



Oxi 3310 IDS (Oxi 3315)

DIGITAL METER FOR DIGITAL IDS-D.O. SENSORS



The latest version of the present operating manual is available on the Internet under www.WTW.com.

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1 Overview

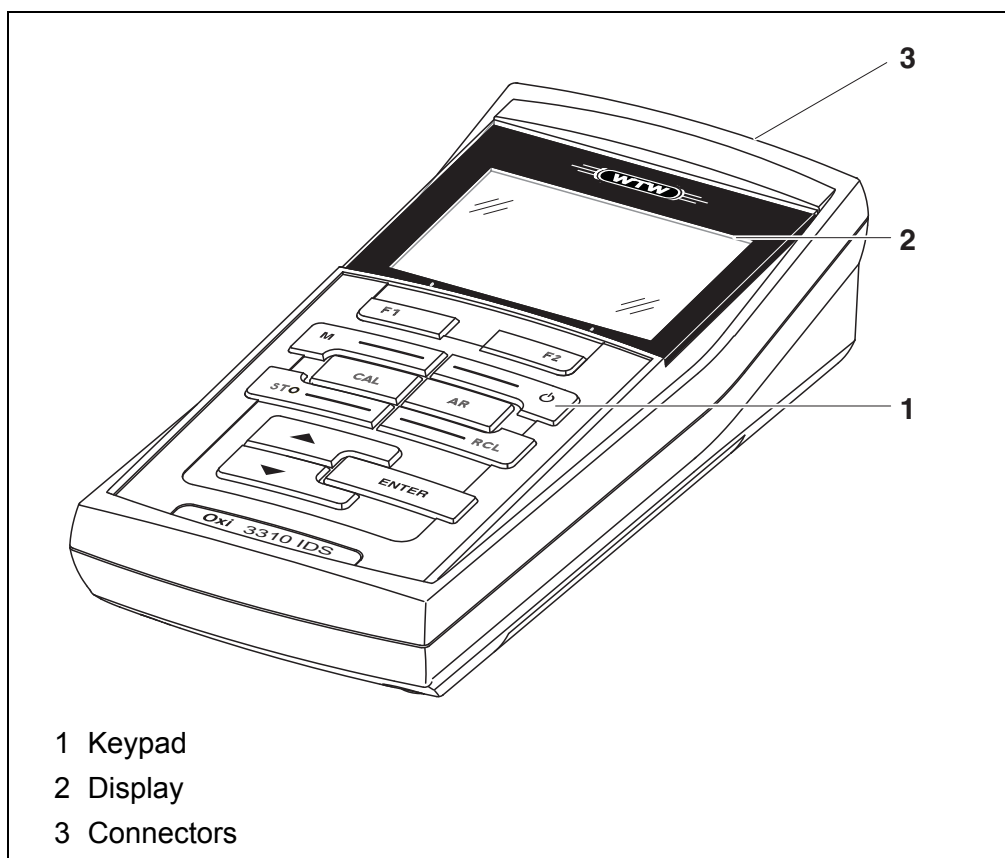
1.1 Oxi 3310 IDS (Oxi 3315) meter

The Oxi 3310 IDS (Oxi 3315) compact digital precision meter enables you to perform oxygen (D.O.) measurements quickly and reliably.

The Oxi 3310 IDS (Oxi 3315) provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.

The Oxi 3310 IDS (Oxi 3315) supports you in your work with the following functions:

- Automatic sensor recognition
- Electronic access control
- Data transmission via the USB interface (USB-B).



1.2 Sensors

A measuring system ready to measure consists of the Oxi 3310 IDS (Oxi 3315) meter and a suitable sensor.

Suitable sensors are WTW IDS oxygen sensors.



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

1.2.1 IDS sensors

IDS sensors

- support the automatic sensor recognition
- show only the settings relevant to the specific sensor in the setting menu
- process signals in the sensor digitally so that precise and interference-free measurements are enabled even with long cables
- facilitate to assign a sensor to a measured parameter with differently colored couplings
- have quick-lock couplings with which to fix the sensors to the meter.

Sensor data from IDS sensors

IDS sensors transmit the following sensor data to the meter:

- SENSOR ID
 - Sensor name
 - Sensor series number
- Calibration data
 - Calibration date
 - Calibration characteristics
 - Calibration interval
 - Calibration history of the last 10 calibrations

The calibration data are updated in the IDS sensor after each calibration procedure. A message is displayed while the data are being updated in the sensor.



Note

In the measured value display, you can display the sensor name and series number of the selected sensor with the [Info] softkey. You can then display all further sensor data stored in the sensor with the [More] softkey.

1.2.2 Automatic sensor recognition

The automatic sensor recognition for IDS sensors allows

- to operate an IDS sensor with different meters without recalibrating
- to assign measurement data to an IDS sensor
 - Measurement datasets are always stored and output with the sensor name and sensor series number.
- to assign calibration data to an IDS sensor
 - Calibration data and calibration history are always stored and output with the sensor name and sensor series number.
- to hide menus automatically that do not concern this sensor

To be able to use the automatic sensor recognition, a meter that supports the automatic sensor recognition (e.g. Oxi 3310 IDS (Oxi 3315)) and a digital IDS sensor are required.

In digital IDS sensors, sensor data are stored that clearly identify the sensor. The sensor data are automatically taken over by the meter.

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 D.O. 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 11 TECHNICAL DATA, page 51).

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 11 TECHNICAL DATA, page 51).

