

# Conductivity meter CO 3100 L

## OPERATING MANUAL



European Catalogue Number:  
CO 3100 L: 662-0233

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# 1 Safety

This operating manual contains basic instructions that you must follow during the commissioning, operation and maintenance of the meter. Consequently, all responsible personnel must read this operating manual before working with the meter.

The operating manual must always be available within the vicinity of the meter.

## Target group

The meter was developed for work in the laboratory.

Thus, we assume that, as a result of their professional training and experience, the operators will know the necessary safety precautions to take when handling chemicals.

## Safety instructions

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



### Warning

**indicates instructions that must be followed precisely in order to avoid possibly great dangers to personnel.**



### Caution

**indicates instructions that must be followed precisely in order to avoid the possibility of slight injuries or damage to the instrument or the environment.**

## Further notes



### Note

indicates notes that draw your attention to special features.



### Note

indicates cross-references to other documents, e.g. operating manuals.

**Function and  
operational safety****1.1 Authorized use**

Authorized use of the meter consists exclusively of the measurement of conductivity, resistivity, salinity, TDS (total dissolved solids) and temperature in a laboratory or field environment.

The technical specifications as given in chapter 3 TECHNICAL DATA must be observed. Only the operation and running of the meter according to the instructions given in this operating manual is authorized.

Any other use is considered **unauthorized**.

**1.2 General safety instructions**

This meter is constructed and tested in compliance with the IEC 1010 safety regulations for electronic measuring instruments.

It left the factory in a safe and secure technical condition.

The smooth functioning and operational safety of the meter can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.

The smooth functioning and operational safety of the meter can only be guaranteed under the environmental conditions that are specified in chapter 3 TECHNICAL DATA.

If the meter was transported from a cold environment to a warm environment, the formation of condensate can lead to the faulty functioning of the meter. In this event, wait until the temperature of the meter reaches room temperature before putting the meter back into operation.

**Caution**

**The meter is only allowed to be opened by authorized personnel.**

**Safe operation**

If safe operation is no longer possible, the meter must be taken out of service and secured against inadvertent operation!

Safe operation is no longer possible if the meter:

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer operates as described in this manual.

If you are in any doubt, please contact the supplier of the meter.

**Obligations of the purchaser**

The purchaser of this meter must ensure that the following laws and guidelines are observed when using dangerous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations
- Safety datasheets of the chemical manufacturers.

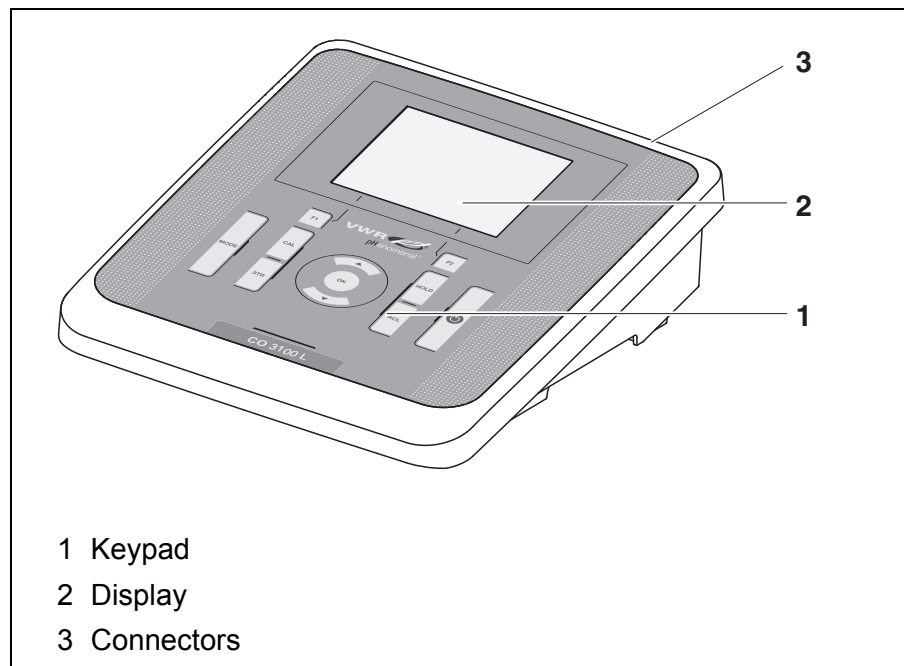
**Caution**

**In addition to the safety instructions mentioned here, also follow the safety instructions of the sensors used.**

## 2 Overview

The CO 3100 L compact precision conductivity meter enables you to perform conductivity measurements quickly and reliably.

The CO 3100 L provides the maximum degree of operating comfort, reliability and measuring certainty for all applications. The proven procedures for determining or adjusting the cell constant support your work with the conductivity meter.



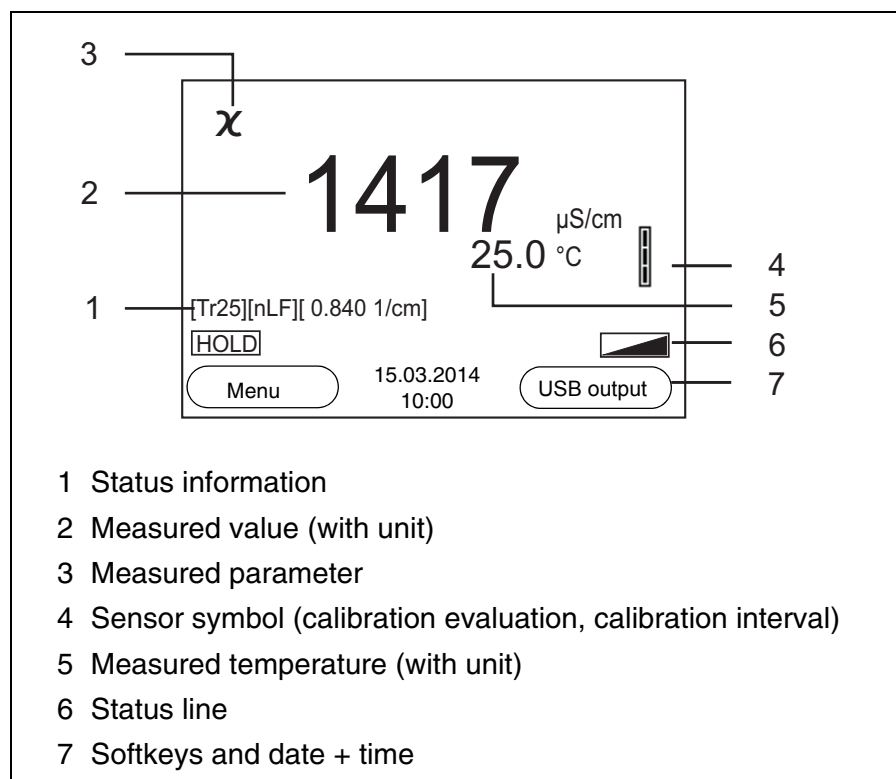


## 2.1 Keypad


In this operating manual, keys are indicated by brackets <.> .  
The key symbol (e.g. <OK>) 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. <OK\_\_>).

|                                      |  |
|--------------------------------------|--|
| <F1>:<br><F1__>:<br><F2>:<br><F2__>: | Softkeys providing situation dependent functions, e.g.:<br><F1>/[Menu]: Opens the menu for measurement settings<br><F1__>/[Menu]: Opens the menu for system settings |
| <On/Off>:                            | Switches the meter on or off   |
| <MODE>:                              | Selects the measured parameter   |
| <CAL>:<br><CAL__>:                   | Calls up the calibration procedure<br>Displays the calibration data  |
| <STR>:<br><STR__>:                   | Saves a measured value manually<br>Opens the menu for the automatic save function  |
| <RCL>:<br><RCL__>:                   | Displays the manually stored measured values<br>Displays the automatically stored measured values  |
| <▲>:                                 | Increments values, scrolls   |
| <▼>:                                 | Decrements values, scrolls   |
| <OK>:<br><OK__>:                     | Opens the menu for measurement settings / confirms entries<br>Opens the menu for system settings   |
| <HOLD>                               | Freezes the measured value (HOLD function)<br>Switches the AutoRead measurement on or off  |

