER>**.



7. Open the setting mode for the *Language* with **<MENU/ENTER>**.



8. Select the required language with **<▲><▼>**.
9. Confirm the setting with **<MENU/ENTER>**.
   The meter switches to the measuring mode.
   The selected language is active.

5.4.6 Example 2 on navigation: Setting the date and time

The measuring instrument has a clock with a date function. The date and time are shown in the measured value display.
When storing measured values and calibrating, the current date and time are automatically stored as well.

The correct setting of the date and time and date format is important for the following functions and displays:

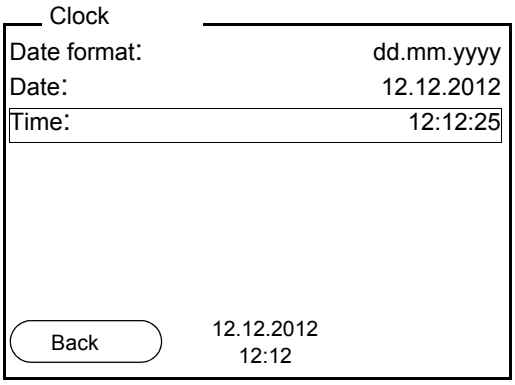
- Current date and time
- Calibration date
- Identification of stored measured values.

Therefore, check the time at regular intervals.

After a fall of the supply voltage (empty batteries), the date and time are reset.

The date format can be switched from the display of day, month, year (*dd.mm.yyyy*) to the display of month, day, year (*mm/dd/yyyy* or *mm.dd.yyyy*).

1. In the measured value display:
   Using **<MENU/ENTER__>**, open the *Storage & config* menu.
   The instrument is in the setting mode.
2. Select and confirm the *System* / *Clock* menu with **<▲><▼>** and **<MENU/ENTER>**.
   The setting menu for the date and time opens up.
3. Select and confirm the *Time* menu with **<▲><▼>** and **<MENU/ENTER>**.
   The hours are highlighted.



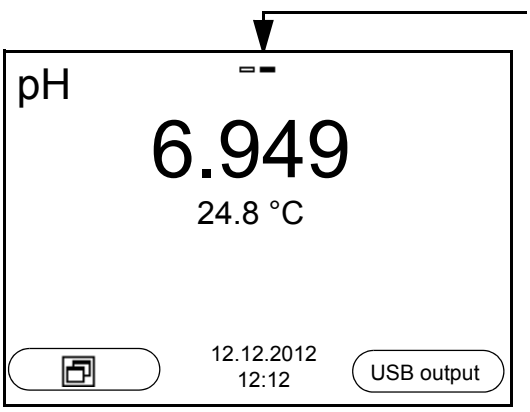
4. Change and confirm the setting with **<▲><▼>** and **<MENU/ENTER>**.
   The minutes are highlighted.
5. Change and confirm the setting with **<▲><▼>** and **<MENU/ENTER>**.
   The seconds are highlighted.
6. Change and confirm the setting with **<▲><▼>** and **<MENU/ENTER>**.
   The time is set.

7. If necessary, set the *Date* and *Date format*. The setting is made similarly to that of the time.

8. To make further settings, switch to the next higher menu level with [Back]**<F1>**.
   or
   Switch to the measured value display with **<M>**.
   The instrument is in the measuring mode.

5.5 Channel display

The pH/ION 7320 manages the connected sensors and displays which sensor is plugged to which connection.



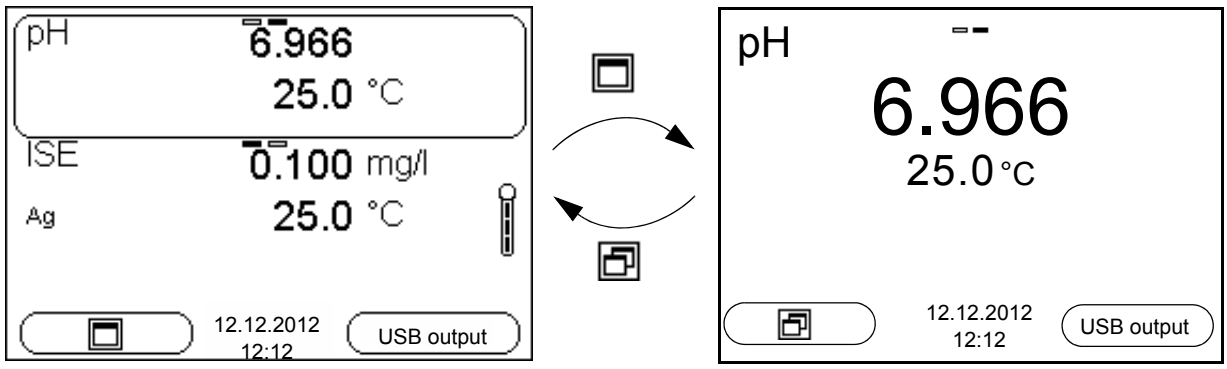
Channel display
Display of the plug position for the respective parameter. The filled bar indicates for each connected sensor to which plug position of the meter it is connected.

5.5.1 Display of several sensors in the measuring mode

The measured values of the connected sensors can be displayed in the following ways:

- Clear display of all connected sensors
- Detailed display of one sensor
  (e.g. incl. CMC feature with pH sensors)

With the softkey you can very easily switch between the two display types. The suitable softkey is displayed depending on the operating situation.



6 pH value

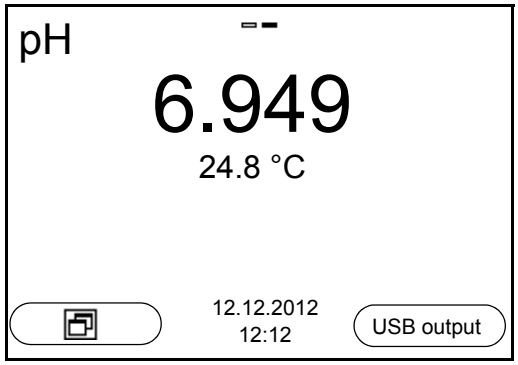
6.1 Measuring

6.1.1 Measuring the pH value

NOTE
When connecting an earthed PC/printer, measurements cannot be performed in earthed media as the values would be incorrect.
The USB interface is not galvanically isolated.

To ensure the high measurement accuracy of the measuring system, always measure with a calibrated electrode (see section 6.2 CALIBRATION, page 31).

1. Connect the pH electrode to the meter.
2. If necessary, select the measured parameter with **<M>**.
3. When measuring without temperature sensor:
   Temper the test sample or measure the current temperature and enter it with **<▲> <▼>**.
4. Immerse the pH electrode in the test sample.
   The measured value is checked for stability (automatic stability control).
   The display of the measured parameter flashes.
5. Wait for a stable measured value.
   The display of the measured parameter no longer flashes.



Stability control (AutoRead) & HOLD function

The stability control function (*AutoRead*) continually checks the stability of the measurement signal. The stability has a considerable impact on the reproducibility of measured values.

The measured parameter flashes on the display

- as soon as the measured value is outside the stability range
- when the automatic *Stability control* is switched off.

You can activate or switch off the automatic *Stability control* function (see section 9.3.1 SYSTEM, page 74).

1. Freeze the measured value with **<AR>**.
   The [HOLD] status indicator is displayed.
   The HOLD function is active.

You can terminate the *Stability control* function and the HOLD function with **<AR>** or **<M>** at any time.

2. Using **<ENTER>**, activate the *Stability control* function manually.
   The [AR] status indicator appears while the measured value is assessed as not stable. A progress bar is displayed and the display of the measured parameter flashes.
   The [HOLD][AR] status indicator appears as soon as a stable measured value is recognized. The progress bar disappears and the display of the measured parameter stops flashing.
   The current measurement data is output to the interface. Measurement data meeting the stability control criterion is marked by AR.

You can prematurely terminate the *Stability control* function manually with **<ENTER>** at any time. If the *Stability control* function is prematurely terminated, the current measurement data are output to the interface without the AutoRead info.

3. Using **<ENTER>**, start a further measurement with stability control.
   or
   Release the frozen measured value again with **<AR>** or **<M>**.
   The [AR] status display disappears. The display switches back to the previous indication.

Criteria for a stable measured value

The *Stability control* function checks whether the measured values are stable within the monitored time interval.

Measured parameter	Time interval	Stability in the time interval
pH value	15 seconds	Δ : better than 0.01 pH
Temperature	15 seconds	Δ : better than 0.5 °C

The minimum duration until a measured value is assessed as stable is the monitored time interval. The actual duration is mostly longer.

6.1.2 Measuring the temperature

For reproducible pH measurements, it is essential to measure the temperature of the test sample.
You have the following options to measure the temperature:

- Automatic measurement of the temperature with the temperature sensor (NTC30 or Pt1000) integrated in the sensor.
- Measurement by an external temperature sensor.
- Manual determination and input of the temperature.

The measuring instrument recognizes whether a suitable sensor is connected and automatically switches on the temperature measurement.

The display of the temperature indicates the active temperature measuring mode:

Temperatur e sensor	Resolution of the temp. display	Temp. measurement
yes	0.1 °C	Automatic with temperature sensor
-	1 °C	Manual

If you wish to measure (or calibrate) without temperature sensor, proceed as follows:

1. Measure the current temperature of the test sample.
2. In the **<MENU/ENTER>**/pH/*Man. temperature* menu, set the temperature value with **<▲><▼>**.

6.2 Calibration

6.2.1 Why calibrate?

pH electrodes age. This changes the zero point (asymmetry) and slope of the pH electrode. As a result, an inexact measured value is displayed. Calibration determines and stores the current values of the zero point and slope of the electrode.
Thus, you should calibrate at regular intervals.

6.2.2 When do you have to calibrate?

- After connecting a sensor
- Routinely within the framework of the company quality assurance
- When the calibration interval has expired

6.2.3 Automatic calibration (AutoCal)

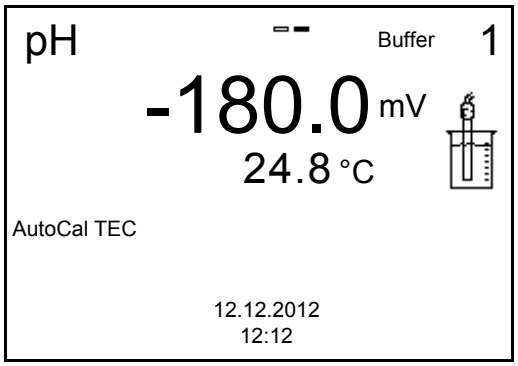
Make sure that in the sensor menu, *Buffer* menu, the buffer set is correctly selected (see 9.1.1 SETTINGS FOR PH MEASUREMENTS, PAGE 65).

Use any one to five buffer solutions of the selected buffer set in ascending or descending order.

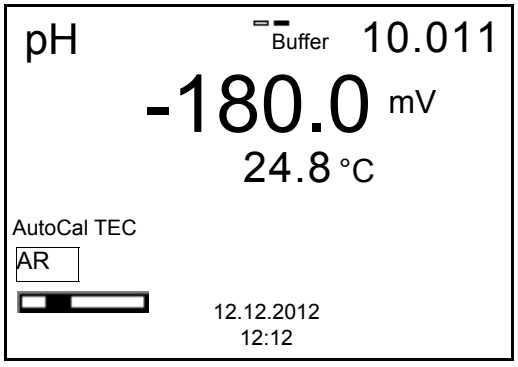
Below, calibration with Technical buffers (TEC) is described. When other buffer sets are used, other nominal buffer values are displayed. Apart from that, the procedure is identical.

If single-point calibration was set in the menu, the calibration procedure is automatically finished with the measurement of buffer solution 1 and the calibration record is displayed.

1. Connect the pH electrode to the meter.
2. Keep the buffer solutions ready.
   When measuring without temperature sensor:
   Temper the buffer solutions or measure the current temperature.
3. In the measured value display, select the measured parameter pH or mV with **<M>**.
4. Start the calibration with **<CAL>**.
   The calibration display for the first buffer appears (voltage display).



5. Thoroughly rinse the electrode with deionized water.
6. Immerse the electrode in the first buffer solution.
7. When measuring without temperature sensor:
   Enter the temperature of the buffer with **<▲><▼>**.
8. Start the measurement with **<ENTER>**.
   The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.



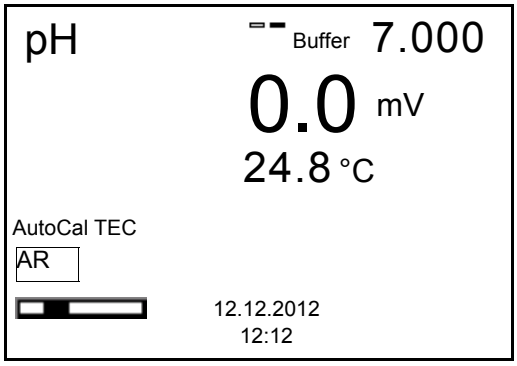
9. Wait for the end of the measurement with stability control or accept the calibration value with **<ENTER>**.
   The calibration display for the next buffer appears (voltage display).
10. If necessary, finish the calibration procedure as a single-point calibration with **<M>**.
    The calibration record is displayed.

For **single-point calibration**, the instrument uses the Nernst slope (-59.2 mV/pH at 25 °C) and determines the zero point of the electrode.

Continuing with two-point calibration

11. Thoroughly rinse the electrode with deionized water.
12. Immerse the electrode in the second buffer solution.
13. When measuring without temperature sensor:
    Enter the temperature of the buffer with **<▲><▼>**.

14. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.



15. Wait for the measurement with stability control to be completed or terminate the stability control and take over the calibration value with **<ENTER>**.
The calibration display for the next buffer appears (voltage display).

16. If necessary, finish the calibration procedure as a two-point calibration with **<M>**.
The calibration record is displayed.