3 Commissioning

3.1 Scope of delivery

- Meter Oxi 3310 IDS (Oxi 3315)
- 4 batteries 1.5 V Mignon type AA
- USB cable (A plug on mini B plug)
- Short instructions
- CD-ROM with
 - USB drivers
 - detailed operating manual
 - Software MultiLab Importer

3.2 Power supply

The Oxi 3310 IDS (Oxi 3315) is supplied with power in the following ways:

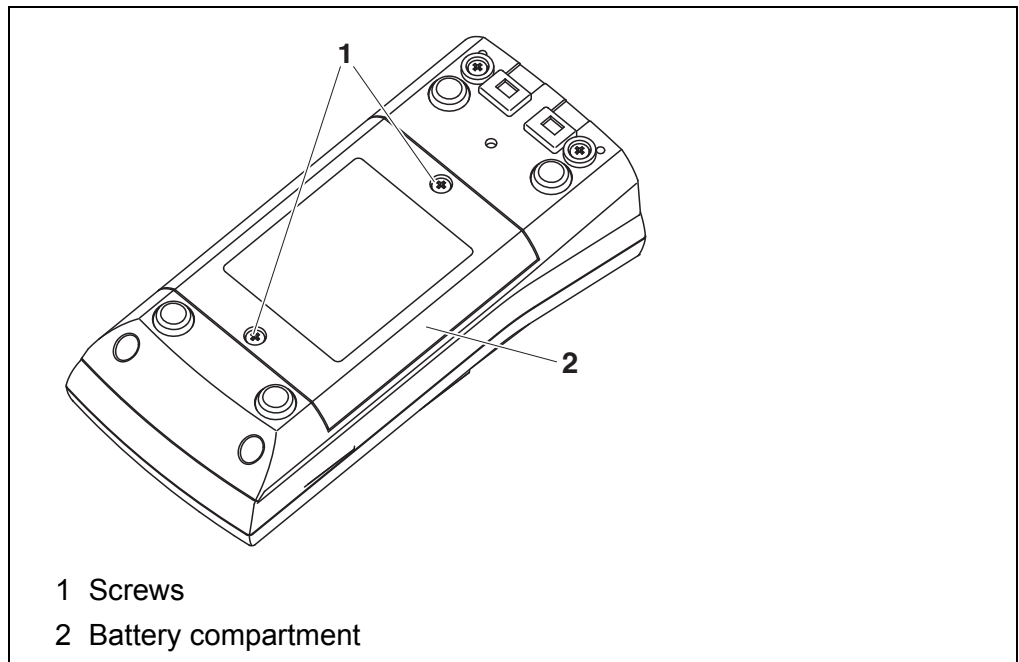
- Battery operation (4 batteries, 1.5 V Mignon type AA)
- USB operation via a connected USB-B cable

3.3 Initial commissioning

Perform the following activities:

- Insert the supplied batteries
- Switch on the meter (see section 4.2 SWITCHING ON THE METER, page 17)
- Set the date and time (see section 4.4.5 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 22)

3.3.1 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 ± signs on the batteries must correspond to the ± signs in the battery compartment.



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.

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 4.4.5 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 22).

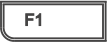

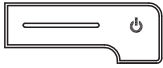








4 Operation

4.1 General operating principles

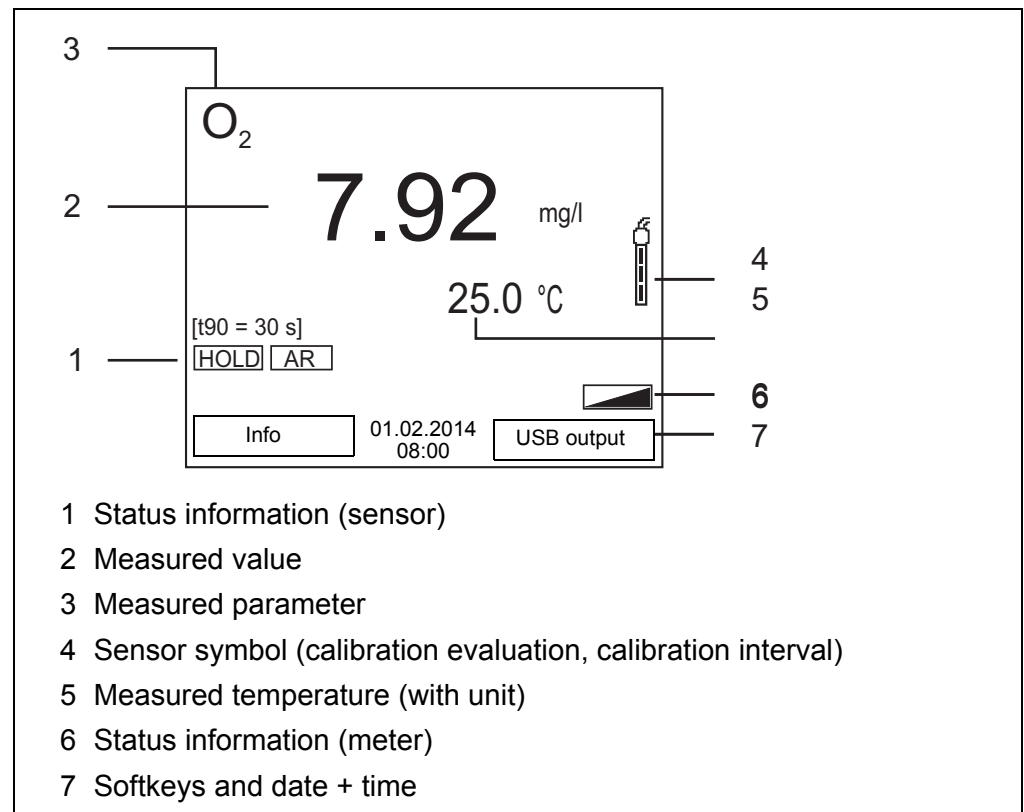
4.1.1 Keypad

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.: <F1>/[Info]: View information on a sensor
	<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