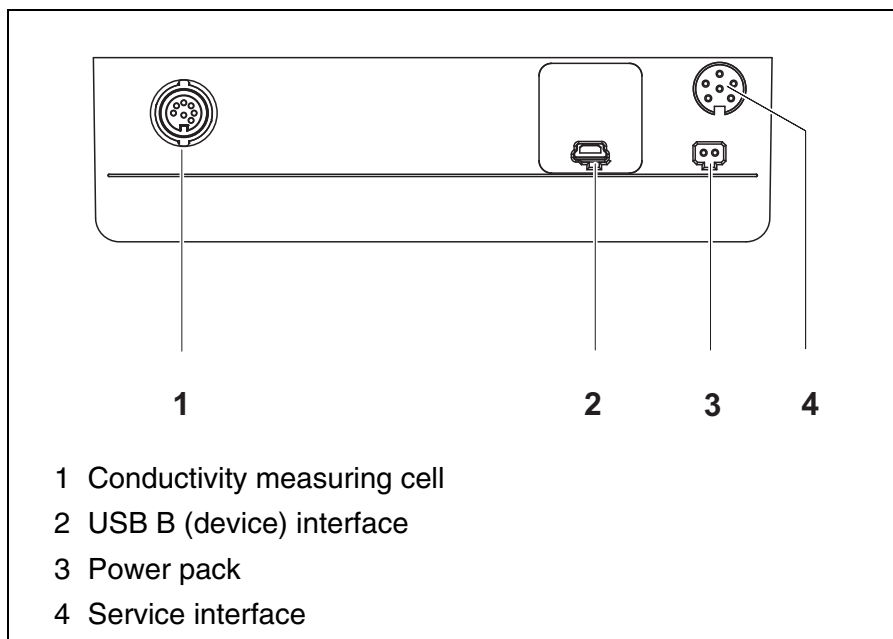
## 2.2 Display



### Function display indicators

|   |  |
|---|--|
| Error   | An error occurred during calibration   |
| AR  | Stability control (AutoRead) is active |
| HOLD  | Measured value is frozen (<HOLD> key)  |
|  | Batteries are almost empty             |

## 2.3 Connectors



### Caution

Only connect measuring cells to the meter that cannot return any voltages or currents that are not allowed ( $> \text{SELV}$  and  $> \text{current circuit with current limiting}$ ).

Almost all customary measuring cells fulfill these conditions.

### 3 Technical data

#### 3.1 General data

|                                  |                              |  |
|----------------------------------|------------------------------|--|
| <b>Dimensions</b>                | Approx. 240 x 190 x 80 mm    |  |
| <b>Weight</b>                    | Approx. 1.0 kg               |  |
| <b>Mechanical structure</b>      | Type of protection           | IP 43  |
| <b>Electrical safety</b>         | Protective class             | III  |
| <b>Test certificates</b>         | CE                           |  |
| <b>Ambient conditions</b>        | Storage                      | - 25 °C ... + 65 °C  |
|                                  | Operation                    | -10 °C ... + 55 °C   |
|                                  | Admissible relative humidity | Yearly mean: < 75 %<br>30 days/year: 95 %<br>Other days: 85 %  |
| <b>Power supply</b>              | 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 800 h without / 100 h with illumination  |
|                                  | Power pack                   | Input: 100 ... 240 V ~ / 50 ... 60 Hz / 270 mA<br>Output: 9 V = / 1.1 A<br>Connection max. overvoltage category II<br>Primary plugs contained in the scope of delivery: Euro, US, UK and Australian. |
| <b>USB interface</b>             | Type                         | USB 1.1<br>USB B (device), data output   |
|                                  | Baud rate                    | Adjustable:<br>1200, 2400, 4800, 9600, 19200 Baud  |
|                                  | Data bits                    | 8  |
|                                  | Stop bits                    | 2  |
|                                  | Parity                       | None   |
|                                  | Handshake                    | RTS/CTS  |
|                                  | Cable length                 | Max. 3 m   |
| <b>Guidelines and norms used</b> | EMC                          | EC directive 2004/108/EC<br>EN 61326-1<br>EN 61000-3-2<br>EN 61000-3-3<br>FCC Class A  |

|                     |  |
|---------------------|--|
| Meter safety        | EC directive 2006/95/EC<br>EN 61010-1<br>UL 61010-1<br>CAN/CSA-C22.2#61010-1 |
| IP protection class | EN 60529   |

### 3.2 Measuring ranges, resolution, accuracy

Measuring ranges,  
resolution  
(depending on the sensor)

| Variable                          | Measuring range                            | Resolution |
|-----------------------------------|--|------------|
| $\chi$ [ $\mu$ S/cm]              | 0.000 ... 1.999*                           | 0.001      |
|                                   | 0.00 ... 19.99**                           | 0.01       |
|                                   | 0.0 ... 199.9                              | 0.1        |
|                                   | 200 ... 1999                               | 1          |
| $\chi$ [mS/cm]                    | 2.00 ... 19.99                             | 0.01       |
|                                   | 20.0 ... 199.9                             | 0.1        |
|                                   | 200 ... 1000                               | 1          |
| $\rho$ (Resistivity)<br>[Ohm*cm]  | 1.000 ... 1.999                            | 0.001      |
|                                   | 2.00 ... 19.99                             | 0.01       |
|                                   | 20.0 ... 199.9                             | 0.1        |
|                                   | 200 ... 1999                               | 1          |
| $\rho$ (Resistivity)<br>[kOhm*cm] | 2.00 ... 19.99                             | 0.01       |
|                                   | 20.0 ... 199.9                             | 0.1        |
|                                   | 200 ... 1999                               | 1          |
| $\rho$ (Resistivity)<br>[MOhm*cm] | 2.00 ... 19.99**                           | 0.01       |
|                                   | 20.0 ... 199.9*                            | 0.1        |
| SAL                               | 0.0 ... 70.0<br>according to the IOT table | 0.1        |
| TDS                               | 0 ... 1999 mg/l                            | 1          |
|                                   | 2.00 ... 19.99 g/l                         | 0.01       |
|                                   | 20.0 ... 199.9 g/l                         | 0.1        |
| T [°C]                            | -5.0 ... +105.0                            | 0.1        |
| T [°F]                            | +23.0 ... +221.0                           | 0.1        |

\* only possible with cells of the cell constant,  $0.010 \text{ cm}^{-1}$

\*\* only possible with cells of the cell constant,  $0.010 \text{ cm}^{-1}$  or  $0.090 \dots 0.110 \text{ cm}^{-1}$

**Cell constants**

| <b>Cell constant C</b> | <b>Values</b>  |
|------------------------|--|
| To be calibrated       | 0.450 ... 0.500 cm <sup>-1</sup><br>0.800 ... 0.880 cm <sup>-1</sup>                                   |
| Adjustable             | 0.010 cm <sup>-1</sup> (fixed)<br>0.090 ... 0.110 cm <sup>-1</sup><br>0.250 ... 1.000 cm <sup>-1</sup> |

**Reference temperature**

| <b>Reference temperature</b> | <b>Values</b>                    |
|------------------------------|----------------------------------|
| Adjustable                   | 20 °C (Tref20)<br>25 °C (Tref25) |



**Note**

The accuracy values specified here apply exclusively to the meter. The accuracy of the measuring cell has also to be taken into account.

## 4 Commissioning

### 4.1 Scope of delivery

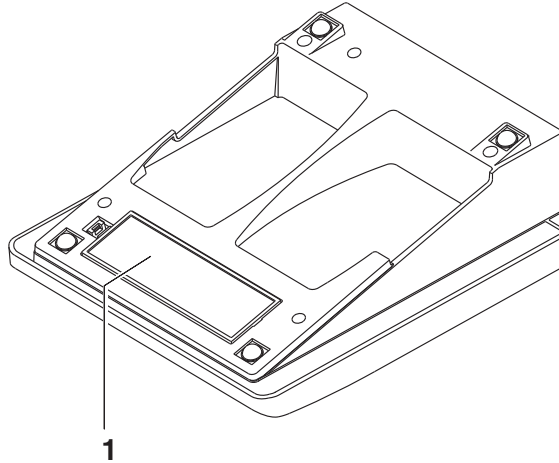
- Conductivity meter CO 3100 L
- 4 batteries 1.5 V Mignon type AA
- USB cable
- Power pack
- Stand
- Stand holder
- Short instructions
- CD-ROM with
  - USB drivers
  - detailed operating manual
  - Software MultiLab Importer

### 4.2 Initial commissioning

Perform the following activities:

- Insert the supplied batteries
- For mains operation: Connect the power pack
- If necessary, mount the stand
- Switching on the meter
- Set the date and time

### 4.2.1 Inserting the batteries



- 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  $\pm$  signs on the batteries must correspond to the  $\pm$  signs in the battery compartment.



#### Note

Alternatively, you can also use Ni-MH rechargeable batteries (type Mignon AA). In order to charge the batteries, an external charging device is required.

- 2 Place four batteries (type Mignon AA) in the battery compartment.
- 3 Close the battery compartment.

### 4.2.2 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 chapter 3 TECHNICAL DATA).



**Caution**

Use original power packs only (see chapter 3 TECHNICAL DATA).