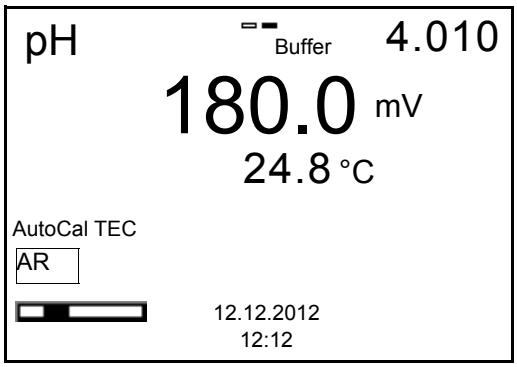
Continuing with three- to five-point calibration

17. Thoroughly rinse the electrode with deionized water.

18. Immerse the electrode in the next buffer solution.

19. When measuring without temperature sensor:
Enter the temperature of the buffer with **<▲><▼>**.

20. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.



21. Wait for the measurement with stability control to be completed or terminate the stability control and take over the calibration value with **<ENTER>**.
The calibration display for the next buffer appears (voltage display).

22. If necessary, use **<M>** to finish calibration or
Continue calibrating using the next buffer with **<ENTER>**.

Calibration is automatically completed after the last buffer of a buffer set has been measured. Then the calibration record is displayed.

The calibration line is determined by linear regression.

6.2.4 Manual calibration (ConCal)

Make sure that in the sensor menu, *Buffer* menu, the *ConCal* buffer set is selected (see section 9.1.1 SETTINGS FOR PH MEASUREMENTS, page 65).

Use any one to five buffer solutions in ascending or descending order.

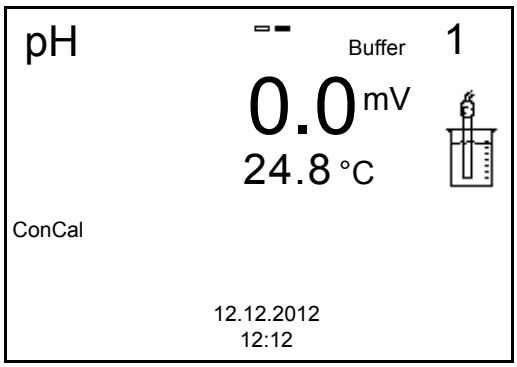
If single-point calibration was set in the menu, the calibration procedure is automatically finished with the measurement of buffer solution 1 and the calibration record is displayed.

1. Connect the pH electrode to the meter.
The pH measuring window is displayed.

2. Keep the buffer solutions ready.
When measuring without temperature sensor:
Temper the buffer solutions or measure the current temperature.

3. In the measured value display, select the measured parameter pH or mV with **<M>**.

4. Start the calibration with **<CAL>**.
The calibration display appears.

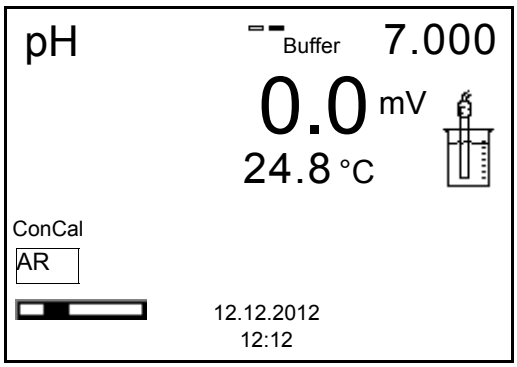


5. Thoroughly rinse the electrode with deionized water.

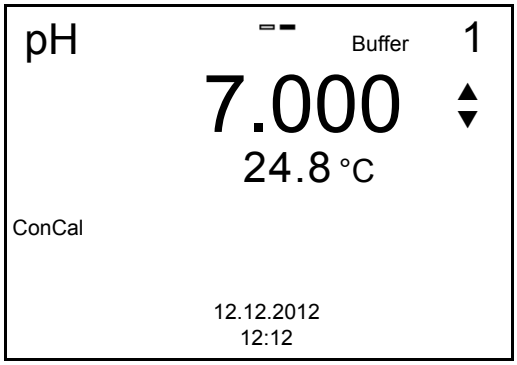
6. Immerse the electrode in the first buffer solution.

7. When measuring without temperature sensor:
Enter the temperature of the buffer with **<▲><▼>**.

8. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.



9. Wait for the end of the measurement with stability control or accept the calibration value with **<ENTER>**.
The calibration display for the setting of the nominal buffer value appears.



10. Set the nominal buffer value for the measured temperature with **<▲><▼>**.

11. Accept the set calibration value with **<ENTER>**.
The calibration display for the next buffer appears (voltage display).

12. If necessary, finish the calibration procedure as a single-point calibration with **<M>**.
The calibration record is displayed.

For **single-point calibration**, the instrument uses the Nernst slope (-59.2 mV/pH at 25 °C) and determines the zero point of the electrode.

Continuing with two-point calibration

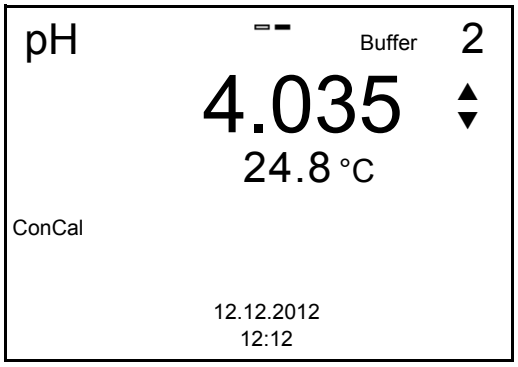
13. Thoroughly rinse the electrode with deionized water.

14. Immerse the electrode in the second buffer solution.

15. When measuring without temperature sensor:
Enter the temperature of the buffer with **<▲><▼>**.

16. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.

17. Wait for the measurement with stability control to be completed or terminate the stability control and take over the calibration value with **<ENTER>**.
The calibration display for the setting of the nominal buffer value appears.



18. Set the nominal buffer value for the measured temperature with **<▲><▼>**.

19. Accept the set calibration value with **<ENTER>**.
The calibration display for the next buffer appears (voltage display).

20. Finish the calibration procedure as a two-point calibration with **<M>**.
The calibration record is displayed.

Continuing with three- to five-point calibration

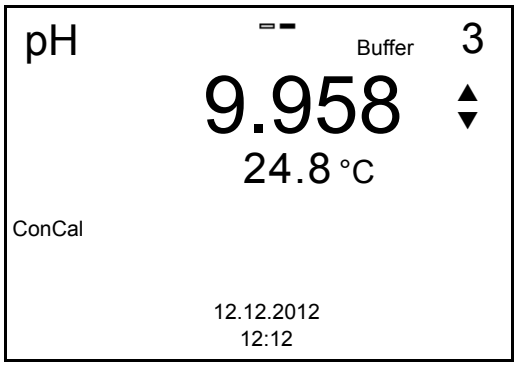
21. Thoroughly rinse the electrode with deionized water.

22. Immerse the electrode in the next buffer solution.

23. When measuring without temperature sensor:
Enter the temperature of the buffer with **<▲><▼>**.

24. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control). The [AR] status indicator is displayed. A progress bar is displayed and the display of the measured parameter flashes.

25. Wait for the measurement with stability control to be completed or terminate the stability control and take over the calibration value with **<ENTER>**.
The calibration display for the setting of the nominal buffer value appears.



26. Set the nominal buffer value for the measured temperature with **<▲><▼>**.

27. Accept the set calibration value with **<ENTER>**.
The calibration display for the next buffer appears (voltage display).

28. Use **<M>** to finish calibration or
Continue calibrating using the next buffer with **<ENTER>**.

After the fifth buffer has been measured the calibration is automatically finished. Then the calibration record is displayed.

The calibration line is determined by linear regression.

6.2.5 Calibration points

Calibration can be performed using one to five buffer solutions in any order (single-point to five-point calibration). The meter determines the following values and calculates the calibration line as follows:

	Values to be determined	Displayed calibration data
1-point	*Asy*	● Zero point = *Asy* ● Slope = Nernst slope (-59.2 mV/pH at 25 °C)
2-point	*Asy* *Slp.*	● Zero point = *Asy* ● Slope = *Slp.*
3-point to 5-point	*Asy* *Slp.*	● Zero point = *Asy* ● Slope = *Slp.* The calibration line is calculated by linear regression.

You can display the slope in the units, mV/pH or % (see section 9.1.1 SETTINGS FOR PH MEASUREMENTS, page 65).

6.2.6 Calibration data

The calibration record is automatically transmitted to the interface after calibrating.

Displaying the calibration data

The calibration record of the last calibration is to be found under the menu item, **<MENU/ENTER>** / *Calibration* / / *Calibration record*. To open it, press the **<CAL__>** key in the measured value display.

Subsequently, you can transmit the displayed calibration data to the interface, e. g. to a PC, with **<F2>***[USB output]*.

Displaying the calibration data storage

The calibration records of the last calibrations (up to 10) are given in the menu, **<MENU/ENTER>**/*Calibration* / *Calibration data storage*.

Menu item	Setting/function	Description
Calibration / *Calibration data storage* /*Display*	-	Displays the calibration record. Further options: ● Scroll through the calibration records with **<▲><▼>**. ● Output the displayed calibration record to the interface with **<F2>**/*[USB output]*. ● Quit the display with **<F1>**/ *[Back]* or **<MENU/ENTER>**. ● Switch directly to the measured value display with **<M>**.
Calibration / *Calibration data storage* / *Output to USB*	-	Outputs the calibration records to the interface.

Calibration evaluation

After calibrating, the meter automatically evaluates the calibration. The zero point and slope are evaluated separately. The worse evaluation of both is taken into account. The evaluation appears on the display and in the calibration record.

Display	Calibration record	Zero point [mV]	Slope [mV/pH]
	+++	-15 ... +15	-60.5 ... -58.0
	++	-20 ... <-15 or >+15 ... +20	>-58.0 ... -57.0
	+	-25 ... <-20 or >+20 ... +25	-61.0 ... <-60.5 or >-57.0 ... -56.0
	-	-30 ... <-25 or ->+25 ... +30	-62.0 ... <-61.0 or >-56.0 ... -50.0
Clean the electrode according to the electrode operating manual			
Error	*Error*	-30 ... +30	-62.0 ... -50.0
Error elimination (see section 13 WHAT TO DO IF..., page 87)			

Calibration record (example)

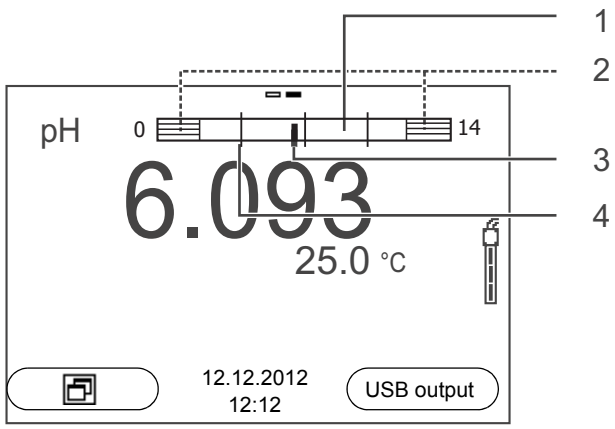
```
pH/ION 7320
Ser. no. 11292113

CALIBRATIONpH
12.12.2012 15:55

Ser. no. 10501234
AutoCal TEC
Buffer 1                4.01
Buffer 2                7.00
Buffer 3                10.01
Voltage 1               184,0 mV
Voltage 2               3,0 mV
Voltage 3               -177,0 mV
Temperature 1           24.0 °C
Temperature 2           24.0 °C
Temperature 3           24.0 °C
Slope                   -60.2 mV/pH
Asymmetry               4.0 mV
Sensor                   +++
```

6.2.7 Continuous measurement control (CMC function)

The Continuous Measurement Control (CMC function) facilitates to evaluate the current measured value instantly and definitely.

After each successful calibration the scale of the pH measuring range is displayed in the measured value display. Here you can very clearly see whether or not the current measured value is in the calibrated part of the measuring range.

The following information is displayed:



1 Measuring range for which a valid calibration is available (white). Measured values in this range are suitable for documentation.

2 Measuring range for which no valid calibration is available (shaded). Measured values in this range are not suitable for documentation. If necessary, calibrate the meter with buffers covering this measuring range.
If the current measured value is outside the calibrated range, this area is shaded stronger.
If a measured value is outside the measuring range pH 0 - 14, overflow arrows are displayed at the left or right edge of the measuring range.

3 Currently measured pH value (needle)

4 Marking lines for all nominal buffer values used with the last valid calibration

The limits of the calibrated range are determined by the buffers used for calibration:

Lower limit:	Buffer with lowest pH value - 2 pH units
Upper limit:	Buffer with highest pH value + 2 pH units

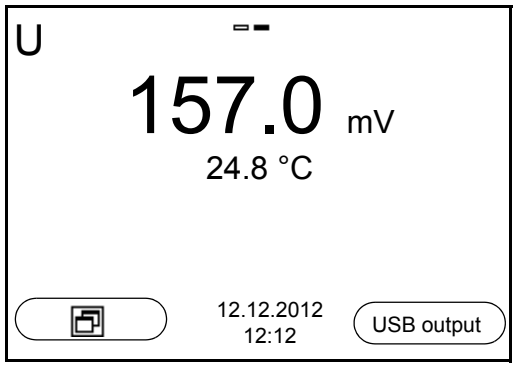
7 ORP voltage

7.1 Measuring

7.1.1 Measuring the ORP

NOTE
When connecting an earthed PC/printer, measurements cannot be performed in earthed media as the values would be incorrect.
The USB interface is not galvanically isolated.

1. Connect the ORP electrode to the meter.
2. If necessary, select the U (mV) display with **<M>**.
3. When measuring without temperature sensor:
   Measure the temperature of the test sample.
   In the **<MENU/ENTER>**/U/*Man. temperature* menu, set the temperature value with **<▲><▼>**.
4. Rinse the ORP electrode and immerse it in the test sample.
   The measured value is checked for stability (automatic stability control).
   The display of the measured parameter flashes.
5. Wait for a stable measured value.
   The display of the measured parameter no longer flashes.