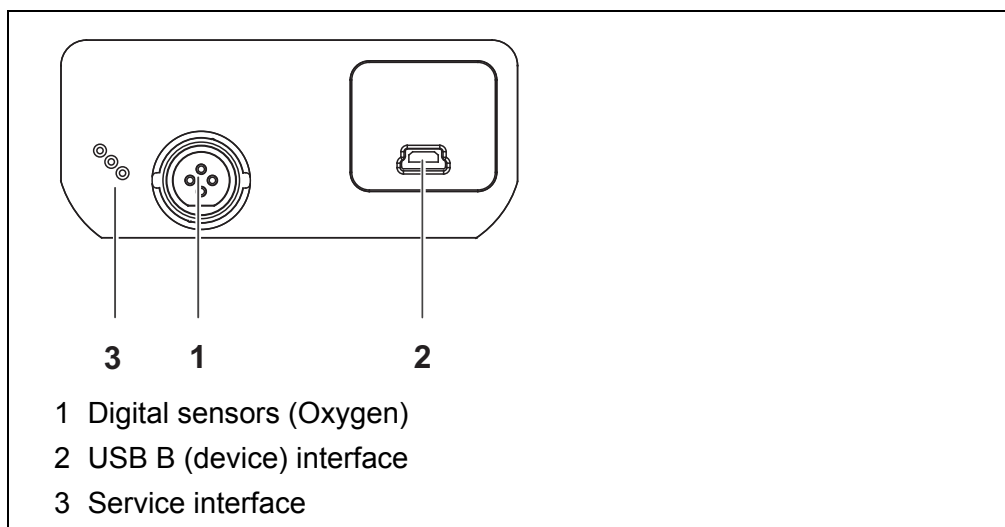
4.1.2 Display



4.1.3 Status information (meter)

AR	Stability control (AutoRead) is active
HOLD	Measured value is frozen (<AR> key)
	Batteries are almost empty
	Data are automatically output to the USB-B interface at intervals

4.1.4 Connectors

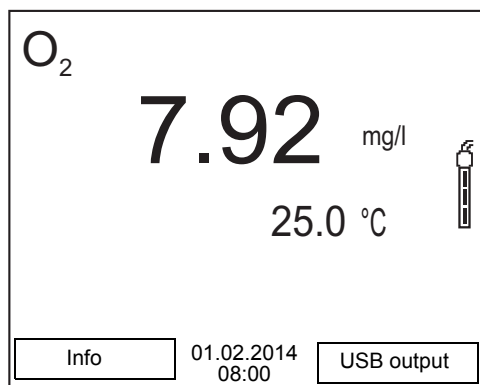


CAUTION

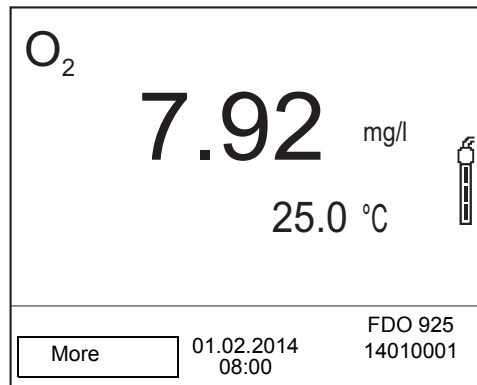
Only connect sensors to the meter that cannot return any volt-ages or currents that are not allowed (> SELV and > current circuit with current limiting).
WTW IDS sensors and IDS adapters meet these requirements.

4.1.5 Sensor info

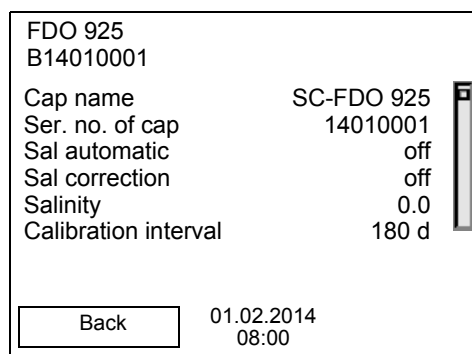
You can display the current sensor data and sensor settings of a connected sensor at any time. The sensor data are available in the measured value display with the <F1>/[Info] softkey.



1. In the measured value display:
Display the sensor data (sensor name, series number) with [<F1>Info].

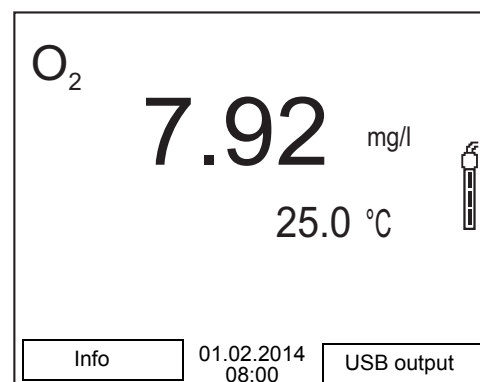


2. Display further sensor data (settings) with <F1>/[More].



4.2 Switching on the meter

1. Switch the meter on with <On/Off>. The meter performs a self-test.
2. Connect the sensor. The meter is ready to measure.