- |   |   |
|---|---|
| 1 | Connect the plug of the power pack to the socket for the power pack on the CO 3100 L. |
| 2 | Connect the original power pack to an easily accessible power outlet.                 |

**4.2.3 Switching on the meter**

- |   |   |
|---|---|
| 1 | <p>Press the &lt;On/Off&gt; key.<br/>The meter performs a self-test.<br/>The display shows the manufacturer's logo while the self-test is being performed.<br/>Subsequently, the meter switches to the measuring mode (measured value display).</p> |
|---|---|

**Note**

The meter has an energy saving feature to avoid unnecessary battery depletion.

The energy saving feature switches off the meter if no key is pressed during the adjusted interval. (How to set the switch-off interval, see section 5.3.1).

**4.2.4 Setting the date and time**

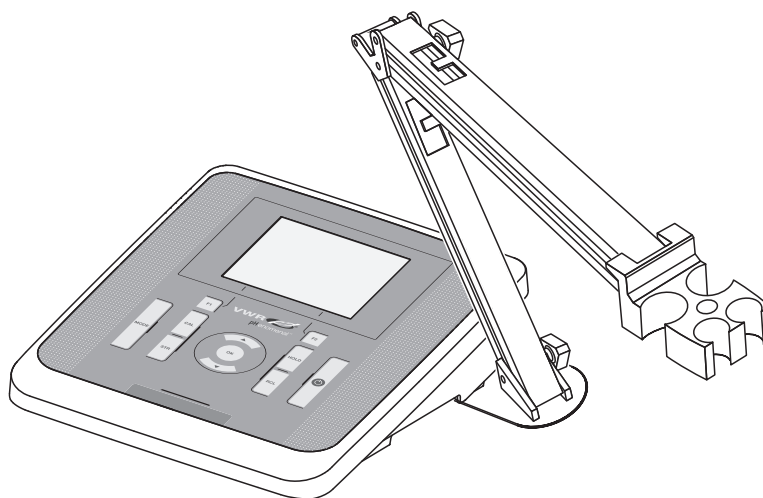
- |   |                   |
|---|-------------------|
| 1 | See section 5.2.4 |
|---|-------------------|

**4.2.5 Stand**

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

- |   |   |
|---|---|
| 1 | Screw the stand base to the underside of the meter. |
| 2 | Insert the stand rod in the stand base.             |

An arrangement of the meter with the stand may look as follows:

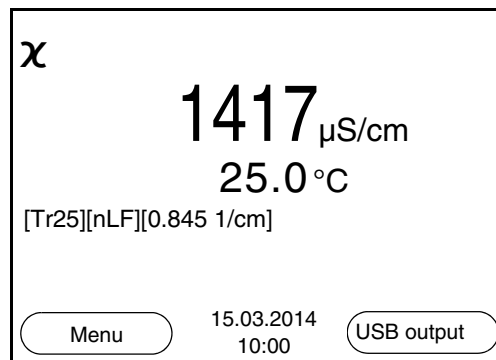


## 5 Operation

### 5.1 Switching on the meter

#### Switching on

Press the <On/Off> key.  
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.



#### Switching off

Press the <On/Off> key.

#### Automatic switch-off function

The instrument has an automatic switch-off function in order to save the batteries (see section 5.3.1). The automatic switch-off function switches off the meter if no key is pressed for an adjustable period.

The automatic switch-off function is not active

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

#### 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 5.3.1).

## 5.2 General operating principles

This section contains basic information on the operation of the CO 3100 L.

### Operating elements, display

An overview of the operating elements and the display is given in section 2.1 and section 2.2.

### Operating modes, navigation

An overview of the operating modes and navigation of the CO 3100 L is given in section 5.2.1 and section 5.2.2.

### 5.2.1 Operating modes

The instrument has the following operating modes:

- 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
- Storing in memory  
The meter stores the measurement data manually or automatically
- Transmitting data  
The meter transmits measurement data and calibration records to the USB interface automatically or manually.
- Setting  
The system menu or a sensor menu with submenus, settings and functions is displayed

### 5.2.2 Navigation

#### Measured value display

In the measured value display, you can

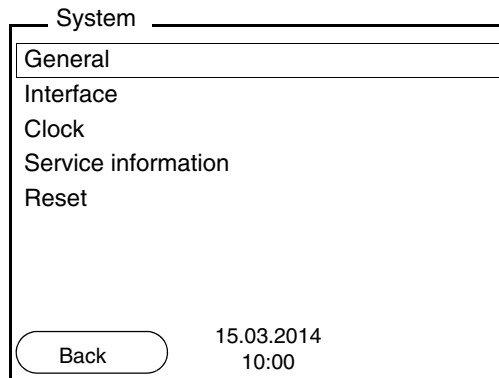
- open the menu for calibration and measurement settings with **<F1>** (short keystroke)
- Open the *Storage & config* menu with the sensor-independent settings with **<F1\_\_>** (long keystroke, approx. 2 s).
- Change the display in the measurement window by pressing **<MODE>** (e.g. conductivity → resistivity → → →).

#### Menus and dialogs

The menus for settings and dialogs in procedures contain further sub-elements. The selection is made with the **<▲><▼>** keys. The current selection is displayed with a frame.

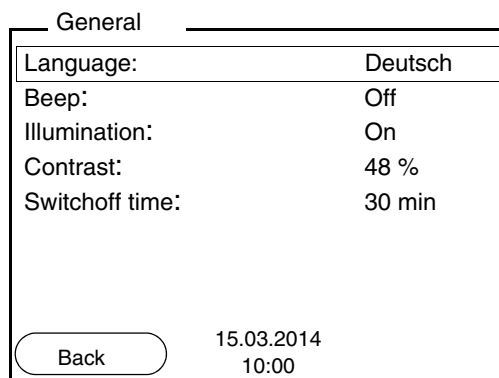
- Submenus

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



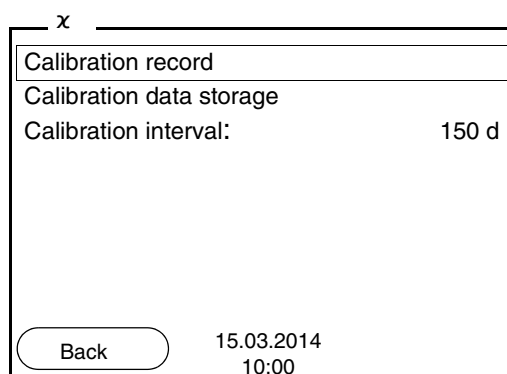
- **Settings**

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

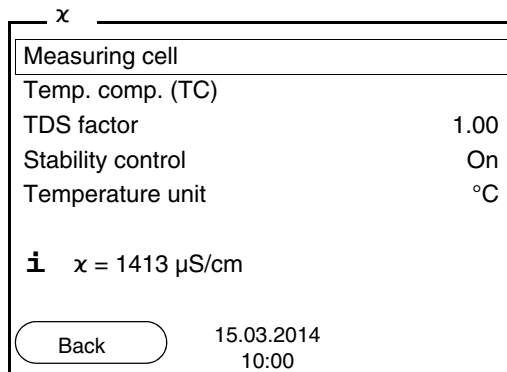


- **Functions**

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



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



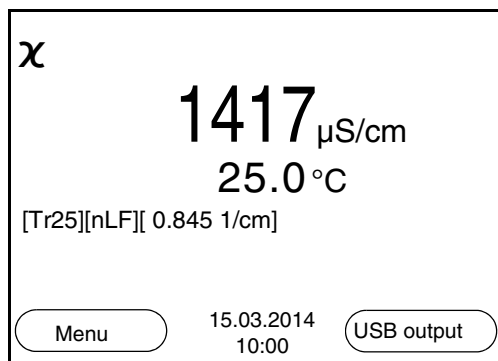
**Note**

The principles of navigation are explained in the two following sections by reference of examples:

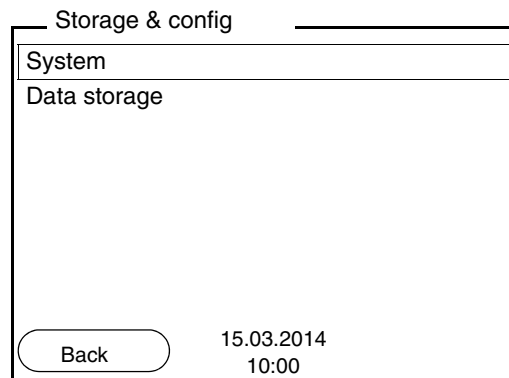
- Setting the language (section 5.2.3)
- Setting the date and time (see section 5.2.4).