Stability control (AutoRead)

The stability control function (*AutoRead*) continually checks the stability of the measurement signal. The stability has a considerable impact on the reproducibility of measured values.

You can activate or switch off the automatic *Stability control* function (see section 9.3.1 SYSTEM, page 74).

The measured parameter flashes on the display

- as soon as the measured value is outside the stability range
- when you switch over between the measured parameters with **<M>**.
- when the automatic *Stability control* is switched off.

Criteria for a stable measured value

The *Stability control* function checks whether the measured values are stable within the monitored time interval.

Measured parameter	Time interval	Stability in the time interval
ORP voltage	15 seconds	Δ : better than 0.3 mV
Temperature	15 seconds	Δ : better than 0.5 °C

The minimum duration until a measured value is assessed as stable is the monitored time interval. The actual duration is mostly longer.

Manually starting the stability control

You can start the *Stability control* manually at any time, irrespective of the setting for automatic *Stability control* (see section 9.3.1 SYSTEM, page 74) in the *System* menu.

1. Freeze the measured value with **<AR>**.
   The [HOLD] status indicator is displayed.
2. Using **<ENTER>**, activate the *Stability control* function manually.
   The [AR] status indicator appears while the measured value is assessed as not stable. A progress bar is displayed and the display of the measured parameter flashes.
   The [HOLD][AR] status indicator appears as soon as a stable measured value is recognized. The progress bar disappears and the display of the measured parameter stops flashing.
   The current measurement data is output to the interface. Measurement data meeting the stability control criterion is marked by AR.

You can prematurely terminate the *Stability control* function manually with **<ENTER>** at any time. If the *Stability control* function is prematurely terminated, the current measurement data are output to the interface without the AutoRead info.

3. Using **<ENTER>**, start a further measurement with *Stability control*.
   or
   Release the frozen measured value again with **<AR>**.
   The display switches to the measured value display.
   The [AR][HOLD] status display disappears.

Freezing the measured value (HOLD function)

With the HOLD function, you can freeze the current measured value. The displayed measured value stops changing until you switch the HOLD function off.

If the HOLD function is active, you can, e.g. start a manual measurement with stability control.

1. Freeze the measured value with **<AR>**.
   The [HOLD] status indicator is displayed.

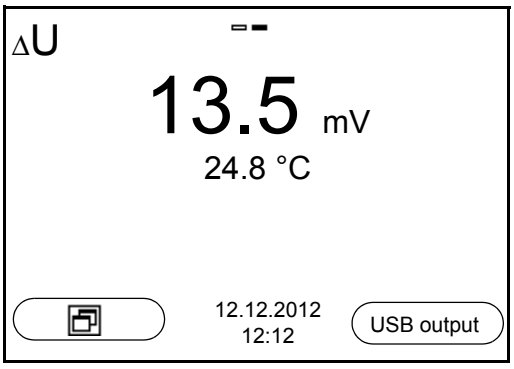
2. Release the frozen measured value again with **<AR>**.
   The HOLD function is switched off.
   The [HOLD] status display disappears.

7.1.2 Measuring the relative ORP

To measure the difference of the ORPs of two solutions, you have to define the ORP of one solution as the zero point first.

pH and ORP electrodes can be used to determine the relative ORP.

1. Connect the ORP electrode to the meter.
2. Prepare the reference solution for the determination of the reference point.
3. Select the ΔU (mV display with **<M>**.
4. Immerse the ORP electrode in the reference solution.
5. Display the potential of the current zero point with **<CAL>**.
6. Press **<ENTER>** to measure the reference solution.
   The measured value is checked for stability (automatic stability control). The display of the measured parameter flashes.
   The measured potential is defined as the zero point.
   or
   Press **<M>** to terminate the display of the zero point.
7. Rinse the ORP electrode and immerse it in the test sample.
   The measured value is checked for stability (automatic stability control). The display of the measured parameter flashes.
8. Wait for a stable measured value.
   The display of the measured parameter no longer flashes.



AutoRead The *Stability control* function checks whether the measured values are stable within the monitored time interval.

Measured parameter	Time interval	Stability in the time interval
ORP	15 seconds	Δ : better than 0.3 mV
Temperature	15 seconds	Δ : better than 0.5 °C

The minimum duration until a measured value is assessed as stable is the monitored time interval. The actual duration is mostly longer.

7.1.3 Measuring the temperature

For reproducible ORP measurements, it is essential to measure the temperature of the test sample.
You have the following options to measure the temperature:

- Automatic measurement of the temperature with the temperature sensor (NTC30 or Pt1000) integrated in electrode.
- Measurement by an external temperature sensor.
- Manual determination and input of the temperature.

The measuring instrument recognizes whether a suitable sensor is connected and automatically switches on the temperature measurement.

The display of the temperature indicates the active temperature measuring mode:

Temperature sensor	Resolution of the temp. display	Temp. measurement
yes	0.1 °C	Automatic with temperature sensor
-	1 °C	Manual

If you wish to measure (or calibrate) without temperature sensor, proceed as follows:

1. Measure the current temperature of the test sample.
2. In the **<MENU/ENTER>**/U/*Man. temperature* menu, set the temperature value with **<▲><▼>**.

7.2 ORP calibration

ORP electrodes are not calibrated. You can, however, check ORP electrodes by measuring the ORP of a test solution and comparing the value with the nominal value.

8 Ion concentration

8.1 Measuring

8.1.1 Measuring the ion concentration

NOTE
When connecting an earthed PC/printer, measurements cannot be performed in earthed media as the values would be incorrect.
The USB interface is not galvanically isolated.

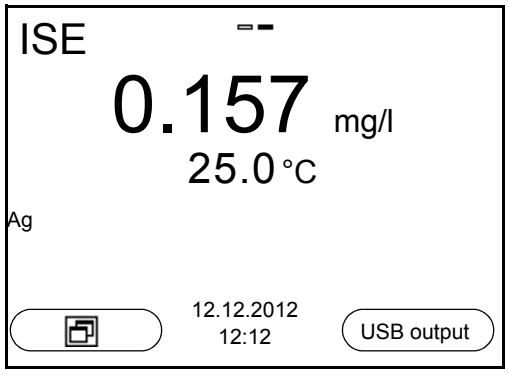
Incorrect calibration of ion selective electrodes will result in incorrect measured values. Calibrate regularly before measuring.

For precise ISE measurements the temperature difference between measurement and calibration should not be greater that 2 K. Therefore, adjust the temperature of the standard and measuring solutions accordingly. If the temperature difference is greater the *[TpErr]* warning appears in the measured value display.

1. Connect the ISE combination electrode to the meter.
   The pH/ISE measuring window is displayed.
2. If necessary, select the ISE display (unit, mg/l) with **<M>**.
3. If necessary, measure the temperature of the test sample with a thermometer.
4. Calibrate or check the meter with the electrode.

While no valid calibration is available, e.g. in the delivery condition, "Error" appears in the measured value display.

5. Immerse the electrode in the test sample.



Stability control (AutoRead) & HOLD function

The stability control function (*AutoRead*) continually checks the stability of the measurement signal. The stability has a considerable impact on the reproducibility of measured values.

The measured parameter flashes on the display

- as soon as the measured value is outside the stability range
- when the automatic *Stability control* is switched off.

You can activate or switch off the automatic *Stability control* function (see section 9.3.1 SYSTEM, page 74).

1. Freeze the measured value with **<AR>**.
   The [HOLD] status indicator is displayed.
   The HOLD function is active.

You can terminate the *Stability control* function and the HOLD function with **<AR>** or **<M>** at any time.

2. Using **<ENTER>**, activate the *Stability control* function manually.
   The [AR] status indicator appears while the measured value is assessed as not stable. A progress bar is displayed and the display of the measured parameter flashes.
   The [HOLD][AR] status indicator appears as soon as a stable measured value is recognized. The progress bar disappears and the display of the measured parameter stops flashing.
   The current measurement data is output to the interface. Measurement data meeting the stability control criterion is marked by AR.

You can prematurely terminate the *Stability control* function manually with **<ENTER>** at any time. If the *Stability control* function is prematurely terminated, the current measurement data are output to the interface without the AutoRead info.

3. Using **<ENTER>**, start a further measurement with stability control.
   or
   Release the frozen measured value again with **<AR>** or **<M>**.
   The [AR] status display disappears. The display switches back to the previous indication.

Criteria

The AutoRead criteria affect the reproducibility of the measured values. The following criteria can be adjusted:

- *high*: highest reproducibility
- *medium*: medium reproducibility
- *low*: lowest reproducibility

Increasing reproducibility also causes the response time to increase until a measured value is evaluated as stable.

8.1.2 Measuring the temperature

For reproducible ion-selective measurements, it is essential to measure the temperature of the test sample.
You have the following options to measure the temperature:

- Measurement by an external temperature sensor.
- Manual determination and input of the temperature.

The measuring instrument recognizes whether a suitable sensor is connected and automatically switches on the temperature measurement.

The display of the temperature indicates the active temperature measuring mode:

Temperatur e sensor	Resolution of the temp. display	Temp. measurement
yes	0.1 °C	Automatic with temperature sensor
-	1 °C	Manual

If you wish to measure (or calibrate) without temperature sensor, proceed as follows:

1. Measure the current temperature of the test sample.
2. In the **<MENU/ENTER>**/ISE/*Man. temperature* menu, set the temperature value with **<▲><▼>**.

8.2 Calibration

8.2.1 Why calibrate?

Ion-selective electrodes age and are temperature-dependent. This changes the slope. As a result, an inexact measured value is displayed. Calibration determines the calibration line of the electrode and stores this value in the meter.
Thus, you should calibrate before each measurement and at regular intervals.

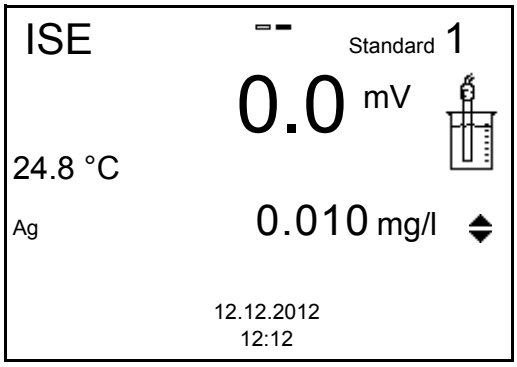
8.2.2 When to calibrate?

- Before any measurement if possible
- After connecting another ISE electrode
- When the sensor symbol flashes, e.g. after a voltage interruption (empty batteries)

8.2.3 Calibration (ISE Cal)

ISE Cal is the conventional **two-point** to **seven-point calibration procedure** that uses 2 to 7 freely selectable standard solutions. The concentration expected for the measurement determines the concentration of the calibration standards.

1. Connect the ISE combination electrode to the meter.
   The pH/mV/ISE measuring window is displayed.
2. Keep the standard solutions ready.
3. If necessary, measure the temperature of the standard solutions with a thermometer.
4. If necessary, change the unit of the measurement result and calibration standards in the *ISE setup*/*Unit* menu.
5. In the measured value display, select the ISE measuring window with **<▲>** **<▼>** and **<M>**.
6. Start the calibration with **<CAL>**.
   The calibration display appears.

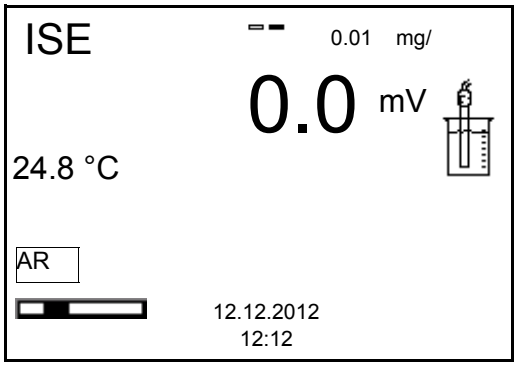


7. Thoroughly rinse the electrode with distilled water.

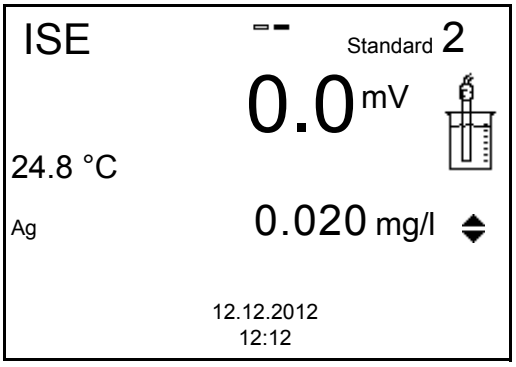
8. Immerse the electrode in standard solution 1.

9. When calibrating without temperature sensor:
   - Measure the temperature of the standard solution using a thermometer.
   - Use **<F2>**/[T ⇅ C] to select the setting of the temperature.
   - Use **<▲> <▼>** to set the temperature.
   - Use **<F2>**/[T ⇅ C] to select the setting of the concentration.

10. Set the concentration of the standard solution with **<▲> <▼>** and press **<MENU/ENTER>**.
The standard solution is measured.
The measured value is checked for stability (AutoRead).



11. Wait for the end of the AutoRead measurement or accept the calibration value with **<MENU/ENTER>**.
The calibration display for the next standard solution appears.