4.3 Switching off the meter

1. Switch the printer off with <On/Off>.

4.4 Navigation

4.4.1 Operating modes

Operating mode	Explanation
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 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

4.4.2 Measured value display

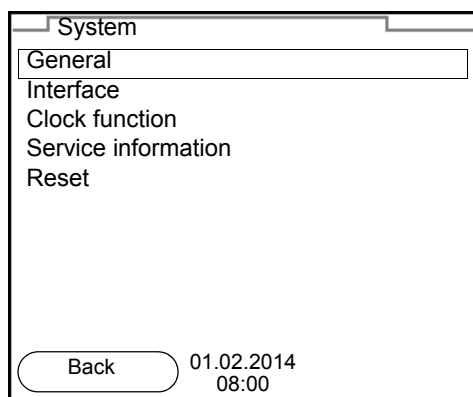
In the measured value display, you can

- open the menu for calibration and measurement settings with **<ENTER>** (short keystroke)
- **<ENTER_>** open the *Storage & config* menu with the sensor-independent settings by pressing **<ENTER>** (long keystroke, approx. 2 s).
- change the display in the selected measuring screen (e. g. pH <-> mV) by pressing **<M>**.
- change the display in the measurement window by pressing **<M>** (e.g. D.O. concentration ->D.O. saturation ->D.O. partial pressure ->).

4.4.3 Menus and dialogs

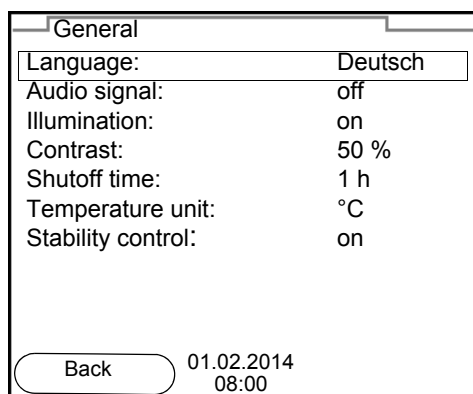
The menus for settings and dialogs in procedures contain further subelements. The selection is made with the **<▲><▼>** keys. The current selection is displayed with a frame.

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



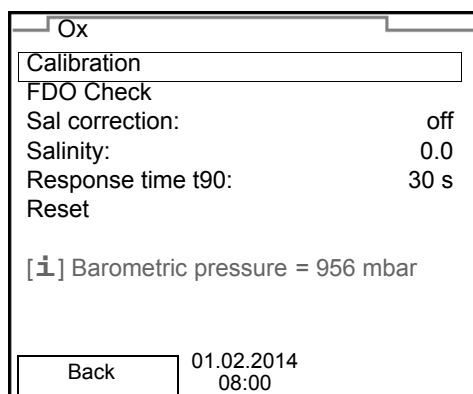
- **Settings**

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



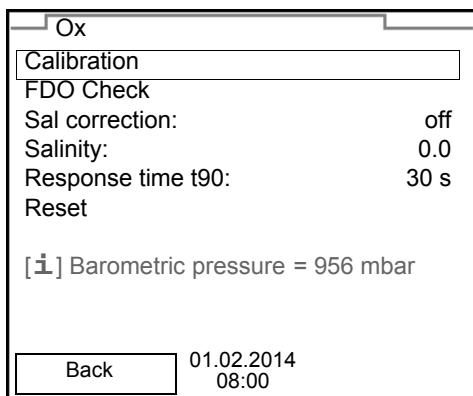
- **Functions**

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



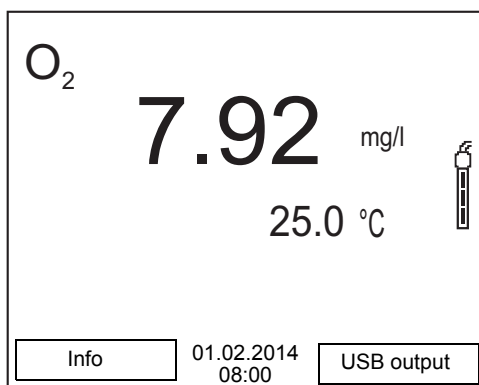
- **Messages**

Information is marked by the [i] symbol. It cannot be selected. Example:

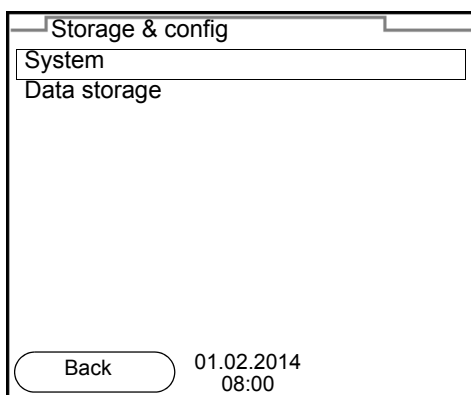


4.4.4 Navigation example 1: Setting the language

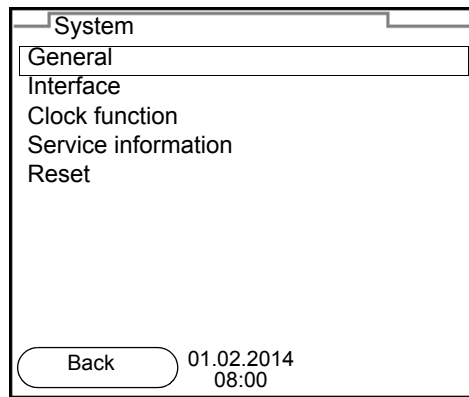
1. Press the **<On/Off>** key.
The measured value display appears.
The instrument is in the measuring mode.