**5.2.3 Navigation example 1: Setting the language**

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

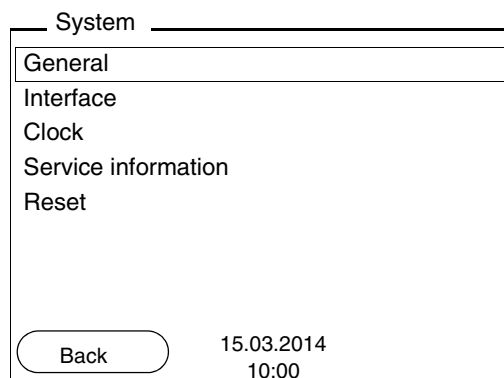


2 Using **<F1\_>/[Menu]**, open the *Storage & config* menu.  
The instrument is in the setting mode.



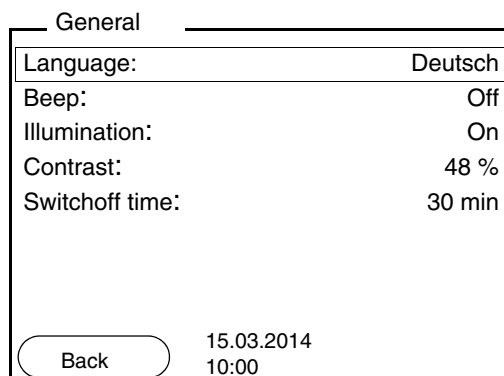
3 Select the *System* submenu with <▲><▼>. The current selection is displayed with a frame.

4 Open the *System* submenu with <OK>.



5 Select the *General* submenu with <▲><▼>. The current selection is displayed with a frame.

6 Open the *General* submenu with <OK>.



- 7 | Open the setting mode for the *Language* with <OK>.

| General  |         |
|--|---------|
| Language:  | Deutsch |
| Beep:  | Off     |
| Illumination:  | On      |
| Contrast:  | 48 %    |
| Switchoff time:  | 30 min  |
| <div style="display: flex; justify-content: space-between; align-items: center;"> <span>Back</span> <span>15.03.2014<br/>10:00</span> </div> |         |

- 8 | Select the required language with <▲><▼>.
- 9 | Confirm the setting with <OK>.  
The meter switches to the measuring mode.  
The selected language is active.

#### 5.2.4 Example 2 on navigation: Setting the date and time

The meter has a clock with a date function. The date and time are indicated in the status line of 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.



#### Note

The date and time are reset to default after a fall of the supply voltage (empty batteries).

#### Setting the date, time and date format

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:<br>Using <F1 __>/[Menu], open the <i>Storage &amp; config</i> menu.<br>The instrument is in the setting mode. |
| 2 | Select and confirm the <i>System / Clock</i> menu with <▲><▼> and <OK>.<br>The setting menu for the date and time opens up.                  |
| 3 | Select and confirm the <i>Time</i> menu with <▲><▼> and <OK>.<br>The hours are highlighted.  |

Clock

|   |            |
|---|------------|
| Date format:  | dd.mm.yyyy |
| Date:   | 15.03.2014 |
| Time:   | 14:53:40   |
| <div style="display: flex; justify-content: space-between; align-items: center; padding-top: 20px;"> <span>Back</span> <span>15.03.2014<br/>10:00</span> </div> |            |

|   |  |
|---|--|
| 4 | Change and confirm the setting with <▲><▼> and <OK>.<br>The minutes are highlighted.   |
| 5 | Change and confirm the setting with <▲><▼> and <OK>.<br>The seconds are highlighted.   |
| 6 | Change and confirm the setting with <▲><▼> and <OK>.<br>The time is set.   |
| 7 | If necessary, set the <i>Date</i> and <i>Date format</i> . 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>.<br>or<br>Switch to the measured value display with <MODE>.<br>The instrument is in the measuring mode. |

### 5.3 Sensor-independent settings

The *Storage & config* menu comprises the following settings:

- *System* (see section 5.3.1).
- *Data storage* (see section 5.3.2)

#### 5.3.1 System

##### Overview

The following sensor-independent meter characteristics can be adjusted in the *Storage & config/System* menu:

- Menu language
- Beep on keystroke
- Illumination
- Display contrast
- Interval of the automatic switch-off function
- Data interface
- Clock and date function
- Reset of all sensor-independent system settings to the default condition

##### Settings

To open the *Storage & config* menu, press the **<F1\_\_>**[Menu] key in the measured value display. After completing the settings, switch to the measured value display with **<MODE>**.

| Menu item                                | Setting                                    | Explanation                              |
|--|--|--|
| <i>System / General / Language</i>       | <i>Deutsch</i><br><i>English</i><br>(more) | Selects the menu language                |
| <i>System / General / Beep</i>           | <i>On</i><br><i>Off</i>                    | Switches on/off the beep on keystroke    |
| <i>System / General / Illumination</i>   | <i>Auto</i><br><i>On</i><br><i>Off</i>     | Switches the display illumination on/off |
| <i>System / General / Contrast</i>       | 0 ... 100 %                                | Changes the display contrast             |
| <i>System / General / Switchoff time</i> | 10 min ... 24 h                            | Adjusts the switch-off time              |
| <i>System / Interface / Baud rate</i>    | 1200, 2400,<br>4800, 9600,<br>19200        | Baud rate of the data interface          |

| Menu item                                     | Setting                               | Explanation   |
|---|---------------------------------------|---|
| <i>System / Interface / Output format</i>     | <i>ASCII<br/>CSV</i>                  | Output format for data transmission<br>For details, see section 5.6                 |
| <i>System / Interface / Decimal separator</i> | <i>Dot (xx.x)<br/>Comma (xx,x)</i>    | Decimal separator   |
| <i>System / Interface / Output header</i>     |                                       | Output of a header for <i>Output format: CSV</i>                                    |
| <i>System / Clock</i>                         | <i>Time<br/>Datum<br/>Date format</i> | Settings of time and date.<br>For details, see section 5.2.4                        |
| <i>System / Service information</i>           |                                       | Hardware version and software version of the meter are displayed.                   |
| <i>System / Reset</i>                         | -                                     | Resets the system settings to the default values.<br>For details, see section 5.8.2 |

### 5.3.2 Data storage

This menu contains all functions to display, edit and erase stored measured values and calibration records.



#### Note

Detailed information on the memory functions of the CO 3100 L is given in section 5.5.

### 5.3.3 Automatic Stability control

The function, automatic *Stability control* (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 5.4.4).

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.



## 5.4 Conductivity

### 5.4.1 General information

You can measure the following parameters:

- Conductivity
- Specific resistance
- Salinity
- Total dissolved solids (TDS)



#### Attention

**When a grounded PC is connected, measurements cannot be performed in grounded media as incorrect values would result. The USB interface is not galvanically isolated.**

#### Temperature measurement

The conductivity measuring cell CO 11 has an integrated temperature sensor.

#### Preparatory activities

Perform the following preparatory activities when you want to measure:

|   |  |
|---|--|
| 1 | Connect a conductivity measuring cell to the measuring instrument.<br>The conductivity measuring screen is displayed.  |
| 2 | Check whether the <i>Measuring cell</i> and cell constant settings are suitable for the connected conductivity measuring cell. If necessary, correct the settings. |



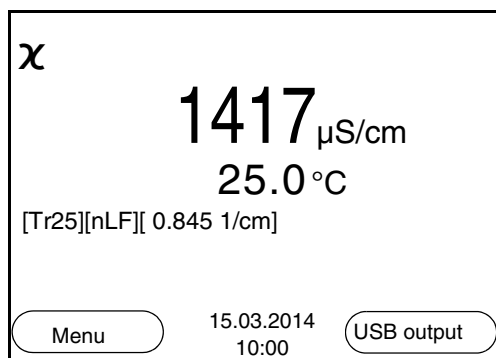
#### Note

The selection of the measuring cell and the setting of the cell constant is done in the measurement settings menu for conductivity (see section 5.4.4). The cell constant to be set must either be taken from the operating manual of the measuring cell or is printed on the measuring cell.

### 5.4.2 Measuring

You can carry out conductivity measurements as follows:

|   |  |
|---|--|
| 1 | Perform the preparatory activities according to section 5.4.1. |
| 2 | Immerse the conductivity measuring cell in the test sample.    |



#### Selecting the displayed measured parameter

You can switch between the following displays with **<MODE>**:

- Conductivity [ $\mu\text{S}/\text{cm}$ ] / [ $\text{mS}/\text{cm}$ ]
- Resistivity [ $\Omega\cdot\text{cm}$ ] / [ $\text{k}\Omega\cdot\text{cm}$ ] / [ $\text{M}\Omega\cdot\text{cm}$ ]
- Salinity SaL [ ]
- Total dissolved solids TDS [ $\text{mg}/\text{l}$ ] / [ $\text{g}/\text{l}$ ]

The factor to calculate the total dissolved solids is set to 1.00 in the factory. You can adjust this factor to meet your requirements in the range 0.40 ... 1.00. The factor is set in the *Measurement* menu for the parameter, TDS.