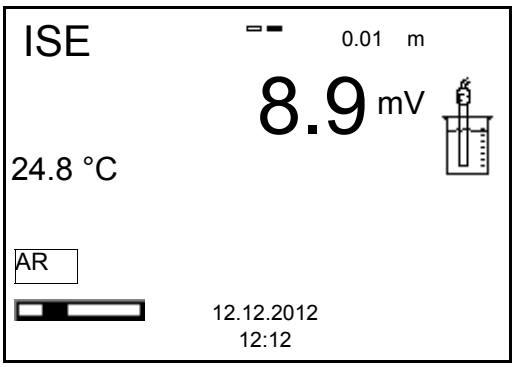
Continuing with two-point calibration

12. Thoroughly rinse the electrode with distilled water.

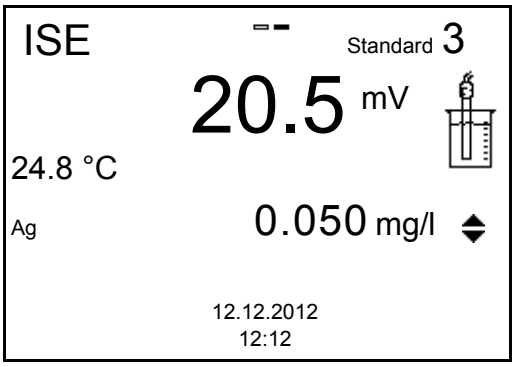
13. Immerse the electrode in standard solution 2.

14. When calibrating without temperature sensor:
   - Measure the temperature of the standard solution using a thermometer.
   - Use **<F2>**/[T ⇅ C] to select the setting of the temperature.
   - Use **<▲> <▼>** to set the temperature.
   - Use **<F2>**/[T ⇅ C] to select the setting of the concentration.

15. Set the concentration of the standard solution with **<▲> <▼>** and press **<MENU/ENTER>**.
The standard solution is measured.
The measured value is checked for stability (AutoRead).



16. Wait for the end of the AutoRead measurement or accept the calibration value with **<MENU/ENTER>**.
The calibration display for the next standard solution appears.



17. Press **<MENU/ENTER>** to continue with three-point calibration.
or
Finish the calibration procedure as a two-point calibration with **<M>**.
The new calibration values are displayed.

Continuing with three- to seven-point calibration

Repeat the steps 8 to 13 in the same way with the third and further standard solutions as necessary. The new calibration values are displayed after the last calibration step was completed.

Based on the calibration data, the calibration curve is determined in sections, according to the Nernst equation modified by Nikolski.

8.2.4 Calibration standards

Use two to seven different standard solutions. The standard solutions have to be selected in either increasing or decreasing order.

Select the unit of the standard solution and measurement result in the *ISE setup*/*Unit* menu.

Standard solution (Std 1 - 7)	**Values**
Unit [mg/l]	0.010 ... 500,000
Unit [mol/l]	0.100 ... 5,000 µmol/l 10.00 ... 5,000 mmol/l
Unit [mg/kg]	0.010 ... 500,000
Unit [ppm]	0.010 ... 500,000
Unit [%]	0.001 ... 50,000

The measurement precision is also dependent on the selected standard solutions. Therefore, the selected standard solutions should cover the value range expected of the subsequent concentration measurement.

If the measured electrode potential is outside the calibrated range, the *[ISEErr]* warning is displayed.

8.2.5 Calibration data

Displaying the calibration data

The calibration record of the last calibration is to be found under the menu item, **<MENU/ENTER>** / *Calibration* / / *Calibration record*. To open it, press the **<CAL__>** key in the measured value display.

Subsequently, you can transmit the displayed calibration data to the interface, e. g. to a PC, with **<F2>***[USB output]*.

Displaying the calibration data storage

The calibration records of the last calibrations (up to 10) are given in the menu, **<MENU/ENTER>**/ ISE / *Calibration* / *Calibration data storage*.

Menu item	Setting/function	Description
Calibration / *Calibration data storage* /*Display*	-	Displays the calibration record. Further options: ● Scroll through the calibration records with **<▲><▼>**. ● Output the displayed calibration record to the interface with **<F2>**/*[USB output]*. ● Quit the display with **<F1>**/ *[Back]* or **<MENU/ENTER>**. ● Switch directly to the measured value display with **<M>**.
Calibration / *Calibration data storage* / *Output to USB*	-	Outputs the calibration records to the interface.

Calibration evaluation

After calibrating, the meter automatically evaluates the calibration.

Display	Calibration record	Magnitude of the slope [mV]
	+++	50.0 ... 70.0 * or 25.0 ... 35.0 **
Error	*Error*	< 30 or > 90.0 * or < 15 or > 45 **
Error elimination (see section 14.2 ISE, page 111)		* monovalent ions ** divalent ions

Calibration record (example)

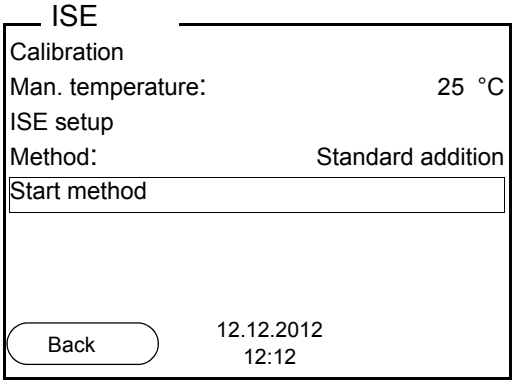
```
pH/ION 7320
Ser. no. 12345678

CALIBRATION ISE
18.01.2013 08:09:10

Sensor
Ser. no. 12345678

Standard 1              0.010 mg/l
Standard 2              0.020 mg/l
Voltage 1               38.5 mV
Voltage 2               58.0 mV
Temperature 1           24.0 øC
Temperature 2           24.0 øC
Ion type                Ag
Slope                   64.7 mV
Sensor                  +++
_____________________________________
```

8.3 Selecting the measuring method

The following methods are supported:

- *Standard addition*
- *Standard subtraction*
- *Sample addition*
- *Sample subtraction*
- *Blank value addition*

1. Connect the ISE combination electrode to the meter.
   The pH/ISE measuring window is displayed.
2. If necessary, select the ISE display (unit, mg/l) with **<M>**.
3. If necessary, measure the temperature of the test sample with a thermometer.
4. Open the ISE menu with **<MENU/ENTER>**.
5. Thoroughly rinse the electrode with distilled water.
6. Adjust the temperature of the standard solutions.
7. Select *Method* with **<▲> <▼>** and confirm with **<MENU/ENTER>**.
8. Select a method with **<▲> <▼>** and confirm with **<MENU/ENTER>**.



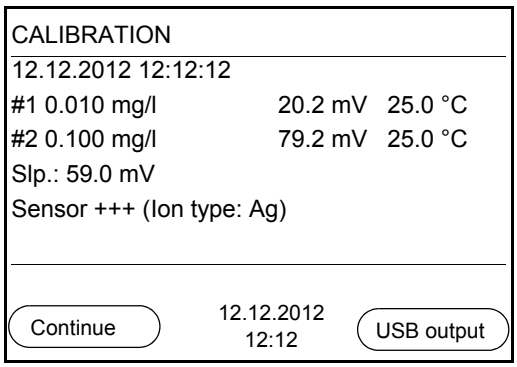
9. Select *Start method* with **<▲> <▼>** and confirm with **<MENU/ENTER>**.
   Measurement with the selected method begins (see section 8.3.1 STANDARD ADDITION, page 54 ... section 8.3.5 STANDARD ADDITION WITH BLANK VALUE CORRECTION (BLANK VALUE ADDITION), page 62).

8.3.1 *Standard addition*

In the "Standard addition" procedure, a known amount of standard solution is added to the sample.

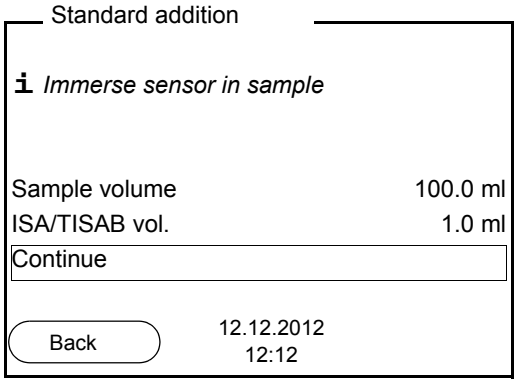
The ion concentration in the sample is calculated from the change in potential.

1. Select the measuring method (see section 8.3 SELECTING THE MEASURING METHOD, page 53).
2. Prepare two standard calibration solutions.
3. Perform a two-point calibration according to user guidance.
4. The calibration record is displayed as soon as a stable value is achieved for the second standard calibration solution.



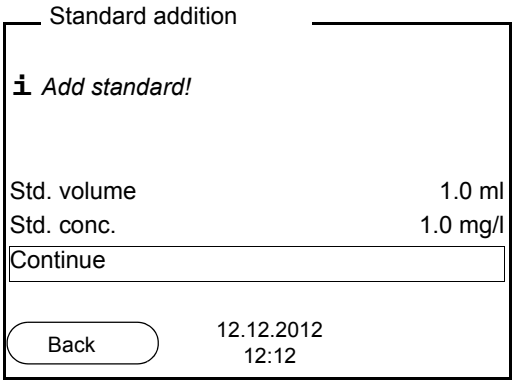
Measuring

5. Start the measurement with **<F1>**/[*Continue*].
   An entry window appears.



6. Prepare the sample.
7. If necessary, add the ISA/TISAB solution to the sample.
8. Thoroughly rinse the electrode with deionized water.
9. Immerse the electrode in the sample.
10. Using **<▲> <▼>** and **<MENU/ENTER>**, select the values for the volume of the sample (*Sample volume*) and the volume of the ISA/TISAB solution (*ISA/TISAB vol.*).

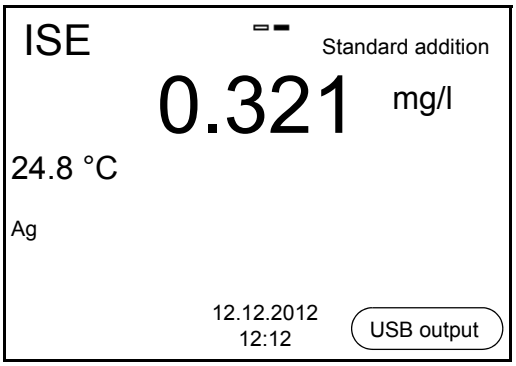
11. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
When the measurement is finished an entry window appears.



12. Add the standard solution to the sample.

13. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the standard solution (*Std. volume*) and concentration of the standard solution (*Std. conc.*) .

14. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
The measurement result is displayed when the measurement is completed.



15. If necessary, start measuring further samples with **<MENU/ENTER>**.
Repeat steps 6 - 14 for all samples.

16. Terminate the measuring method with **<M>**.
A safety query appears.

17. Select *Yes* with **<▲> <▼>**.

18. Confirm *Yes* with **<MENU/ENTER>**.
Measurement with the selected method is completed.

8.3.2 *Standard subtraction*

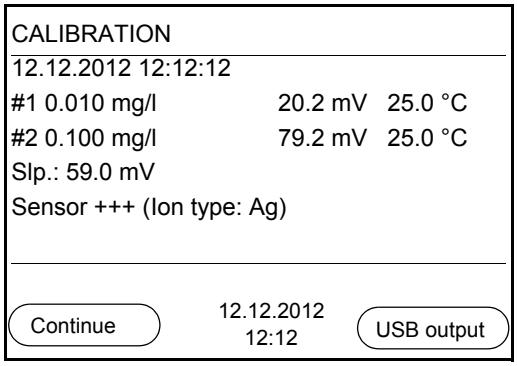
In the "Standard Subtraction" procedure, a known amount of standard solution is added to the sample (as complexing agent or precipitating agent) and, thus, the ion concentration lowered.

The ion concentration in the sample is calculated from the change in potential.

1. Select the measuring method (see section 8.3 SELECTING THE MEASURING METHOD, page 53).

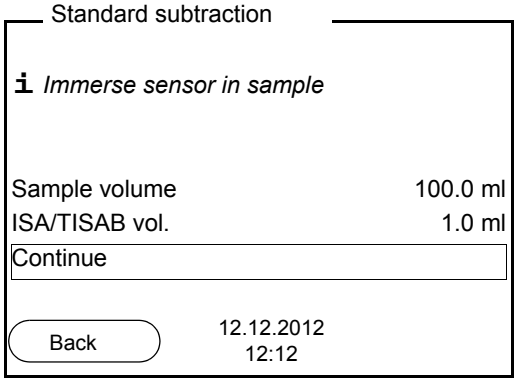
Calibration

2. Prepare two standard calibration solutions.
3. Perform a two-point calibration according to user guidance.
4. The calibration record is displayed as soon as a stable value is achieved for the second standard calibration solution.



Measuring

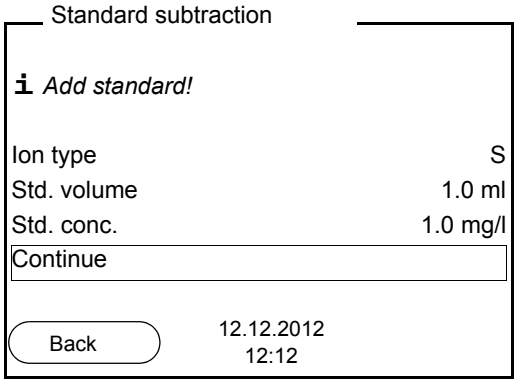
5. Start the measurement with **<F1>**/[*Continue*].
An entry window appears.



6. Prepare the sample.
7. If necessary, add the ISA/TISAB solution to the sample.
8. Thoroughly rinse the electrode with deionized water.
9. Immerse the electrode in the sample.

10. Using **<▲> <▼>** and **<MENU/ENTER>**, select the values for the volume of the sample (*Sample volume*) and the volume of the ISA/TISAB solution (*ISA/TISAB vol.*).

11. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
When the measurement is finished an entry window appears.

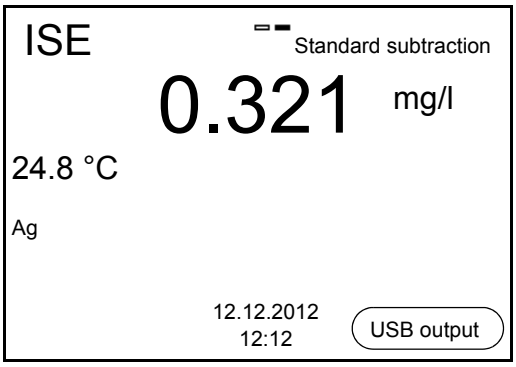


12. Add the standard (complexing agent or precipitating agent) to the sample.

13. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the standard solution (*Std. volume*) and concentration of the standard solution (*Std. conc.*) .