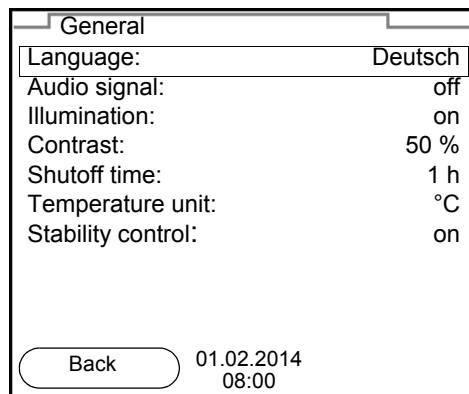
2. Using **<ENTER_>**, open the *Storage & config* menu.
The instrument is in the setting mode.



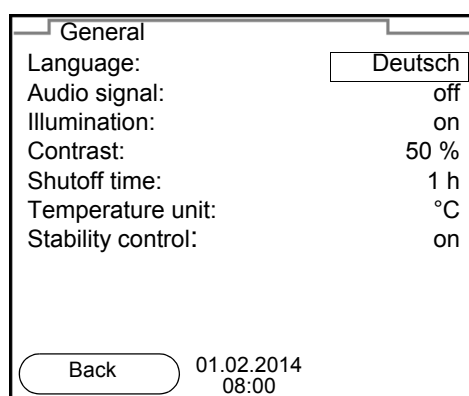
3. Select the *System* submenu with **<▲><▼>**.
The current selection is displayed with a frame.
4. Open the *System* submenu with **<ENTER>**.



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



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



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

4.4.5 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
- Check date (for IDS D.O. sensors)
- Identification of stored measured values.

Therefore, check the time at regular intervals.

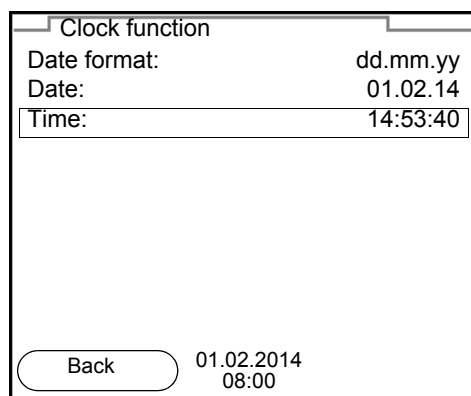


The date and time are reset to default after a fall of the supply voltage (empty batteries).

Setting the date, time and date format

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

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



3. Select and confirm the *Time* menu with **<▲><▼>** and **<ENTER>**.
The hours are highlighted.
4. Change and confirm the setting with **<▲><▼>** and **<ENTER>**.
The minutes are highlighted.
5. Change and confirm the setting with **<▲><▼>** and **<ENTER>**.
The seconds are highlighted.

6. Change and confirm the setting with <▲><▼> and <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 Dissolved oxygen

5.1 Measuring

5.1.1 Measuring D.O.

NOTE

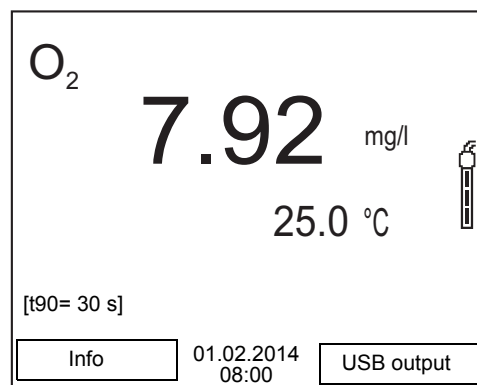
When connecting a grounded PC/printer, measurements cannot be performed in grounded media as the values would be incorrect. The USB interface is not galvanically isolated.

1. Connect the D.O. sensor to the meter.
The D.O. measuring screen is displayed.
2. If necessary, select the measured parameter with **<M>**.
3. Check or calibrate the meter with the sensor.



Only in special cases does the FDO[®] 925 D.O. sensor require calibration. A regular FDO[®] check is sufficient.

4. Immerse the D.O. sensor in the test sample.



Selecting the displayed measured parameter

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

- D.O. concentration [mg/l]
- D.O. saturation [%]
- D.O. partial pressure [mbar].



If D.O. concentration [mg/l] is selected as the measured parameter, low concentrations (below 1 mg/l) are automatically displayed with the higher resolution of 0.001 mg/l.

Salinity correction

When measuring the concentration of solutions with a salt content of more than 1 g/l, a salinity correction is required. For this, you have to measure and input

the salinity of the measured medium first.

When the salinity correction is switched on, the [Sal] indicator is displayed in the measuring screen.



You can switch the salinity correction on or off and enter the salinity in the menu for calibration and measurement settings (see section 6.1.1 SETTINGS FOR D.O. SENSORS (MENU FOR MEASUREMENT AND CALIBRATION SETTINGS), page 33).

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.

Irrespective of the setting for automatic *Stability control* (see section 6.2.3 AUTOMATIC STABILITY CONTROL, page 35) in the *System* menu, you can start a measurement with *Stability control* manually at any time.