#### 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.

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.

#### 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                |
|---------------------|---------------|---|
| Conductivity $\chi$ | 10 seconds    | $\Delta$ : better than 1.0% of measured value |
| Temperature         | 15 seconds    | $\Delta$ : 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.

### HOLD function

|   |  |
|---|--|
| 1 | Freeze the measured value with <b>&lt;HOLD&gt;</b> .<br>The [HOLD] status indicator is displayed.<br>The HOLD function is active.  |
| 2 | Release the frozen measured value again with <b>&lt;HOLD&gt;</b> or <b>&lt;MODE&gt;</b> .<br>The [HOLD] status display disappears. The display switches back to the previous indication. |

### 5.4.3 Temperature compensation

The calculation of the temperature compensation is based on the pre-set reference temperature, 20 °C or 25 °C. It appears on the display as *Tr20* or *Tr25*.

You can select one of the following temperature compensation methods:

- **Nonlinear temperature compensation (*nLF*)** according to EN 27 888
- **Linear temperature compensation (*Lin*)** with adjustable coefficient in the range 0.000 ... 10.000 %/K
- No temperature compensation (off)



### Application tips

#### Note

The reference temperature and temperature compensation are set in the *Measurement* menu for the parameter, conductivity (see section 5.4.4).

Select the following temperature compensations given in the table according to the respective test sample:

| Test sample  | Temperature compensation  | Display indicator |
|--|---|-------------------|
| Natural water<br>(ground water, surface water, drinking water) | <i>nLF</i><br>according to EN 27 888  | <i>nLF</i>        |
| Ultrapure water  | <i>nLF</i><br>according to EN 27 888  | <i>nLF</i>        |
| Other aqueous solutions  | <i>Lin</i> Set linear<br>temperature coefficient<br>0.000 ... 10.000 %/K      | <i>Lin</i>        |
| Salinity (seawater)  | Automatic <i>nLF</i> according to<br>IOT (International Oceanographic Tables) | <i>Sal, nLF</i>   |

#### 5.4.4 Settings for conductivity measuring cells

##### Overview

The following settings are possible for conductivity measuring cells:

- Calibration record (display)
- Calibration interval
- Measuring cell/cell constant
- Reference temperature
- Temperature compensation
- TDS factor
- Unit of the temperature
- Automatic Stability control

##### Settings

The settings are made in the *Measurement* menu for the measured parameter, conductivity. To open the settings, display the required parameter in the measured value display and press the <F1>/[menu] or <OK> key. After completing the settings, switch to the measured value display with <MODE>.



| Menu item                                     | Possible setting | Explanation  |
|---|------------------|--|
| <i>Calibration / Calibration record</i>       | -                | Displays the calibration record of the last calibration.   |
| <i>Calibration / Calibration data storage</i> | -                | Displays the last calibration records.   |
| <i>Calibration / Serial number (sensor)</i>   | -                | <p>Entry of the serial number of the connected sensor. The serial number is output in the calibration record.</p> <ul style="list-style-type: none"> <li>● Change the contents of the highlighted position with &lt;▲&gt;&lt;▼&gt;.</li> <li>● Go to the next position with &lt;F2&gt;/[▶].</li> <li>● When the serial number has been completely entered, confirm with &lt;OK&gt;.</li> </ul> |
| <i>Calibration / Calibration interval</i>     | 1 ... 999 d      | <p><i>Calibration interval</i> for the measuring cell (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol in the measuring screen.</p>   |

| Menu item   | Possible setting                       | Explanation   |
|---|--|---|
| <i>Measurement /<br/>Measuring cell /<br/>Type</i>                | Cal                                    | <i>Measuring cell used</i><br>Measuring cells the cell constant of which is determined by calibration in the KCL control standard solution.<br>Calibration ranges:<br>0.450 to 0.500 cm <sup>-1</sup> and 0.800 to 0.880 cm <sup>-1</sup><br>The currently valid cell constant is displayed in the status line. |
|   | C 0.100                                | Measuring cell C 0.100, nominal cell constant 0.100 cm <sup>-1</sup> .<br>The cell constant can be adjusted in the range from 0.090 to 0.110 cm <sup>-1</sup> .   |
|   | C 0.010                                | Measuring cell C 0.010, nominal cell constant 0.010 cm <sup>-1</sup> .<br>The cell constant is permanently set.   |
|   | man                                    | Any measuring cells with freely adjustable cell constants.  |
| <i>Measurement /<br/>Measuring cell /<br/>Cell const. man</i>     | 0.250 ...<br>1.000 cm <sup>-1</sup>    | Display and setting option of the cell constant of any measuring cells ( <i>man</i> ).  |
| <i>Measurement /<br/>Measuring cell /<br/>Cell const. C 0.100</i> | 0.090 to<br>0.110 cm <sup>-1</sup>     | Display and setting options for the cell constant of the measuring cell C 0.100.  |
| <i>Measurement /<br/>Temp. comp. (TC) /<br/>Method</i>            | <i>nLF</i><br><i>Lin</i><br><i>Off</i> | Procedure for temperature compensation (see section 5.4.3).<br><br>This setting is only available for the measured parameters, <b>x</b> and <b>p</b> .  |

| Menu item   | Possible setting        | Explanation  |
|---|-------------------------|--|
| <i>Measurement / Temp. comp. (TC) / Linear coeff.</i>   | 0,000 ...<br>10,000 %/K | Coefficient of the linear temperature compensation.<br><br>This setting is only available when the linear temperature compensation is set. |
| <i>Measurement / Temp. comp. (TC) / Reference temp.</i> | 20 °C<br>25 °C          | Reference temperature<br><br>This setting is only available for the measured parameters, $\chi$ and $\rho$ .                               |
| <i>Measurement / TDS factor</i>                         | 0.40 ... 1.00           | Factor for TDS value   |
| <i>Measurement / Stability control</i>                  | <i>On / Off</i>         | Switches on or off the automatic stability control during measurement (see section 5.3.3)  |
| <i>Measurement / Temperature unit</i>                   | °C<br>°F                | Temperature unit, degrees Celsius or degrees Fahrenheit.<br>All temperature values are displayed with the selected unit.                   |
| <i>Reset</i>  | -                       | Resets all sensor settings to the delivery condition (see section 5.8.1).  |

#### 5.4.5 Determining the cell constant (calibration in control standard)

##### Why determine the cell constant?

Aging slightly changes the cell constant, e.g. due to coatings. As a result, an inexact measured value is displayed. The original characteristics of the cell can often be restored by cleaning the cell. Calibration determines the current value of the cell constant and stores this value in the meter.

Thus, you should calibrate at regular intervals (we recommend: every 6 months).

##### Procedure

You can determine the actual cell constant of the conductivity measuring cell by calibrating with the control standard in the following ranges:

- 0.800 ... 0.880 cm<sup>-1</sup>  
(e.g. CO 11 with a nominal cell constant of 0.840 cm<sup>-1</sup>)
- 0.450 ... 0.500 cm<sup>-1</sup>  
(e.g. conductivity measuring cells with a nominal cell constant of around 0.475 cm<sup>-1</sup>)

The cell constant is determined in the control standard, 0.01 mol/l KCl. Cell constants outside the ranges quoted above cannot be calibrated.

In the default condition, the calibrated cell constant of the meter is set to 0.845 cm<sup>-1</sup> (conductivity sensor CO 11).

**Stability control  
(AutoRead)**

In calibration, the Stability control function (AutoRead) is automatically activated.

**Display calibration data  
and output to interface**

You can have the data of the last calibration displayed (see section 5.4.6). Subsequently, you can transmit the displayed calibration data to the interface, e.g. to a PC, with the <F2>/[USB output] key.



**Note**

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

**Sample record:**

```
CO 3100 L
Ser. no. 08502113

CALIBRATION Cond
15.03.2014 16:13:33

Cell constant      0.841 1/cm
Temperature        25.0 °C
Sensor             +++
```

**Calibration evaluation**

After calibration, the meter automatically evaluates the current status of the calibration. The evaluation appears on the display and in the calibration record.