14. If necessary, set the ion type for the ion in the standard (*Ion type*) with **<▲> <▼>** and **<MENU/ENTER>**.
On selection of the ion type that can be defined (ION):
Using **<▲> <▼>** and **<MENU/ENTER>**, set the valence (*Valency*) and molar weight (*Molar mass*) for the ion in the standard solution.

15. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
The measurement result is displayed when the measurement is completed.



16. If necessary, start measuring further samples with **<MENU/ENTER>**.
Repeat steps 6 - 13 for all samples.

17. Terminate the measuring method with **<M>**.
A safety query appears.

18. Select *Yes* with **<▲> <▼>**.

19. Confirm *Yes* with **<MENU/ENTER>**.
Measurement with the selected method is completed.

8.3.3 *Sample addition*

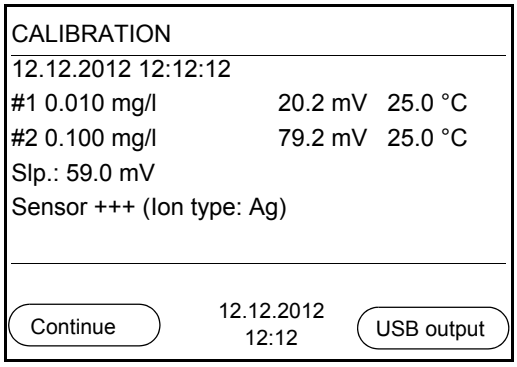
In the "Sample addition" procedure, a known amount of sample is added to the standard solution.

The ion concentration in the sample is calculated from the change in potential.

1. Select the measuring method (see section 8.3 SELECTING THE MEASURING METHOD, page 53).

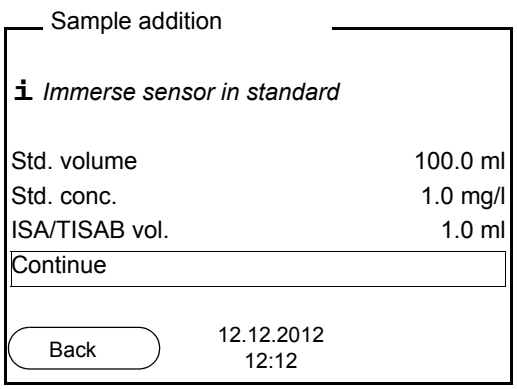
Calibration

2. Prepare two standard calibration solutions.
3. Perform a two-point calibration according to user guidance.
4. The calibration record is displayed as soon as a stable value is achieved for the second standard calibration solution.



Measuring

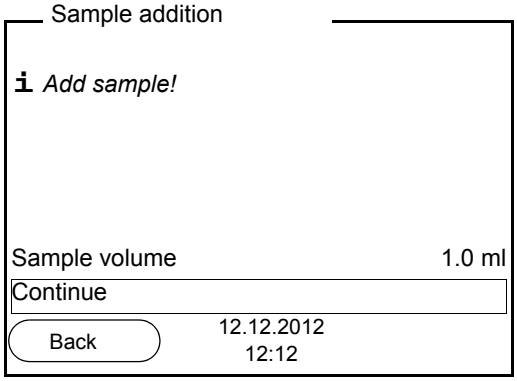
5. Start the measurement with **<F1>**/[*Continue*].
An entry window appears.



6. Prepare the standard solution.
7. If necessary, add the ISA/TISAB solution to the standard solution.
8. Thoroughly rinse the electrode with deionized water.
9. Immerse the electrode in the standard.

10. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the standard solution (*Std. volume*), the concentration of the standard solution (*Std. conc.*) and the volume of the ISA/TISAB solution (*ISA/TISAB vol.*).

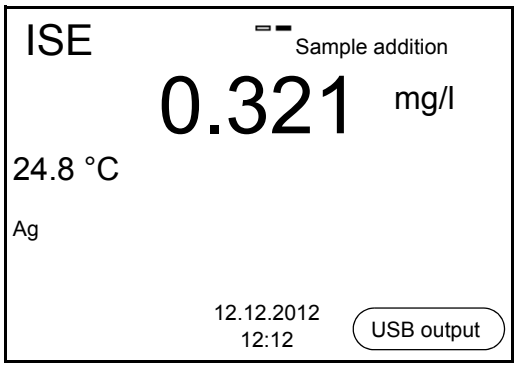
11. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
When the measurement is finished an entry window appears.



12. Add the sample to the standard solution.

13. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the value for the volume of the sample (*Sample volume*).

14. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
The measurement result is displayed when the measurement is completed.



15. If necessary, start measuring further samples with **<MENU/ENTER>**.
Repeat steps 6 - 12 for all samples.

16. Terminate the measuring method with **<M>**.
A safety query appears.

17. Select *Yes* with **<▲> <▼>**.

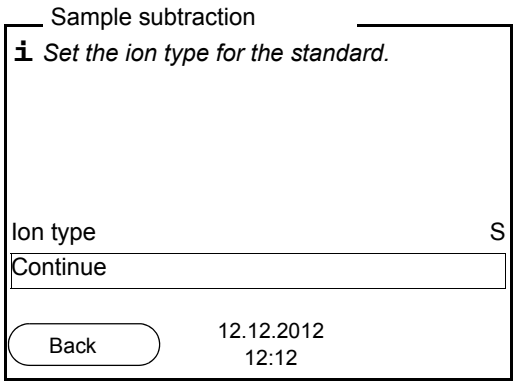
18. Confirm *Yes* with **<MENU/ENTER>**.
Measurement with the selected method is completed.

8.3.4 *Sample subtraction*

With the "Sample subtraction" procedure, a known amount of sample is added to the standard solution (complexing agent or precipitating agent).

The ion concentration in the sample is calculated from the change in potential. The sample subtraction is one method for the indirect determination of ions. It is used for the determination of ions for which no direct determination is possible.

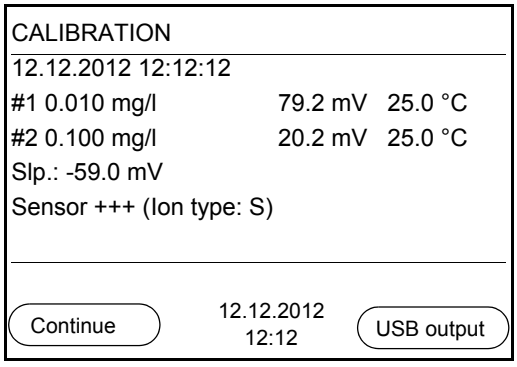
1. Select the measuring method (see section 8.3 SELECTING THE MEASURING METHOD, page 53).



2. If necessary, set the ion type for the ion in the standard (*Ion type (sub)*) with **<▲> <▼>** and **<MENU/ENTER>**.
On selection of the ion type that can be defined (ION):
Using **<▲> <▼>** and **<MENU/ENTER>**, set the valence (*Valency*) and molar weight (*Molar mass*) for the ion in the standard solution.
3. Select *Continue* with **<▲> <▼>** and confirm with **<MENU/ENTER>**.

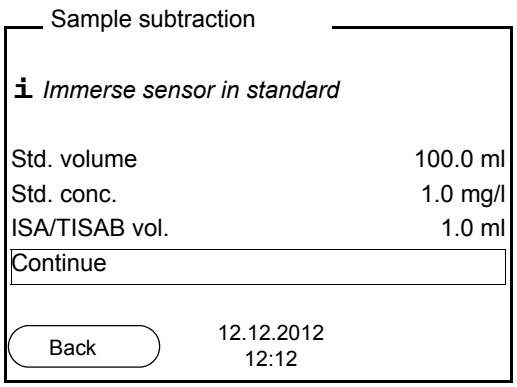
Calibration

4. Prepare two standard calibration solutions.
5. Perform a two-point calibration according to user guidance.
6. The calibration record is displayed as soon as a stable value is achieved for the second standard calibration solution.

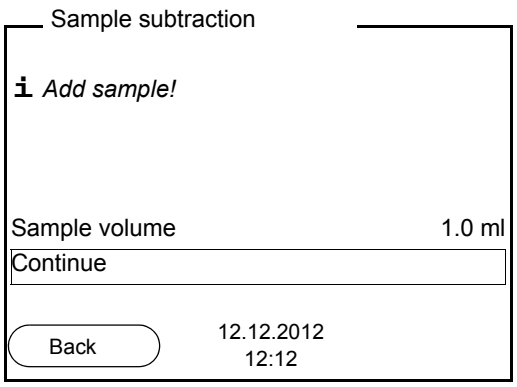


Measuring

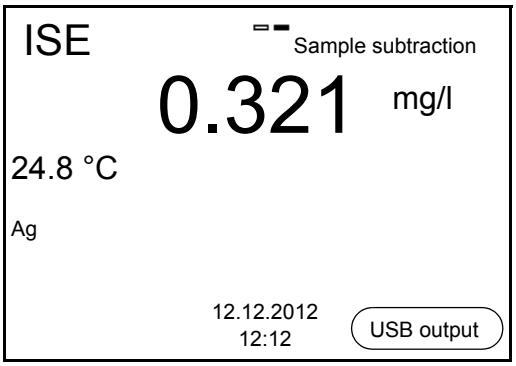
7. Start the measurement with **<F1>** *Continue*.
An entry window appears.



8. Prepare the standard solution.
9. If necessary, add the ISA/TISAB solution to the standard solution.
10. Thoroughly rinse the electrode with deionized water.
11. Immerse the electrode in the standard solution (complexing agent or precipitating agent).
12. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the standard solution (*Std. volume*), the concentration of the standard solution (*Std. conc.*) and the volume of the ISA/TISAB solution (*ISA/TISAB vol.*).
13. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
    When the measurement is finished an entry window appears.



14. Add the sample to the standard (complexing agent or precipitating agent).
15. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the value for the volume of the sample (*Sample volume*).
16. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
    The measurement result is displayed when the measurement is completed.



17. If necessary, start measuring further samples with **<MENU/ENTER>**. Repeat steps 8 - 16 for all samples.
18. Terminate the measuring method with **<M>**.
A safety query appears.
19. Select *Yes* with **<▲> <▼>**.
20. Confirm *Yes* with **<MENU/ENTER>**.
Measurement with the selected method is completed.

8.3.5 Standard addition with blank value correction (*Blank value addition*)

In the "Standard addition with blank value correction" procedure, a known amount of standard solution is added to the sample in two steps.

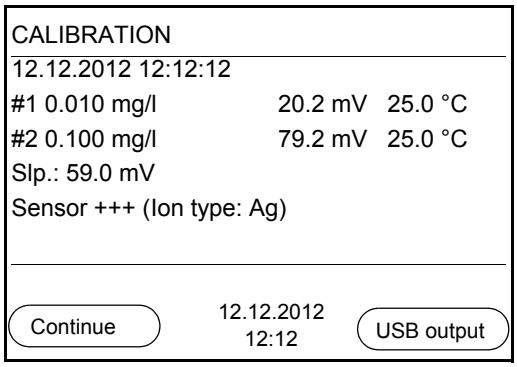
With the first addition, the ion concentration is raised to the linear range of the electrode characteristic curve.

The second addition is equivalent to the standard addition. The ion concentration in the sample is calculated from the change in potential.

1. Select the measuring method (see section 8.3 SELECTING THE MEASURING METHOD, page 53).

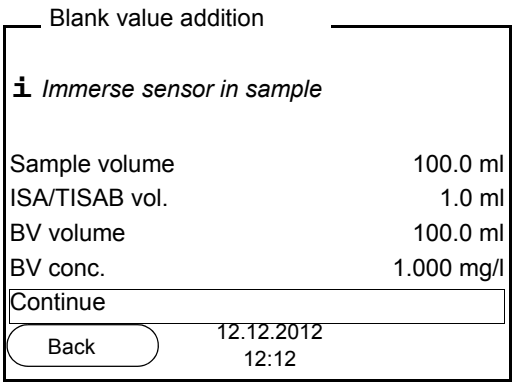
Calibration

2. Prepare two standard calibration solutions.
3. Perform a two-point calibration according to user guidance.
4. The calibration record is displayed as soon as a stable value is achieved for the second standard calibration solution.

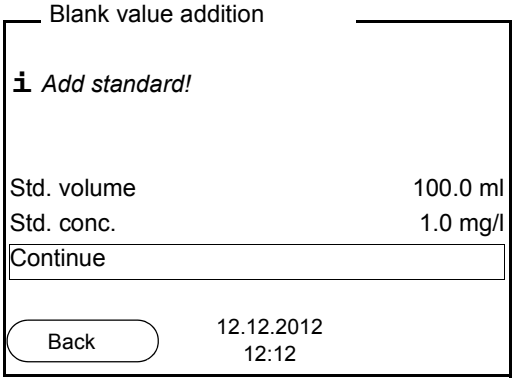


Measuring

5. Start the measurement with **<F1>** *Continue*
   An entry window appears.



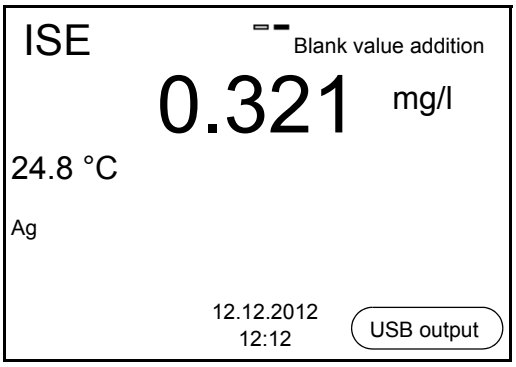
6. Prepare the sample.
7. If necessary, add the ISA/TISAB solution to the sample.
8. Thoroughly rinse the electrode with deionized water.
9. Immerse the electrode in the sample that was supplemented with blank value solution.
10. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the sample (*Sample volume*), the volume of the ISA/TISAB solution (*ISA/TISAB vol.*), the volume of the blank value solution (*BV volume*) and the concentration of the blank value solution (*BV conc.*).
11. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**.
    When the measurement is finished an entry window appears.