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 are output to the interface. Measurement data meeting the stability control criterion are 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
D.O. concentration	20 seconds	Δ : better than 0.03 mg/l
Oxygen saturation	20 seconds	Δ : better than 0.4 %
Oxygen partial pressure	20 seconds	Δ : Better than 0.8 mbar
Temperature	20 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.

5.1.2 Measuring the temperature

For reproducible D.O. measurements, it is essential to measure the temperature of the test sample.

IDS D.O. sensors measure the temperature with a temperature sensor integrated in the IDS sensor.

5.2 FDO[®] check procedure

5.2.1 Why should you check the sensor?

With the FDO[®] Check procedure, you can find out in a simple manner whether the FDO[®] 925 D.O. sensor should be cleaned or calibrated.

5.2.2 When should you check the sensor?

Checking can be useful in the following cases:

- When the check interval has expired (the [check] status indicator is displayed).
- If the measured values seem to be implausible
- If you assume that the sensor cap is contaminated or at the end of its lifetime
- After the sensor cap was exchanged
- Routinely within the framework of the company quality assurance

5.2.3 Carrying out the FDO[®] check procedure

FDO[®] check procedure

Check in water vapor-saturated air.
Use the check and storage beaker (FDO[®] Check) to carry out the FDO[®] check procedure.

Stability control (AutoRead)

In the FDO[®] check procedure, the Stability control function (AutoRead) is automatically activated.

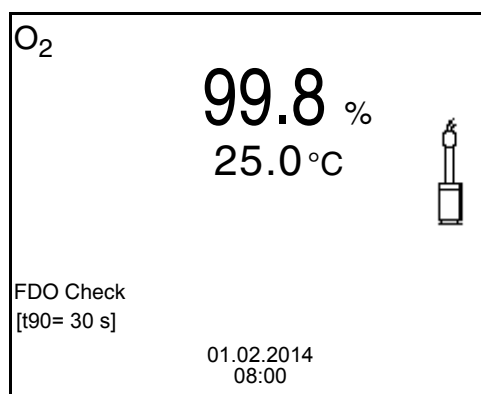
Proceed as follows to carry out the FDO[®] check procedure:

1. Connect the D.O. sensor to the meter.
2. Place the D.O. sensor in the check and storage beaker, FDO[®] Check .



The sponge in the check and storage beaker must be moist (not wet). Leave the sensor in the check and storage beaker long enough so it can adapt to the ambient temperature.

3. Start the FDO[®] check procedure in the measuring menu with *FDO Check / Start FDO Check*.
The meter switches to the measured parameter, %.



4. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control).
The [AR] status indicator is displayed. The measured parameter flashes.
5. Wait for the end of the AutoRead measurement ([HOLD][AR]) status indicator or
take over the measured value with **<ENTER>**.
The measured value is frozen.
6. Switch to the measured value display with **<M>**.
The check measurement is not documented.

5.2.4 Evaluation

The evaluation is based on the accuracy required by the used. Together with the nominal value (100 %) this results in a validity scope for the check.

If the measured value is within the validity scope, no cleaning or user calibration is required.

If the measured value is outside the validity scope, the sensor shaft and membrane should be cleaned, and the check should then be repeated (see section 5.4.1).

Example:

- Required accuracy: $\pm 2 \%$.
- In water vapor-saturated air or air-saturated water, the nominal value for the relative D.O. saturation (abbreviated: saturation) is 100 %.
- Therefore, the validity scope is 98 ... 102 %
- The check resulted in a measured value of 99.3 %

The measurement error is within the specified validity scope. No cleaning or user calibration is required.

5.3 Calibration

5.3.1 Why calibrate?

D.O. sensors age. This changes the slope of the D.O. sensor. Calibration determines the current slope of the sensor and stores this value in the instrument.



The FDO[®] 925 D.O. sensor ages so little it does not have to be regularly calibrated.

To detect changes of the sensor as early as possible, the FDO[®] check procedure can be useful (see section 5.2 FDO[®] CHECK PROCEDURE, page 26).

5.3.2 When to calibrate?

- If your evaluation of the FDO[®] check procedure suggests the necessity of a calibration
- When the calibration interval has expired
- When your accuracy requirements are especially high
- Routinely within the framework of the company quality assurance

5.3.3 Calibration procedures

The Oxi 3310 IDS (Oxi 3315) provides 2 calibration procedures:

- Calibration in water vapor-saturated air.
Use an OxiCal[®] air calibration vessel for the calibration.

- Calibration via a comparison measurement (e.g. Winkler titration according to DIN EN 25813 or ISO 5813). At the same time, the relative slope is adapted to the comparison measurement by a correction multiplier. When the correction multiplier is active, the *[Factor]* indicator appears in the measuring window.

5.3.4 Calibration in water vapor-saturated air

Use the check and storage beaker (FDO® Check) to calibrate the FDO® 925 sensor.

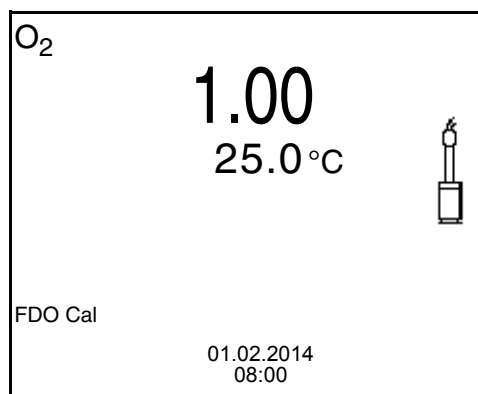
Proceed as follows to calibrate the D.O. sensor:

1. Connect the D.O. sensor to the meter.
2. Place the FDO® 925 D.O. sensor in the check and storage beaker, FDO® Check .



The sponge in the check and storage beaker must be moist (not wet). Leave the sensor in the check and storage beaker long enough so it can adapt to the ambient temperature.