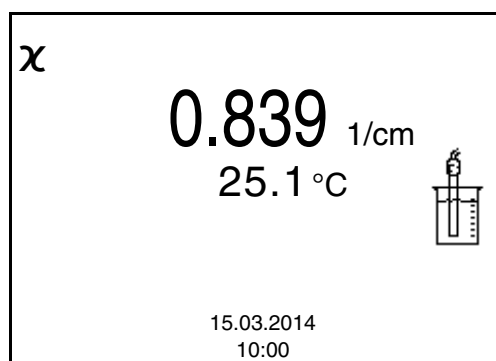
| Display | Calibration record | Cell constant [cm <sup>-1</sup> ]   |
|---------|--------------------|---|
|         | +++                | within the ranges<br>0.450 ... 0.500 cm <sup>-1</sup><br>or<br>0.800 ... 0.880 cm <sup>-1</sup> |

| Display   | Calibration record | Cell constant [ $\text{cm}^{-1}$ ]   |
|---|--------------------|--|
| <i>Error</i>  | <i>Error</i>       | outside the ranges<br>0.450 ... 0.500 $\text{cm}^{-1}$<br>or<br>0.800 ... 0.880 $\text{cm}^{-1}$ |
| Eliminate the error according to chapter 7 WHAT TO DO IF... |                    |  |

### Determining the cell constant

For this calibration procedure, the *Measuring cell* setting must be set to *cal* in the *Measurement* menu. Proceed as follows to determine the cell constant:

|   |   |
|---|---|
| 1 | Connect a conductivity measuring cell to the measuring instrument.  |
| 2 | In the measured value display, select the conductivity parameter with <b>&lt;MODE&gt;</b> .                 |
| 3 | Start the calibration with <b>&lt;CAL&gt;</b> .<br>The cell constant that was calibrated last is displayed. |



|   |   |
|---|---|
| 4 | Immerse the conductivity measuring cell in the control standard solution, 0.01 mol/l KCl.   |
| 5 | Start the measurement with <b>&lt;OK&gt;</b> .<br>The [AR] status indicator is displayed. The measured parameter flashes.   |
| 6 | Wait for the end of the AutoRead measurement or accept the calibration value with <b>&lt;OK&gt;</b> .<br>The calibration record is displayed and output to the interface. |
| 7 | Using <b>&lt;F1&gt;</b> / <i>[Continue]</i> or <b>&lt;OK&gt;</b> , switch to the measured value display.  |

**Displaying the calibration record**

**5.4.6 Displaying calibration records**

The calibration data can be displayed and then output to the interface.

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

The calibration records of the last calibration procedures are available in the **<F1>/[Menu] / Calibration / Calibration data storage** and **<F1\_\_>/[Menu] / Storage & config/Data storage / Calibration data storage** menu.

| Menu item   | Setting/function | Explanation   |
|---|------------------|---|
| <i>Calibration / Calibration data storage / Display</i><br><br>or<br><br><i>Data storage / Calibration data storage / Display</i>         | -                | Displays the calibration record.<br><br>Further options: <ul style="list-style-type: none"> <li>● Scroll through the calibration records with <b>&lt;▲&gt;&lt;▼&gt;</b>.</li> <li>● Output the displayed calibration record to the interface with <b>&lt;F2&gt;/[USB output]</b>.</li> <li>● Quit the display with <b>&lt;F1&gt;/[Back]</b> or <b>&lt;OK&gt;</b>.</li> <li>● Switch directly to the measured value display with <b>&lt;MODE&gt;</b>.</li> </ul> |
| <i>Calibration / Calibration data storage / Output to USB</i><br>or<br><br><i>Data storage / Calibration data storage / Output to USB</i> | -                | Outputs the calibration records to the interface.   |

**Example**

```

CO 3100 L
Ser. no. 08502113

CALIBRATION Cond
15.03.2014 16:13:33

Cell constant          0.841 1/cm
Temperature            25.0 °C
Sensor                 +++

```

**5.5 Data memory**

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

- Manual memory (see section 5.5.1)
- Automatic storing at intervals (see section 5.5.2)

Each data storing process transmits the current dataset to the interface at the same time.

**Measurement dataset**

A complete dataset consists of:

- ID number
- Date/time
- Measured value of the connected sensor
- Measured temperature value of the connected sensor
- AutoRead info: *AR* appears with the measured value if the AutoRead criterion was met while storing (stable measured value). Otherwise, the *AR* display is missing.
- Calibration evaluation: +++, ++, +, -, or no evaluation

**Memory locations**

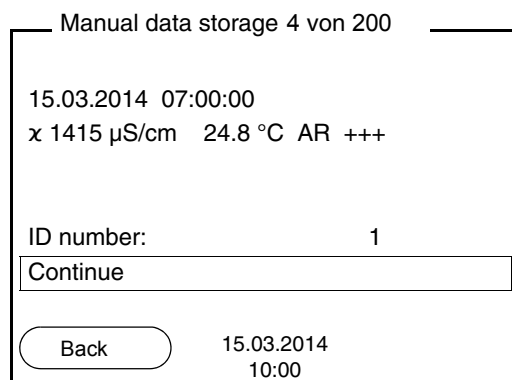
The CO 3100 L meter has two measurement data memories. The measured values recorded either manually or automatic are stored separately in individual measurement data memories.

| <b>Data memory</b>            | <b>Maximum number of datasets</b> |
|-------------------------------|-----------------------------------|
| <i>Manual data storage</i>    | 200                               |
| <i>Automatic data storage</i> | 5000                              |

### 5.5.1 Manual storage

You can store a measurement dataset to the data memory as follows. The dataset is at the same time output to the interface:

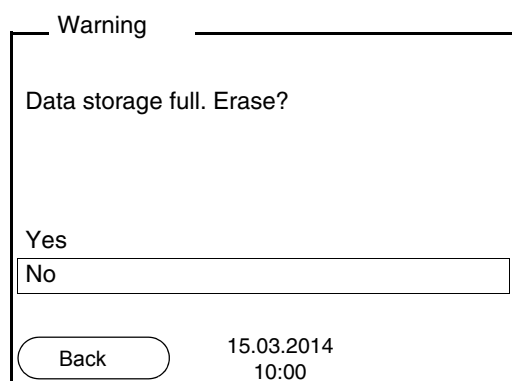
- 1 Press the **<STR>** key shortly. The menu for manual data storage appears.



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

#### If the memory is full

The following window appears if all 200 storage locations are occupied:



You have the following options:

- To erase the entire memory, confirm *Yes*.
- To cancel the storing process and switch to the measured value display, confirm *No*. Then you can e.g. store the data from the memory to a PC (see section 5.5.3) and subsequently erase the memory (see section 5.5.4).

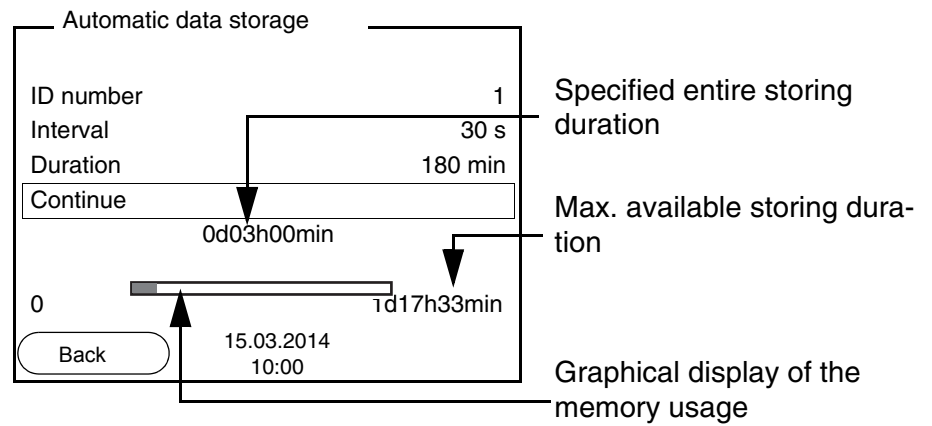


### 5.5.2 Automatic storing at intervals

The storing interval (*Interval*) determines the time interval between automatic data storing processes. Each data storing process transmits the current dataset to the interface at the same time.

#### Configuring the automatic memory function

- 1 Press the <STR\_\_> key.  
The menu for automatic data storing appears.