12. Add the standard solution to the sample.

13. Using **<▲> <▼>** and **<MENU/ENTER>**, enter the values for the volume of the standard solution (*Std. volume*) and concentration of the standard solution (*Std. conc.*).

14. Select *Continue* with **<▲> <▼>** and start the measurement with **<MENU/ENTER>**. The measurement result is displayed when the measurement is completed.



15. If necessary, start measuring further samples with **<MENU/ENTER>**. Repeat steps 6 - 14 for all samples.

16. Terminate the measuring method with **<M>**.
A safety query appears.

17. Select *Yes* with **<▲> <▼>**.

18. Confirm *Yes* with **<MENU/ENTER>**.
Measurement with the selected method is completed.

9 Settings

9.1 Measurement settings

9.1.1 Settings for pH measurements

The settings for pH measurements are made in the menu for calibration and measurement settings of the pH/ORP measurement. To open the settings, display the required measured parameter in the measured value display and press the **<MENU/ENTER>** key. After completing the settings, switch to the measured value display with **<M>**.

In the following table, only those settings are listed that concern the pH measurement.

Default settings are printed in **bold**.

Menu item	Possible setting	Description
Calibration /*Calibration record*	-	Displays the calibration record of the last calibration.
Calibration / *Calibration data storage* /*Display*	-	Displays the calibration record. Further options: ● Scroll through the calibration records with **<▲><▼>**. ● Output the displayed calibration record to the interface with **<F2>**/*[USB output]*. ● Output all calibration records to the interface with **<F2__>***[USB output]*. ● Quit the display with **<F1>**/ *[Back]* or **<MENU/ENTER>**. ● Switch directly to the measured value display with **<M>**.
Calibration / *Calibration data storage* / *Output to USB*	-	Outputs the calibration records to the interface.

Menu item	Possible setting	Description
Calibration/ Serial number (sensor)	-	Entry of the series number of the connected sensor. The series number is output in the calibration record. ● Change the contents of the highlighted position with **<▲><▼>**. ● Go to the next digit with **<F2>**/ [▶]. ● After the series number was completely entered, confirm with **<ENTER>**.
Calibration /Buffer	***TEC*** *ConCal* *NIST/DIN* *...*	Buffer sets to be used for pH calibration (see section 6.2 CALIBRATION, page 31).
Calibration /One point calibration	*Yes* ***No***	Quick calibration with 1 buffer
Calibration /Calibration interval	*1 ...* ***7*** *... 999 d*	*Calibration interval* for the pH electrode (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol in the measuring screen.
Calibration /Unit for slope	**mV/pH** *%*	Unit of the slope. The % display refers to the Nernst slope of -59.2 mV/pH (100 x determined slope/Nernst slope).
Alternative temperature	*On* ***Off***	Takes the temperature value from the 2nd sensor.
Man. temperature	*-25 ...* **+25** *... +130 °C*	Entry of the manually determined temperature. For measurements without temperature sensor only.
Resolution pH	**0.001** *0.01* *0.1*	Resolution of the pH display
Limit monitoring		With the *Limit monitoring* function you define the measured values whose exceeding is signaled. An acoustic signal sounds, and at the same time a message is output to the USB interface. You can switch on or off the acoustic signal in the *System* menu (see section 9.3.1 SYSTEM, page 74).

Menu item	Possible setting	Description
Limit monitoring/ pH monitoring	*On* ***Off***	Switch on or off the limit signaling device for the pH value.
Limit monitoring/ TP monitoring	*On* ***Off***	Switch on or off the limit signaling device for the temperature value.
Limit monitoring/ pH monitoring/ On/ pH upper limit	-2 ... 20	Upper limit. A message is output to the USB interface if it is exceeded. This menu item is only visible when the *pH monitoring* setting is active.
Limit monitoring/ pH monitoring/ On/ pH lower limit	-2 ... 20	Lower limit. A message is output to the USB interface if it is exceeded. This menu item is only visible when the *pH monitoring* setting is active.
Limit monitoring/ TP monitoring/ On/ TP upper limit	-5 ... +105 °C	Upper limit. A message is output to the USB interface if it is exceeded. This menu item is only visible when the *TP monitoring* setting is active.
Limit monitoring/ TP monitoring/ On/ TP lower limit	-5 ... 105 °C	Lower limit. A message is output to the USB interface if it is exceeded. This menu item is only visible when the *TP monitoring* setting is active.
Reset	-	Resets all sensor settings to the delivery condition (see section 9.4.1 RESETTING THE MEASUREMENT SETTINGS, page 75).

9.1.2 Buffer sets for calibration

You can use the buffer sets quoted in the table for an automatic calibration. The pH values are valid for the specified temperature values. The temperature dependence of the pH values is taken into consideration during the calibration.

No.	Buffer set *	pH values	at
1	*ConCal*	Any	Any
2	*NIST/DIN* DIN buffers according to DIN 19266 and NIST Traceable Buffers	1.679 4.006 6.865 9.180 12.454	25 °C
3	*TEC* WTW Technical buffers	2.000 4.010 7.000 10.011	25 °C

No.	Buffer set *	pH values	at
4	*Merck 1**	4.000 7.000 9.000	20°C
5	*Merck 2 **	1.000 6.000 8.000 13.000	20°C
6	*Merck 3 **	4.660 6.880 9.220	20°C
7	*Merck 4 **	2.000 4.000 7.000 10.000	20°C
8	*Merck 5 **	4.010 7.000 10.000	25 °C
9	*DIN 19267*	1.090 4.650 6.790 9.230	25 °C
10	*Mettler Toledo USA **	1.679 4.003 7.002 10.013	25 °C
11	*Mettler Toledo EU **	1.995 4.005 7.002 9.208	25 °C
12	*Fisher **	2.007 4.002 7.004 10.002	25 °C
13	*Fluka BS **	4.006 6.984 8.957	25 °C
14	*Radiometer **	1.678 4.005 7.000 9.180	25 °C
15	*Baker **	4.006 6.991 10.008	25 °C

No.	Buffer set *	pH values	at
16	*Metrohm* *	3.996 7.003 8.999	25 °C
17	*Beckman* *	4.005 7.005 10.013	25 °C
18	*Hamilton Duracal* *	4.005 7.002 10.013	25 °C
19	*Precisa* *	3.996 7.003 8.999	25 °C
20	*Reagecon TEC* *	2.000 4.010 7.000 10.000	25 °C
21	*Reagecon 20* *	2.000 4.000 7.000 10.000 13.000	20°C
22	*Reagecon 25* *	2.000 4.000 7.000 10.000 13.000	25 °C
23	*Chemsolute* *	2.000 4.000 7.000 10.000	20°C
24	*USABlueBook* *	4.000 7.000 10.000	25 °C
25	*YSI* *	4.000 7.000 10.000	25 °C

* Brand names or trade names are trademarks of their respective owners protected by law.

The buffers are selected in the menu, pH / **<MENU/ENTER>** / *Calibration* / *Buffer* (see 9.1.1 SETTINGS FOR PH MEASUREMENTS, PAGE 65).

9.1.3 Calibration interval

The calibration evaluation is displayed as a sensor symbol.

The sensor symbol flashes after the adjusted calibration interval has expired. It is still possible to measure.

To ensure the high measuring accuracy of the measuring system, calibrate after the calibration interval has expired.

Setting the calibration interval

The calibration interval is set to 7 days in the factory.
You can change the interval (1 ... 999 days):

1. Open the menu for measurement settings with **<MENU/ENTER>**.
2. In the *Calibration* / *Calibration interval* menu, set the calibration interval with **<▲><▼>**.
3. Confirm the setting with **<ENTER>**.
4. Quit the menu with **<M>**.

9.1.4 Settings for ORP measurements

The settings for ORP measurements are made in the menu for calibration and measurement settings of the pH/ORP measurement. To open the settings, display the required measured parameter in the measured value display and press the **<MENU/ENTER>** key. After completing the settings, switch to the measured value display with **<M>**.

In the following table, only those settings are listed that influence the ORP measurement.

Default settings are printed in **bold**.

Menu item	Possible setting	Description
Alternative temperature	*On* ***Off***	Takes the temperature value from the 2nd sensor.
Man. temperature	*-25 ...* ***+25*** *... +130 °C*	Entry of the manually determined temperature. For measurements without temperature sensor only.
Resolution mV	**0.1** *1*	Resolution of the mV display
Reset	-	Resets all sensor settings to the delivery condition (see section 9.4.1 RESETTING THE MEASUREMENT SETTINGS, page 75).

9.2 Settings for ISE measurements

The settings are made in the measuring menu of the ISE measurement. To open the settings, activate the relevant measuring window in the measured value display and press the **<MENU/ENTER>** key shortly. After completing the settings, switch to the measured value display with **<M>**.

The following settings are possible for ISE measurements:

Menu item	Possible setting	Description
Calibration / *Calibration record*	-	Displays the calibration record of the last calibration.
Calibration / *Calibration data storage* / *Display*	-	Displays the calibration record. Further options: ● Scroll through the calibration records with **<▲><▼>**. ● Output the displayed calibration record to the interface with **<F2>**/*[USB output]*. ● Output all calibration records to the interface with **<F2__>***[USB output]*. ● Quit the display with **<F1>**/*[Back]* or **<MENU/ENTER>**. ● Switch directly to the measured value display with **<M>**.
Calibration / *Calibration data storage* / *Output to USB*	-	Outputs the calibration records to the interface.
Calibration/ *Serial number (sensor)*	-	Entry of the series number of the connected sensor. The series number is output in the calibration record. ● Change the contents of the highlighted position with **<▲><▼>**. ● Go to the next digit with **<F2>**/[▶]. ● After the series number was completely entered, confirm with **<ENTER>**.

Menu item	Possible setting	Description
Alternative temperature	*On* ***Off***	Takes the temperature value from the 2nd sensor.
Man. temperature	*-25 ...* ***+25*** *... +130 °C*	Entry of the manually determined temperature. For measurements without temperature sensor only.
ISE setup / *AutoRead criterion*	*low* ***medium*** *high*	Selection of the AutoRead criteria (see section 8.1.1 MEASURING THE ION CONCENTRATION, page 45).
ISE setup / *Ion type*	Ag, Br, Ca, Cd, Cl, CN, Cu, F, I, K, Na, NO3, Pb, S, NH3, NH4*, CO2, ION	Selection of the ion type to be measured. An ion that is not included in the list can be measured with the setting, ION.
	* Measuring with the NH 500 electrode: The NH4 setting is not suitable for the gas-sensitive electrode NH 500. Select the following settings: *Ion type* "ION", *Valency* "-1".	
ISE setup / *Unit*	mg/l µmol/l mg/kg ppm %	Selection, with which unit the measurement result and calibration standards should be displayed.
ISE setup / *Ion type* / ION	*Valency* *Molar mass*	Set the valence (*Valency*) and molar weight (*Molar mass*) for the ion.
ISE setup / *Density*	0.001 ... 9.999 g/ml or kg/l	Adjustable density of the test sample (only with *Unit*: mg/kg, ppm, %)
Method	*Standard addition* *Standard subtraction* *Sample addition* *Sample subtraction* *Blank value addition*	Selection of the available measuring methods.
Start method		Start measurement with the selected method.

9.3 Sensor-independent settings

9.3.1 *System*

To open the *Storage & config* menu, press the **<MENU/ENTER__>** key in the measured value display. After completing the settings, switch to the measured value display with **<M>**.

Default settings are printed in **bold**.

Menu item	Possible setting	Description
System / *General* / *Language*	*Deutsch* ***English*** *(further)*	Selects the menu language
System / *General* / *Beep*	***On*** *Off*	Switches on/off the beep on keystroke
System / *General* / *Illumination*	***Auto*** *On* *Off*	Switches the display illumination on/off
System / *General* / *Contrast*	*0 ...* ***50*** *... 100 %*	Changes the display contrast
System / *General* / *Switchoff time*	*10 min ...* ***1h*** *... 24 h*	Adjusts the switch-off time
System / *General* / *Temperature unit*	***°C*** *°F*	Temperature unit, degrees Celsius or degrees Fahrenheit. All temperature values are displayed with the selected unit.
System / *General* / *Stability control*	***On*** *Off*	Switches on or off the automatic stability control during measurement
System / *Interface* / *Baud rate*	*1200, 2400,* ***4800****, 9600, 19200*	Baud rate of the data interface
System / *Interface* / *Output format*	***ASCII*** *CSV*	Output format for data transmission (see section 11 TRANSMITTING DATA (USB INTERFACE), page 83)
System / *Interface* / *Decimal separator*	***Dot (xx.x)*** *Comma (xx,x)*	Decimal separator
System / *Interface* / *Output header*		Output of a header for *Output format*: *CSV*

Menu item	Possible setting	Description
System / *Printer*		Settings for the integrated printer of the pH/ION 7320P. For details, see section 4 PRINTER (ONLY PH/ION 7320 P), page 14
System /*Clock*	*Date format* *Datum* *Time*	Time and date settings (see section 5.4.6 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 25)
System /*Service information*		Hardware version and software version of the meter are displayed.
System /*Reset*	-	Resets the system settings to the delivery condition (see section 9.4.2 RESETTING THE SYSTEM SETTINGS, page 76).

9.3.2 *Data storage*

This menu contains all functions to display, edit and erase stored measured values and calibration records (see section 10 DATA STORAGE, page 77).

9.4 Reset

You can reset (initialize) all sensor settings and sensor-independent settings separately from each other.

9.4.1 Resetting the measurement settings

The calibration data are reset to the default settings together with the measuring parameters. Recalibrate after performing a reset.