3. Start the calibration with **<CAL>**.
The last calibration data (relative slope) is displayed.



4. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control).
The [AR] status indicator is displayed. The measured parameter flashes.
5. Wait for the AutoRead measurement to be finished ([HOLD][AR] status indicator).
The calibration record is displayed and output to the interface.
6. Switch to the measured value display with **<ENTER>**.

5.3.5 Calibration with *Comparison meas.* (FDO Comp)

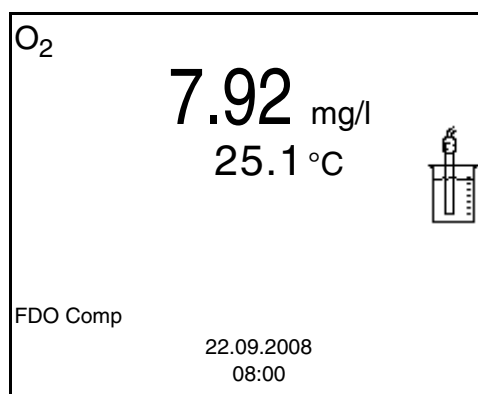
For this calibration procedure, the *Comparison meas.* setting must be set to *on* in the *Calibration* menu.



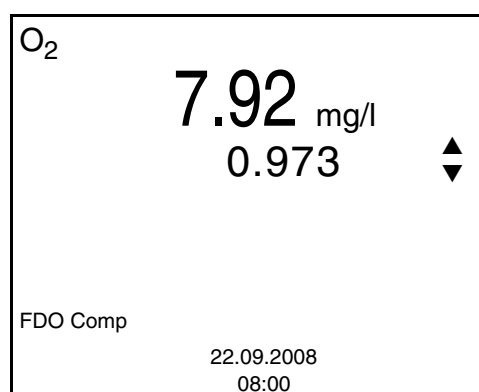
Before calibrating via a comparison measurement, the sensor should be calibrated in the air calibration vessel.

Proceed as follows to calibrate the instrument:

1. Connect the D.O. sensor to the meter.
2. Immerse the D.O. sensor in the reference solution.
3. Start the calibration with **<CAL>**.



4. Start the measurement with **<ENTER>**.
The measured value is checked for stability (stability control).
The [AR] status indicator is displayed. The measured parameter flashes.
5. Wait for the end of the AutoRead measurement or accept the calibration value with **<ENTER>**.
The multiplier that was set last is displayed.



6. Using **<▲>** **<▼>**, set the correction multiplier to adjust the displayed concentration value to the nominal value (value of the comparison measurement). Subsequently, accept the correction multiplier with **<ENTER>**.
The meter switches to the measured value display.
The status display [*Factor*] is active.

5.3.6 Calibration data



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

Displaying the calibration record

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 10 calibrations are to be found in the menu, *Calibration / Calibration data storage / Display*. To open the *Calibration* menu, press the **<ENTER>** key in the measured value display.




Menu item	Setting/function	Explanation
<i>Calibration / Calibration data storage / Display</i>	-	Displays the calibration records. Further options: <ul style="list-style-type: none"> ● Scroll through the calibration records with <▲><▼>. ● Output the displayed calibration record to the interface with <F2>/<i>[USB-Ausgabe]</i>. ● Output all calibration records to the interface with <F2_>/<i>[USB-Ausgabe]</i>. ● Quit the display with <F1>/<i>[Zurück]</i> or <ENTER>. ● Switch directly to the measured value display with <M>.
<i>Calibration / Calibration data storage / Output to RS232/USB</i>	-	Outputs the calibration data memory to the interface

Calibration evaluation

After calibration, the meter automatically evaluates the current status of the cal-

ibration. The evaluation appears on the display and in the calibration record.

FDO® 925 calibration evaluation

Display	Calibration record	Relative slope
	+++	S = 0.94 ... 1.06
	++	S = 0.92 ... 0.94 or S = 1.06 ... 1.08
	+	S = 0.90 ... 0.92 or S = 1.08 ... 1.10
<i>Error</i>	<i>Error</i>	S < 0.90 or S > 1.10
Error elimination (see section 10 WHAT TO DO IF..., page 49)		

Calibration record (USB output)

```

CALIBRATION Ox
Calibration date 01.02.2014 07:43:33
FDO 925
Ser. no. 10146858

SC-FDO 925          10158765
Relative slope      0.98
Sensor              +++
  
```


6 Settings

6.1 D.O. measurement settings

6.1.1 Settings for D.O. sensors (menu for measurement and calibration settings)

Settings The settings are available in the menu for measurement and calibration settings. To open the settings, display the required measured parameter in the measured value display and press the **<ENTER>** key. After completing the settings, switch to the measured value display with **<M>**.

Default settings are printed in **bold**.