#### Settings

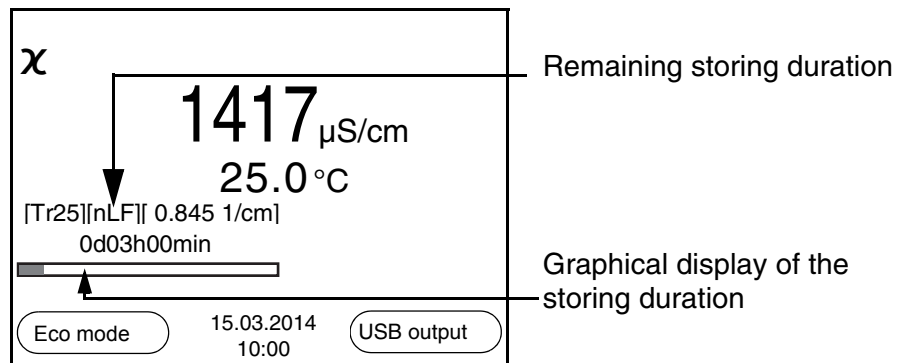
You can configure the automatic data storing function with the following settings:

| Menu item | Possible setting | Explanation                       |
|-----------|------------------|-----------------------------------|
| ID number | 1 ... 10000      | ID number for the dataset series. |

| Menu item       | Possible setting   | Explanation   |
|-----------------|--|---|
| <i>Interval</i> | 1 s, 5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min | Storing interval.<br><br>The lower limit of the storing interval can be restricted by the number of free memory locations.<br>The upper limit is restricted by the storing duration.  |
| <i>Duration</i> | 1 min ... x min  | Storing duration.<br>Specifies after which time the automatic data storing should be terminated.<br><br>The lower limit of the storing duration is restricted by the storing interval.<br>The upper limit is restricted by the number of free memory locations. |

**Starting the automatic storing function**

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



The active automatic data storing function can be recognized by the progress bar in the status line. The progress bar indicates the remaining storing duration.



**Note**

If the automatic storing function is activated, only the following keys are active: Softkeys, <MODE>, <STR\_\_> 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 storing of measurement data (such as the display). By pressing any key the energy saving mode is switched off again.

### Terminating the automatic memory function prematurely

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

- 1 Press the **<STR\_\_>** key.  
The following window appears.

|                         |                     |
|-------------------------|---------------------|
| Warning                 |                     |
| Stop automatic storage? |                     |
| Yes                     |                     |
| No                      |                     |
| Back                    | 15.03.2014<br>10:00 |

- 2 Using **<▲><▼>**, select **Yes** and confirm with **<OK>**.  
The meter switches to the measured value display.  
The automatic data storing function is terminated.

### 5.5.3 Displaying and editing the measurement data memory

The contents of the manual or automatic measurement data memory can be shown on the display.

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

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

### Editing the data memory

The memory is edited in the menu, *Storage & config/ Data storage*. To open the *Storage & config* menu, press the **<F1\_\_>/[Menu]** key in the measured value display. Open the manual or automatic storage directly with the **<RCL>** or **<RCL\_\_>** key.

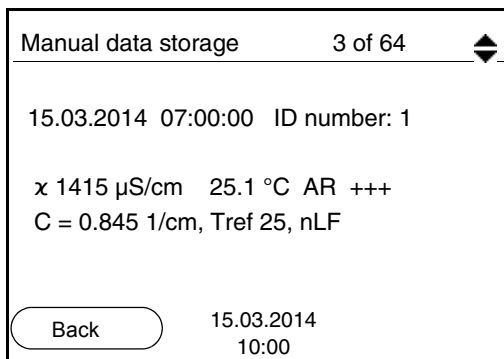


**Note**

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

| Settings | Menu item   | Setting/function | Explanation  |
|----------|---|------------------|--|
|          | <i>Data storage / Manual data storage / Display</i>       | -                | Displays all measurement datasets page by page.<br><br>Further options:<br><ul style="list-style-type: none"> <li>● Scroll through the datasets with &lt;▲&gt;&lt;▼&gt;.</li> <li>● Output the displayed dataset to the interface with &lt;F2&gt;/[USB output].</li> <li>● Quit the display with &lt;F1&gt;/[Back].</li> </ul> |
|          | <i>Data storage / Manual data storage / Erase</i>         | -                | Erases the entire manual measurement data memory.<br><br>Note:<br>All calibration data remain stored when this action is performed.  |
|          | <i>Data storage / Manual data storage / Output to USB</i> | -                | Outputs all stored measurement data to the interface.  |

**Display presentation of a dataset**



**Example**

```
15.03.2014 09:27:20
CO 3100 L
Ser. No. 12345678

ID number 1
χ 99.8 μS/cm    25.0 °C  AR  +++
-----

15.03.2014 09:56:24
CO 3100 L
Ser. No. 12345678

ID number 1
χ 99.9 μS/cm    25.0 °C  AR  +++
-----
```

**Quitting the display**

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

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

**5.5.4 Erasing the measurement data memory**

How to erase the measurement data memory is described in section 5.5.3 DISPLAYING AND EDITING THE MEASUREMENT DATA MEMORY.

## 5.6 Transmitting data (USB interface)

### 5.6.1 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 measured values of all connected measuring cells | Manual                  | <ul style="list-style-type: none"> <li>● With <b>&lt;F2&gt;/[USB output]</b>.</li> <li>● Simultaneously with every manual storing process (see section 5.5.1).</li> </ul>  |
|  | Automatic, at intervals | <ul style="list-style-type: none"> <li>● With <b>&lt;F2__&gt;/[USB output]</b>. Then you can set the transmission interval.</li> <li>● Simultaneously with every automatic storing process (see section 5.5.2).</li> </ul>                         |
| Stored measured values                                   | Manual                  | <ul style="list-style-type: none"> <li>● Displayed dataset with <b>&lt;F2&gt;/[USB output]</b> after calling up from the memory.</li> <li>● All datasets with the <i>Output to USB</i> function.</li> </ul> <p>For details, see section 5.5.3.</p> |
| Calibration records                                      | Manual                  | <ul style="list-style-type: none"> <li>● Calibration record with <b>&lt;F2&gt;/[USB output]</b>.</li> </ul> <p>For details, see section 5.6.</p>   |
|  | Automatic               | <ul style="list-style-type: none"> <li>● At the end of a calibration procedure.</li> </ul>   |



#### Note

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).

### 5.6.2 Connecting a PC

Connect the CO 3100 L to the PC via the USB interface.



#### Attention

**The USB interface is not galvanically isolated.**

**When a grounded PC is connected, measurements cannot be performed in grounded media as incorrect values would result.**

#### Installation of the USB driver on the PC

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

- PC with USB port and CD-ROM drive
- Microsoft Windows  
(for details, see enclosed installation CD, *Driver* directory)

|   |   |
|---|---|
| 1 | Insert the supplied installation CD in the CD drive of your PC.   |
| 2 | Install the driver from the CD.<br>Follow the Windows installation instructions as necessary.   |
| 3 | Connect the CO 3100 L to the PC via the USB interface.<br>The meter is listed as a virtual COM interface among the connections in the Windows instrument manager. |

## 5.7 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.

## 5.8 Reset

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

### 5.8.1 Resetting the measurement settings



#### Note

The calibration data are reset to the default settings together with the

measuring parameters. Recalibrate after performing a reset.

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

| Setting   | Default settings   |
|---|--|
| Cal. interval   | 150 d  |
| Measured parameter  | $\chi$   |
| Cell constant (c)   | calibrated: 0,840<br>adjusted: The meter uses the last manually adjusted cell constant in the range 0.800 ... 1.200 cm <sup>-1</sup> . |
| Temperature compensation  | nLF  |
| Reference temperature   | 25 °C  |
| Temperature coefficient (TC) of the linear temperature compensation | 2.000 %/K  |
| TDS factor  | 1.00   |
| 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 the settings, activate the relevant measuring window in the measured value display and press the <F1>/[Menu] key shortly.



### 5.8.2 Resetting the system settings

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

| Setting        | Default settings |
|----------------|------------------|
| Language       | English          |
| Beep           | On               |
| Baud rate      | 4800 Baud        |
| Output format  | ASCII            |
| 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 <F1 \_\_>/[Menu] key in the measured value display.

## 6 Maintenance, cleaning, disposal, accessories

### 6.1 Maintenance

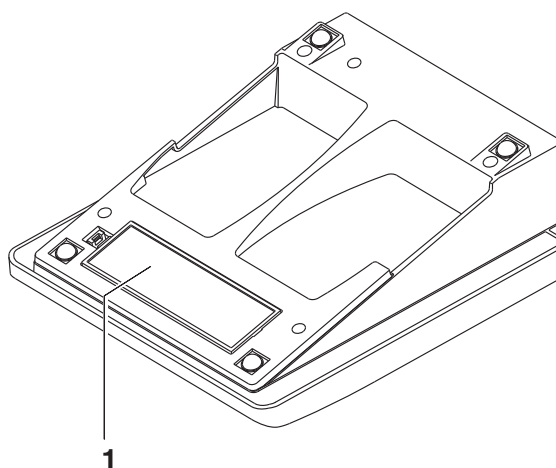
The only maintenance activity required is replacing the batteries.