The following settings for pH measurements are reset to the default settings with the *Reset* function:

pH

Setting	Default settings
Buffer	TEC
Calibration interval	7 d
Unit for slope	mV/pH
Measured parameter	pH
Resolution pH	0.001

Setting	Default settings
Resolution mV	0.1
Asymmetry	0 mV
Slope	-59.2 mV
Man. temperature	25 °C
One point calibration	No
Stability control	On
Temperature unit	°C

The sensor settings are reset under the *Reset* menu item in the menu for calibration and measurement settings. To open it in the measured value display, press the **<MENU/ENTER>** key.

9.4.2 Resetting the system settings

The following system settings can be reset to the delivery status:

Setting	Default settings
Language	English
Beep	On
Baud rate	4800 Baud
Output format	ASCII
Decimal separator	Dot (xx.x)
Contrast	50 %
Illumination	Auto
Switchoff time	1 h

The system settings are reset in the menu, *Storage & config* / *System* / *Reset*. To open the *Storage & config* menu, press the **<MENU/ENTER__>** key in the measured value display.

10 Data storage

You can transmit measured values (datasets) to the data storage:

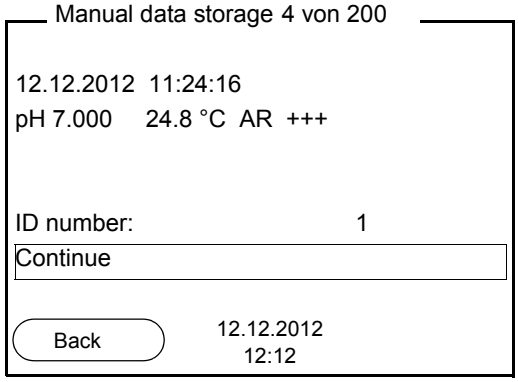
- Manual data storage (see section 10.1 MANUAL DATA STORAGE, page 77)
- Automatic storage at intervals (see section 10.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 78)

With each data storage process, the current datasets of the sensors indicated on the display are transmitted to the interface at the same time.

10.1 Manual data storage

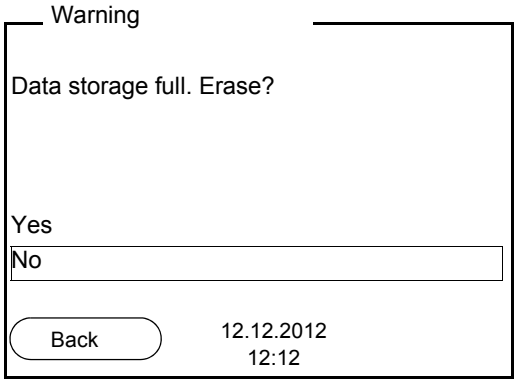
You can transmit a measurement dataset to the data storage as follows. With each data storage process, the current datasets of the sensors indicated on the display are transmitted to the interface at the same time.

1. Press the **<STO>** key shortly.
   The menu for manual data storage appears.



2. If necessary, change and confirm the ID number (1 ... 10000) with **<▲><▼>** and **<MENU/ENTER>**.
   The dataset is stored. The meter switches to the measured value display.

If the storage is full The following window appears if all 200 storage locations are occupied:



You have the following options:

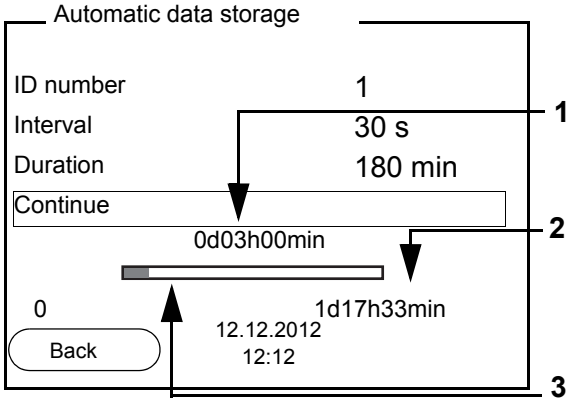
- To erase the entire storage, confirm *Yes*.
- To cancel the storage process and switch to the measured value display, confirm *No*. Then you can e.g. transmit the stored data to a PC (see section 10.3.1 EDITING THE MEASUREMENT DATA STORAGE, page 80) and subsequently erase the data storage (see section 10.3.2 ERASING THE MEASUREMENT DATA STORAGE, page 82).

10.2 Automatic data storage at intervals

The storage interval (*Interval*) determines the time interval between automatic data storage processes. With each data storage process, the current datasets of the sensors indicated on the display are transmitted to the interface at the same time.

Configuring the automatic storage function

1. Press the **<STO__>** key.
   The menu for automatic data storage appears.



1 Adjusted entire storage duration
2 Max. available storage duration
3 Graphical display of the storage usage

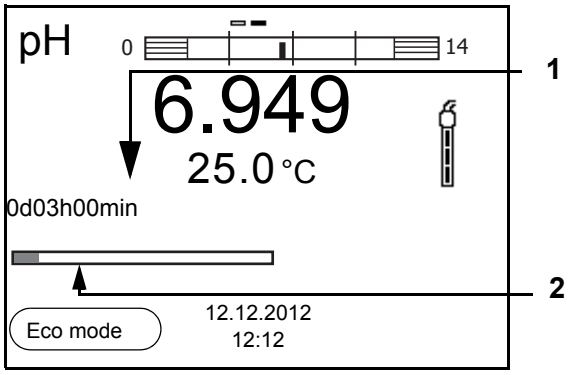
Settings

You can configure the automatic data storage function with the following settings:

Menu item	Possible setting	Description
ID number	*1 ... 10000*	ID number for the dataset series.
Interval	*1 s, 5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min*	Storage interval. The lower limit of the storage interval can be restricted by the number of free storage locations. The upper limit is restricted by the storage duration.
Duration	*1 min ... x min*	Storage duration. Specifies after which time the automatic data storage should be terminated. The lower limit of the storage duration is restricted by the storage interval. The upper limit is restricted by the number of free storage locations.

Starting the automatic storage function

To start the automatic storage function, select *Continue* with **<▲><▼>** and confirm with **<MENU/ENTER>**. The meter switches to the measured value display.



1 Remaining storage duration
2 Graphical display of the storage duration

The active automatic storage function can be recognized by the progress bar in the function display. The progress bar indicates the remaining storage duration.

If the automatic storage function is activated, only the following keys are active: Softkeys, **<M>**, **<STO__>** and **<On/Off>**. The other keys and the automatic switch-off function are deactivated.

Energy saving mode ([Eco mode])

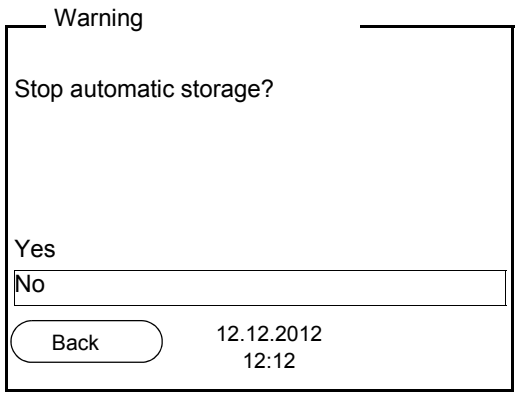
If the automatic storing function is active, the meter provides an energy saving mode ([Eco mode]) to avoid unnecessary energy consumption. The energy

saving mode switches off functions of the meter that are not required for the automatic storage of measurement data (such as the display). By pressing any key the energy saving mode is switched off again.

Terminating the automatic storage function prematurely

Proceed as follows to switch off the automatic data storage function before the adjusted storage duration has expired:

1. Press the **<STO__>** key.
   The following window appears.



2. Using **<▲><▼>**, select *Yes* and confirm with **<MENU/ENTER>**.
   The meter switches to the measured value display.
   The automatic data storage function is terminated.

10.3 Measurement data storage

10.3.1 Editing the measurement data storage

The contents of the manual or automatic measurement data storage can be shown on the display and output to the interface.

Each of the measurement data storages has a function to erase the entire contents.

Editing the data storage

The storage is edited in the menu, *Storage & config* / *Data storage*. To open the *Storage & config* menu, press the **<MENU/ENTER__>** key in the measured value display.

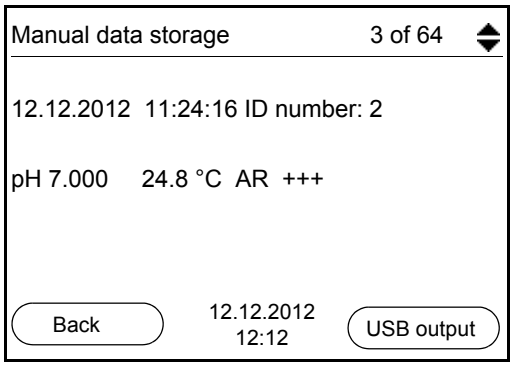
Open the manual or automatic storage directly with the **<RCL>** or **<RCL__>** key.

The settings are explained here using the manual data storage as an example. The same settings and functions are available for the automatic data storage.

Settings

Menu item	Setting/ function	Description
Data storage / *Manual data storage* / *Display*	-	Displays all measurement datasets page by page. Further options: ● Scroll through the datasets with **<▲><▼>**. ● Output the displayed dataset to the interface with **<F2>**/*[USB output]*. ● Quit the display with **<F1>**/ *[Back]*.
Data storage / *Manual data storage* / *Erase*	-	Erases the entire manual measurement data storage. All calibration data remain stored when this action is performed.
Data storage / *Manual data storage* / *Output to USB*	-	Outputs all stored measurement data to the interface.

Display presentation of a dataset



Representation of a dataset (USB output)

```
12.12.2012 09:56:20
pH/ION 7320
Ser. no. 08502113

ID number 2

pH1 6.012 24.8 °C, AR, S: +++
pH2 6.056 24.8 °C, AR, S: +++
_____________________________________

12.12.2012 10:56:20
pH/ION 7320
Ser. no. 08502113

ID number 2

pH1 6.012 24.8 °C, AR, S: +++
pH2 6.056 24.8 °C, AR, S: +++
_____________________________________
```

Quitting the display

To quit the display of stored measurement datasets, you have the following options:

- Switch directly to the measured value display with **<M>**.
- Quit the display and move to the next higher menu level with **<F1>**/*[Back]*.

10.3.2 Erasing the measurement data storage

Erasing the measurement data storage (see section 10.3.1 EDITING THE MEASUREMENT DATA STORAGE, page 80).

10.3.3 Measurement dataset

A complete dataset includes:

- ID number
- Date/time
- Measured values of the connected sensors
- Measured temperature value of the connected sensors or manually set temperature
- AutoRead info: The *AR* indicator appears with the measured value if the AutoRead criterion was met while storing (stable measured value). Otherwise, there is no *AR* indicator.
- Calibration evaluation: +++, ++, +, -, or no evaluation

10.3.4 Storage locations

The pH/ION 7320 meter has two measurement data storages. The measured values recorded either manually or automatic are stored separately in individual measurement data storages.

Storage	Maximum number of datasets
Manual data storage	200
Automatic data storage	5000

11 Transmitting data (USB interface)

11.1 Options for data transmission

Via the USB interface you can transmit data to a PC. The following table shows which data are transmitted to the interface in which way:

Data	Control	Operation / description
Current datasets of the sensors indicated on the display	Manual	● With **<F2>**/*[USB output]*. ● Simultaneously with every manual data storage process (see section 10.1 MANUAL DATA STORAGE, page 77).
	Automatic, at intervals	● With **<F2__>**/*[USB output]*. Then you can set the transmission interval. ● Simultaneously with every automatic data storage process (see section 10.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 78).
Stored measured values	Manual	● Displayed dataset with **<F2>***[USB output]* after calling up from the storage. ● All datasets with the *Output to USB* function. (see section 10.3.1 EDITING THE MEASUREMENT DATA STORAGE, page 80).
Calibration records	Manual	● Calibration record with **<F2>**/*[USB output]* (see section 6.2.6 CALIBRATION DATA, page 38).
	Automatic	● At the end of a calibration procedure.

The following rule applies: With the exception of the menus, shortly pressing the **<F2>***[USB output]* key generally outputs the display contents to the interface (displayed measured values, measurement datasets, calibration records).

11.2 Connecting a PC

Connect the pH/ION 7320 to the PC via the USB interface.

NOTE
When connecting an earthed PC/printer, measurements cannot be performed in earthed media as the values would be incorrect.
The USB interface is not galvanically isolated.

Installation of the USB driver on the PC

System requirements of the PC for installation of the USB driver:

- PC with Pentium processor or higher with at least one free USB connection and CD-ROM drive
- Windows XP, Windows 7.

1. Insert the supplied installation CD in the CD drive of your PC.
2. Install the driver from the CD.
   Follow the Windows installation instructions as necessary.
3. Connect the pH/ION 7320 to the PC via the USB interface.
   The meter is listed as a virtual COM interface among the connections in the Windows instrument manager.

11.3 MultiLab Importer

With the aid of the MultiLab Importer software, you can record and evaluate measurement data with a PC.

More detailed information can be found in the MultiLab Importer operating manual.

12 Maintenance, cleaning, disposal

12.1 Maintenance

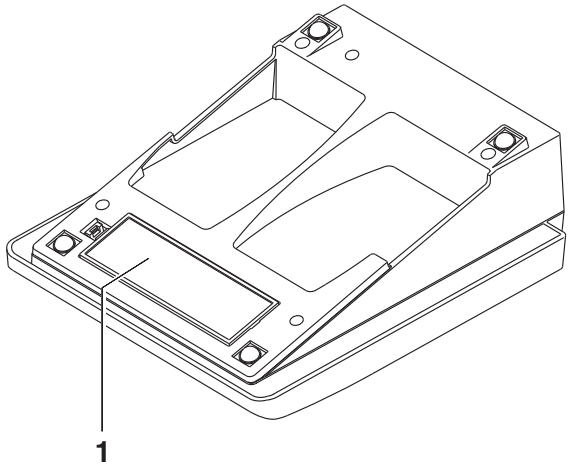
12.1.1 General maintenance activities

The only maintenance activity required is replacing the batteries.

See the relevant operating manuals of the electrodes for instructions on maintenance.

12.1.2 Replacing the batteries

You can operate the meter either with normal batteries or with rechargeable batteries (Ni-MH). In order to charge the batteries, an external charging device is required.



1 Battery compartment

1. Open the battery compartment (1) on the underside of the meter.
2. Remove the four batteries from the battery compartment.
3. Place four new batteries (type Mignon AA) in the battery compartment.

CAUTION
Make sure that the poles of the batteries are positioned correctly.
The ± signs on the batteries must correspond to the ± signs in the battery compartment.

4. Close the battery compartment (1).
5. Set the date and time (see section 5.4.6 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 25)

When the batteries are nearly discharged, the  status indicator is displayed.

Dispose of used batteries according to the local regulations of your country.

End users within the European Union are obligated to return used batteries (even ecologically compatible ones) to a collection point set up for recycling purposes.

Batteries are marked with the crossed-out waste container symbol. Therefore, they may not be disposed with the domestic waste.

12.2 Cleaning

Occasionally wipe the outside of the measuring instrument with a damp, lint-free cloth. Disinfect the housing with isopropanol as required.

CAUTION
The housing is made of synthetic material (ABS). Thus, avoid contact with acetone or similar detergents that contain solvents. Remove any splashes immediately.

12.3 Packing

This meter is sent out in a protective transport packing.
We recommend: Keep the packing material. The original packing protects the meter against damage during transport.

12.4 Disposal

At the end of its operational lifetime, the meter must be returned to the disposal or return system statutory in your country. If you have any questions, please contact your supplier.

13 What to do if...

13.1 pH/ORP

More information and instructions on cleaning and exchange of sensors are given in the documentation of your sensor.

Error message *OFL, UFL*

The measured value is outside the measuring range.

Cause	Remedy
pH electrode:	
– Air bubble in front of the junction	– Remove air bubble
– Air in the junction	– Extract air or moisten junction
– Cable broken	– Replace electrode
– Gel electrolyte dried out	– Replace electrode
– Measured value outside the measuring range	– Use suitable electrode

Error message, *Error*

Cause	Remedy
pH electrode:	
– The values determined for zero point and slope of the electrode are outside the allowed limits.	– Recalibrate
– Junction contaminated	– Clean junction
– Electrode broken	– Replace electrode
Buffer solutions:	
– Wrong buffer solutions	– Change calibration procedure
– Buffer solutions too old	– Use only once. Note the shelf life
– Buffer solutions depleted	– Change solutions

No stable measured value

Cause	Remedy
pH electrode:	
– Junction contaminated	– Clean the junction
– Membrane contaminated	– Clean the membrane
Test sample:	
– pH value not stable	– Measure with air excluded if necessary
– Temperature not stable	– Temper if necessary
Electrode + test sample:	
– Conductivity too low	– Use a suitable electrode
– Temperature too high	– Use a suitable electrode
– Organic liquids	– Use a suitable electrode

Obviously incorrect measured values

Cause	Remedy
pH electrode:	
– pH electrode unsuitable	– Use a suitable electrode
– Temperature difference between buffer and test sample too great	– Adjust the temperature of buffer or sample solutions
– Measurement procedure not suitable	– Follow a special procedure

13.2 ISE

Error message *OFL*

Cause	Remedy
– Measuring range exceeded	– Dilute the test sample

Obviously incorrect measured values

Cause	Remedy
– Electrode not connected	– Connect the electrode
– Cable broken	– Replace the electrode

***Error message,* Error (invalid calibration) or Calibration evaluation poor (-)**

Cause	Remedy
ISE electrode:	
– Moisture in the plug	– Dry the plug
– Electrode is old	– Replace the electrode
– Electrode not suitable for the range to be measured	– Use a suitable electrode
– Electrode not suitable for the selected ion	– Use a suitable electrode or select a suitable ion
– The gas-sensitive electrode NH 500 was calibrated with the NH4 setting	– Select the following settings: *Ion type* "ION", *Valency* "-1"
– Socket damp	– Dry the socket
Calibration procedure:	
– Wrong sequence of standards for three point calibration	– Select the correct sequence
– Calibration standards do not have the correct temperature (max. ± 2 °C temperature difference)	– Adjust the temperature of the calibration standards

Warning *[TpErr]*

Cause	Remedy
– Temperature difference between measurement and calibration greater than 2 °C.	– Adjust the temperature of the test sample

Warning *[ISEErr]*

Cause	Remedy
– Electrode voltage outside calibrated range	– Recalibrate

13.3 General information

Sensor symbol flashes

Cause	Remedy
– Calibration interval expired	– Recalibrate the measuring system

 **display**

Cause	Remedy
– Batteries almost empty	– Replace the batteries (see section 12.1 MAINTENANCE, page 85)

Meter does not react to keystroke

Cause	Remedy
– Operating condition undefined or EMC load unallowed	– Processor reset: Press the **<ENTER>** and **<On/ Off>** key simultaneously

You want to know which software version is in the meter

Cause	Remedy
– E. g., a question by the service department	– Switch on the meter. Open the menu, **<ENTER_>** / *Storage & config* / *System* / *Service information*. The instrument data are displayed.

14 Technical data

14.1 Measuring ranges, resolution, accuracy

14.1.1 pH/ORP

Measuring ranges, resolution

Parameter	Measuring range	Resolution
pH	-2.0 ... +20.0	0.1
	-2.00 ... +20.00	0.01
	- 2.000 ... + 19.999	0.001
U [mV]	-1200.0 ... +1200.0	0.1
	-2500 ... +2500	1
T [°C]	-5.0 ... +105.0	0.1
T [°F]	23.0 ... +221.0	0.1

Manual temperature input

Parameter	Range	Increment
T_{manual} [°C]	-25 ... +130	1
T_{manual} [°F]	-13 ... +266	1

Accuracy (± 1 digit)

Parameter	Accuracy	Temperature of the test sample
pH / range *		
-2.0 ... +20.0	± 0.1	+15 °C ... +35 °C
-2.00 ... +20.00	± 0.01	+15 °C ... +35 °C
- 2.000 ... + 19.999	± 0.005	+15 °C ... +35 °C
U [mV] / range		
-2500 ... +2500	± 1	+15 °C ... +35 °C
-1200.0 ... +1200.0	± 0.3	+15 °C ... +35 °C
T [°C] / temperature sensor		
NTC 30	± 0.1	
PT 1000	± 0.1	

** when measuring in a range of ± 2 pH around a calibration point*

The accuracy values specified here apply exclusively to the meter. The accuracy of the electrodes and buffer solutions has to be taken into account additionally.

14.1.2 ISE

Measuring ranges, resolution

Parameter	Measuring range	Resolution
ISE [mg/l]	0.000 ... 9.999 10.00 ... 99.99 100.0 ... 999.9 1000 ... 999999	0.001 0.01 0.1 1
ISE [µmol/l]	0.000 ... 9.999 10.00 ... 99.99 100.0 ... 999.9 1000 ... 9999	0.001 0.01 0.1 1
[mmol/l]	1000 ... 999999	1
ISE [mg/kg]	0.000 ... 9.999 10.00 ... 99.99 100.0 ... 999.9 1000 ... 999999	0.001 0.01 0.1 1
ISE [ppm]	0.000 ... 9.999 10.00 ... 99.99 100.0 ... 999.9 1000 ... 999999	0.001 0.01 0.1 1
ISE [%]	0.000 ... 9.999 10.00 ... 99.99 100.0 ... 999.9 1000 ... 999999	0.001 0.01 0.1 1

Manual temperature input

Parameter	Range	Increment
T_{manual} [°C]	- 20 ... + 130	1

14.2 General data

Dimensions	pH/ION 7320:	Approx. 230 x 190 x 80 mm
	pH/ION 7320 P:	Approx. 280 x 230 x 80 mm
Weight	pH/ION 7320:	Approx. 0.8 kg
	pH/ION 7320 P:	Approx. 1.0 kg
Mechanical structure	Type of protection	IP 43
Electrical safety	Protective class	III
Test certificates	CE	

Ambient conditions	Storage	-25 °C ... +65 °C
	Operation	+5 °C ... +55 °C With the power pack connected: +5 °C ... +40 °C
	Admissible relative humidity	Yearly mean: < 75 % 30 days/year: 95 % Other days: 85 %

Power supply	Batteries	4 x 1.5 V alkali-manganese batteries, type AA
	Rechargeable batteries	4 x 1.2 V NiMH rechargeable batteries, type AA (no charging function)
	Operational life	Up to 1000 h without / 150 h with illumination
	Power pack	Kuantech Co. Ltd. KSAC 0900110W1UV-1 Input: 100 ... 240 V ~ / 50 ... 60 Hz / 270 mA Output: 9 V = / 1.1 A Connection max. overvoltage category II Primary plugs contained in the scope of delivery: Euro, US, UK and Australian.

Sensor input	Input resistance	> 5 * 10^{12} ohm
	Input current	< 1 * 10^{-12} A

USB interface	Type	USB 1.1 USB B (device), data output
	Baud rate	Adjustable: 1200, 2400, 4800, 9600, 19200 Baud
	Data bits	8
	Stop bits	2
	Parity	None
	Handshake	RTS/CTS
	Cable length	Max. 3 m

Applicable directives and standards

EMC	EC directive 2004/108/EC EN 61326-1 EN 61000-3-2 EN 61000-3-3 FCC Class A
Meter safety	EC directive 2006/95/EC EN 61010-1
IP protection class	EN 60529

FCC Class A Equipment Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Changes or modifications not expressly approved by the manufacturer could void the user‘s authority to operate the equipment.

15 Firmware update

Available firmware updates are provided on the Internet.
With the firmware update program and a PC you can update the firmware of the pH/ION 7320 to the newest version.

For the update you have to connect the meter to a PC.

For the update via the USB interface, the following is required:

- a free USB interface (virtual COM port) on the PC
- the driver for the USB interface (on the enclosed CD-ROM)
- the USB cable (included in the scope of delivery of the pH/ION 7320).

1. Install the downloaded firmware update on a PC.
   An update folder is created in the Windows start menu.
   If an update folder already exists for the meter (or meter type), the new data is displayed there.
2. In the windows start menu, open the update folder and start the firmware update program.
3. Using the USB interface cable, connect the pH/ION 7320 to a USB interface (virtual COM port) of the PC.
4. Switch on the pH/ION 7320.
5. In the firmware update program, start the update process with OK.
6. Follow the instructions of the firmware update program.
   During the programming process, a corresponding message and a progress bar (in %) are displayed.
   The programming process takes approx. three minutes. A terminatory message is displayed after a successful programming process. The firmware update is completed.
7. Disconnect the pH/ION 7320 from the PC.
   The pH/ION 7320 is ready for operation again.

After switching the meter off and on you can check whether the meter has taken over the new software version (see YOU WANT TO KNOW WHICH SOFTWARE VERSION IS IN THE METER, PAGE 91).

16 Glossary

pH/ORP/ISE

Asymmetry see zero point

Electromotive force of a electrode The electromotive force U of the electrode is the measurable electromotive force of an electrode in a solution. It equals the sum of all the galvanic voltages of the electrode. Its dependency on the pH results in the electrode function, which is characterized by the parameters, slope and zero point.

Junction The junction is a porous body in the housing wall of reference electrodes or electrolyte bridges. It arranges the electrical contact between two solutions and makes the electrolyte exchange more difficult. The expression, junction, is also used for ground or junction-less transitions.

ORP voltage The ORP is caused by oxidizing or reducing substances dissolved in water if these substances become effective on an electrode surface (e. g. a gold or platinum surface).

pH value The pH value is a measure of the acidic or basic effect of an aqueous solution. It corresponds to the negative decadic logarithm of the molal hydrogen ions activity divided by the unit of the molality. The practical pH value is the value of a pH measurement.

Potentiometry Name of a measuring technique. The signal (depending on the measured parameter) of the electrode is the electrical potential. The electrical current remains constant.

Slope The slope of a linear calibration function.

Zero point The zero point of a pH electrode is the pH value at which the electromotive force of the pH electrode at a specified temperature is zero. Normally, this is at 25 °C.

General information

Adjusting To manipulate a measuring system so that the relevant value (e. g. the displayed value) differs as little as possible from the correct value or a value that is regarded as correct, or that the difference remains within the tolerance.

AutoRange Name of the automatic selection of the measuring range.

Calibration Comparing the value from a measuring system (e. g. the displayed value) to the correct value or a value that is regarded as correct. Often, this expression is also used when the measuring system is adjusted at the same time (see adjusting).

Channel A channel is a display indication that corresponds to a physical connection on the meter.

Measured parameter The measured parameter is the physical dimension determined by measuring, e. g. pH, conductivity or D.O. concentration.

Measured value	The measured value is the special value of a measured parameter to be determined. It is given as a combination of the numerical value and unit (e. g. 3 m; 0.5 s; 5.2 A; 373.15 K).
Molality	Molality is the quantity (in Mol) of a dissolved substance in 1000 g solvent.
Reset	Restoring the original condition of all settings of a measuring system.
Resolution	Smallest difference between two measured values that can be displayed by a meter.
Stability control (AutoRead)	Function to control the measured value stability.
Standard solution	The standard solution is a solution where the measured value is known by definition. It is used to calibrate a measuring system.
Temperature function	Name of a mathematical function expressing the temperature behavior of a test sample, a sensor or part of a sensor.
Test sample	Designation of the test sample ready to be measured. Normally, a test sample is made by processing the original sample. The test sample and original sample are identical if the test sample was not processed.

17 Index

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Z

Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com.

Service and Returns:
Xylem Analytics Germany
Sales GmbH & Co. KG
WTW
Am Achalaich 11
82362 Weilheim
Germany

Tel.: +49 881 183-325
Fax: +49 881 183-414
E-Mail wtw.rma@xylem.com
Internet: www.xylemanalytics.com

Xylem Analytics Germany GmbH
Am Achalaich 11
82362 Weilheim
Germany