#### Note

See the relevant operating manuals of the measuring cells for instructions on maintenance.

#### 6.1.1 Replacing the batteries



- |   |   |
|---|---|
| 1 | Open the battery compartment (1) on the underside of the meter. |
| 2 | Remove the batteries from the battery compartment.              |



#### Caution

**Make sure that the poles of the batteries are positioned correctly. The  $\pm$  signs on the batteries must correspond to the  $\pm$  signs in the battery compartment.**



#### Note

Alternatively, you can also use Ni-MH rechargeable batteries (type Mignon AA). In order to charge the batteries, an external charging device is required.

|   |   |
|---|---|
| 3 | Place four batteries (type Mignon AA) in the battery compartment. |
| 4 | Close the battery compartment.                                    |

## 6.2 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.**

## 6.3 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.

## 6.4 Disposal



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.

Instead it's your responsibility to correctly dispose of your equipment at lifecycle -end by handling it over to an authorized facility for separate collection and recycling. It's also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment.

For more information about where you can drop off your waste of equipment, please contact your local dealer from whom you originally purchased this equipment.

By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you

## 6.5 Accessories

| <b>Measuring cells</b>  | <b>Order no.</b> |
|---|------------------|
| pHenomenal CO 11<br>CONDUCTIVITY SENSOR PHENOMENAL 1,5M<br>8PIN | 663-0147         |

| <b>Solutions</b>                    | <b>Order no.</b> |
|-------------------------------------|------------------|
| KCl 0,01 mol/l: 1,413 mS/cm, 100 ml | 83607.180        |
| KCl 0,01 mol/l: 1,413 mS/cm, 500 ml | 83607.290        |
| KCl 0,1 mol/l: 12,8 mS/cm, 500 ml   | 83608.260        |

| <b>Accessories</b>                               | <b>Order no.</b> |
|--|------------------|
| SURVIVAL KIT PHENOMENAL                          | 662-1166         |
| COMMUNICATION KIT<br>(CD-ROM, USB cable, Manual) | 662-1225         |

## 7 What to do if...

| Error message<br><i>OFL, UFL</i> | Cause  | Remedy  |
|----------------------------------|--|---|
|                                  | <ul style="list-style-type: none"> <li>– Measured value outside the measuring range</li> </ul> | <ul style="list-style-type: none"> <li>– Use suitable measuring cell</li> </ul> |

| Error message,<br><i>Error</i> | Cause   | Remedy   |
|--------------------------------|---|--|
|                                | <ul style="list-style-type: none"> <li>– Measuring cell contaminated</li> </ul>       | <ul style="list-style-type: none"> <li>– Clean cell and replace it if necessary</li> </ul> |
|                                | <ul style="list-style-type: none"> <li>– Calibration solution not suitable</li> </ul> | <ul style="list-style-type: none"> <li>– Check the calibration solutions</li> </ul>        |
|                                | <ul style="list-style-type: none"> <li>– Measuring cell not connected</li> </ul>      | <ul style="list-style-type: none"> <li>– Connect the measuring cell</li> </ul>             |

### Sensor symbol flashes

| Cause  | Remedy   |
|--|--|
| <ul style="list-style-type: none"> <li>– Calibration interval expired</li> </ul> | <ul style="list-style-type: none"> <li>– Recalibrate the measuring system</li> </ul> |

### Display



| Cause  | Remedy  |
|--|---|
| <ul style="list-style-type: none"> <li>– Batteries almost empty</li> </ul> | <ul style="list-style-type: none"> <li>– Replace the batteries (see section 6.1 MAINTENANCE)</li> </ul> |

### Meter does not react to keystroke

| Cause   | Remedy  |
|---|---|
| <ul style="list-style-type: none"> <li>– Operating condition undefined or EMC load unallowed</li> </ul> | <ul style="list-style-type: none"> <li>– Processor reset:<br/>Press the <b>&lt;OK&gt;</b> and <b>&lt;On/Off&gt;</b> key simultaneously</li> </ul> |

### You want to know which software version is in the meter

| Cause  | Remedy   |
|--|--|
| <ul style="list-style-type: none"> <li>– E.g., a question by the service department</li> </ul> | <ul style="list-style-type: none"> <li>– Switch on the meter. Open the menu, <b>&lt;F1__&gt;</b>[Menu] / <i>Storage &amp; config</i> / <i>System</i> / <i>Service information</i>. The instrument data are displayed.</li> </ul> |



## 8 Firmware update

### General information

Available firmware updates are provided on the Internet. With the "Firmware Update " program and a PC you can update the firmware of the CO 3100 L 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 CO 3100 L).

### Program installation

|   |   |
|---|---|
| 1 | <p>Install the downloaded firmware update on a PC.</p> <p>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.</p> |
|---|---|

### Program start

|   |  |
|---|--|
| 2 | In the windows start menu, open the update folder and start the firmware update program. |
|---|--|

### Firmware update

|   |   |
|---|---|
| 3 | Using the USB interface cable, connect the CO 3100 L to a USB interface (virtual COM port) of the PC.   |
| 4 | Switch on the CO 3100 L.  |
| 5 | In the firmware update program, start the update process with OK.   |
| 6 | <p>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.</p> |
| 7 | <p>Disconnect the CO 3100 L from the PC. The CO 3100 L is ready for operation again.</p>  |

After switching the meter off and on you can check whether the meter has taken over the new software version (see page 53).





## 9 Lists

This chapter provides additional information and orientation aids.

**Specialist terms** The glossary briefly explains the meaning of the specialist terms. However, terms that should already be familiar to the target group are not described here.

**Index** The index will help you to find the topics that you are looking for.

### Glossary

**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).

**Cell constant, k** Characteristic quantity of a conductivity measuring cell, depending on the geometry.

**Conductivity** Short form of the expression, specific electrical conductivity. It corresponds to the reciprocal value of the resistivity. It is a measured value of the ability of a substance to conduct an electric current. In water analysis, the electrical conductivity is a dimension for the ionized substances in a solution.

**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.

|                                 |  |
|---------------------------------|--|
| <b>Reference temperature</b>    | Fixed temperature value to compare temperature-dependent measured values. For conductivity measurements, the measured value is converted to a conductivity value at a reference temperature of 20 °C or 25 °C.   |
| <b>Reset</b>                    | Restoring the original condition of all settings of a measuring system.  |
| <b>Resistance</b>               | Short name for the specific electrolytic resistance. It corresponds to the reciprocal value of the electrical conductivity.  |
| <b>Resolution</b>               | Smallest difference between two measured values that can be displayed by a meter.  |
| <b>Salinity</b>                 | The absolute salinity $S_A$ of seawater corresponds to the relationship of the mass of dissolved salts to the mass of the solution (in g/Kg). In practice, this dimension cannot be measured directly. Therefore, the practical salinity according to IOT is used for oceanographic monitoring. It is determined by measuring the electrical conductivity.   |
| <b>Salt content</b>             | General designation for the quantity of salt dissolved in water.   |
| <b>Stability control</b>        | Function to control the measured value stability.  |
| <b>Standard solution</b>        | The standard solution is a solution where the measured value is known by definition. It is used to calibrate a measuring system.   |
| <b>Temperature coefficient</b>  | Value of the slope $\alpha$ of a linear temperature function.<br>$\mathcal{X}_{T_{\text{Ref}}} = \mathcal{X}_{\text{Meas}} * \frac{1}{1 + \alpha * (T - T_{\text{Ref}})}$  |
| <b>Temperature compensation</b> | Name of a function that considers the temperature influence on the measurement and converts it accordingly. Depending on the measured parameter to be determined, the temperature compensation functions in different ways. For conductimetric measurements, the measured value is converted to a defined reference temperature. For potentiometric measurements, the slope value is adjusted to the temperature of the test sample but the measured value is not converted. |
| <b>Temperature function</b>     | Name of a mathematical function expressing the temperature behavior of a test sample, a sensor or part of a sensor.  |
| <b>Test sample</b>              | 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.  |

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## 10 Technical service

### Web resources

Visit the VWR website at [www.vwr.com](http://www.vwr.com) for:

- Complete technical service contact information
- Access to VWR's Online Catalogue, and information about accessories and related products
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**Contact us:** For information or technical assistance contact your local VWR representative or visit [www.vwr.com](http://www.vwr.com).

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**VWR International** warrants that this product will be free from defects in material and workmanship for a period of three (3) years from date of delivery. If a defect is present, VWR will, at its option and cost, repair, replace, or refund the purchase price of this product to the customer, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or from ordinary wear and tear. If the required maintenance and inspection services are not performed according to the manuals and any local regulations, such warranty turns invalid, except to the extent, the defect of the product is not due to such non-performance.

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