Menu item	Possible setting	Explanation
<i>Calibration / Calibration record</i>	-	Displays the calibration record of the last calibration.
<i>Calibration / Calibration data storage / Display</i>	-	Displays the last calibration records (max. 10)
<i>Calibration / Calibration data storage / Output to RS232/USB</i>	-	Outputs the calibration data memory to the interface
<i>Calibration / Calibration interval</i>	1 ... 180 ... 999 d	<i>Calibration interval</i> for the D.O. sensor (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol in the measuring screen.
<i>Calibration / Comparison meas.</i>	on off	Enables to adjust the measured value with the aid of a comparison measurement, e.g. Winkler titration. For details, see section 5.3 CALIBRATION, page 28.
<i>FDO Check / Start FDO Check</i>	-	Starts the FDO [®] check procedure
<i>FDO Check / Check interval</i>	1 ... 60 ... 999 d	Interval for the <i>FDO Check</i> (in days). The meter reminds you to check the sensor regularly by <i>FDO Check</i> status indicator in the measuring screen.
<i>Sal correction</i>	on off	Manual salt content correction for concentration measurements.

Menu item	Possible setting	Explanation
<i>Salinity</i>	0.0 ... 70.0	Salinity or salinity equivalent for the salt content correction. This menu item is only available if the manual salinity correction (<i>Sal correction</i>) is switched on.
<i>Response time t90</i>	30 ... 300 s	Response time of the signal filter (in seconds). A signal filter in the sensor reduces the limits of variation of the measured value. The signal filter is characterized by the response time t90. This is the time after which 90 % of a signal change is displayed.
<i>Reset</i>	-	Resets all sensor settings to the delivery condition (see section 6.3.1 RESETTING THE MEASUREMENT SETTINGS , page 37).

6.2 Sensor-independent settings

6.2.1 System

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	Explanation
<i>System / General / Language</i>	<i>Deutsch</i> English (more)	Selects the menu language
<i>System / General / Audio signal</i>	on off	Switches on/off the beep on keystroke
<i>System / General / Illumination</i>	Auto on off	Switches the display illumination on/off
<i>System / General / Contrast</i>	0 ... 50 ... 100 %	Changes the display contrast
<i>System / General / Shutoff time</i>	10 min ... 1h ... 24 h	Adjusts the switch-off time
<i>System / General / Temperature unit</i>	°C °F	Temperature unit, degrees Celsius or degrees Fahrenheit. All temperature values are displayed with the selected unit.

Menu item	Possible setting	Explanation
<i>System / General / Stability control</i>	on off	Switches on or off the automatic stability control during measurement (see section 6.2.3 AUTOMATIC STABILITY CONTROL, page 35)
<i>System / Interface / Baud rate</i>	1200, 2400, 4800 , 9600, 19200	Baud rate of the USB Device interface
<i>System / Interface / Output format</i>	ASCII CSV	Output format for data transmission For details, see section 8 TRANSMITTING DATA (USB INTERFACE), page 45
<i>System / Interface / Decimal separator</i>	Dot (xx.x) Comma (xx,x)	Decimal separator
<i>System / Interface / Output header</i>		Output of a header for <i>Output format: CSV</i>
<i>System / Clock function</i>	<i>Date format</i> <i>Datum</i> <i>Time</i>	Settings of time and date. For details, see section 4.4.5 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 22
<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. For details, see section 6.3.2 RESETTING THE SYSTEM SETTINGS, page 37

6.2.2 Data storage

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



Detailed information on the memory functions of the Oxi 3310 IDS (Oxi 3315) are given in section 7 DATA MEMORY, page 39.

6.2.3 Automatic Stability control

The automatic *Stability control* (AutoRead) function continuously 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 6.2 SENSOR-INDEPENDENT SETTINGS, page 34).

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.

6.2.4 Automatic switch-off function

The instrument has an automatic switch-off function in order to save the batteries (see section 6.2.1 SYSTEM, page 34). The automatic switchoff function switches off the meter if no key is pressed for an adjustable period.

The automatic switchoff function is not active

- if a USB-B cable is connected
- if the *Automatic data storage* function is active, or with *automatic data transmission*

6.2.5 Display illumination

The meter automatically switches off the display illumination if no key is pressed for 20 seconds.

The illumination is switched on with the next keystroke again.

You can also generally switch on the display illumination (see section 6.2.1 SYSTEM, page 34).

6.3 Reset

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

6.3.1 Resetting the measurement settings



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

Dissolved oxygen

The following settings for D.O. measurements are reset to the default settings with the *Reset* function:

Setting	Default settings
<i>Calibration interval</i>	180 d
<i>Check interval</i>	60 d
<i>Measured parameter</i>	D.O. concentration
<i>Relative slope (S_{Rel})</i>	1,00
<i>Salinity (value)</i>	0,0
<i>Salinity (function)</i>	Off

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

6.3.2 Resetting the system settings

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

Setting	Default settings
<i>Language</i>	English
<i>Audio signal</i>	on
<i>Baud rate</i>	4800 Baud
<i>Output format</i>	ASCII
<i>Decimal separator</i>	.
<i>Contrast</i>	50 %
<i>Illumination</i>	Auto
<i>Shutoff time</i>	1 h
<i>Temperature unit</i>	°C
<i>Stability control</i>	on

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

7 Data memory

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

- Manual data storage (see section 7.1 MANUAL STORAGE, page 39)
- Automatic data storage at intervals (see section 7.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 40)

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

7.1 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 **<STO>** key shortly.
The menu for manual data storage appears.

Manual data storage 4 von 500
 01.02.2014 07:43:33
 Ox 7.88 mg/l 24.8 °C AR +++
 t90 = 30 s

ID number: 1
 continue

Back 01.02.2014 08:00

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

If the memory is full

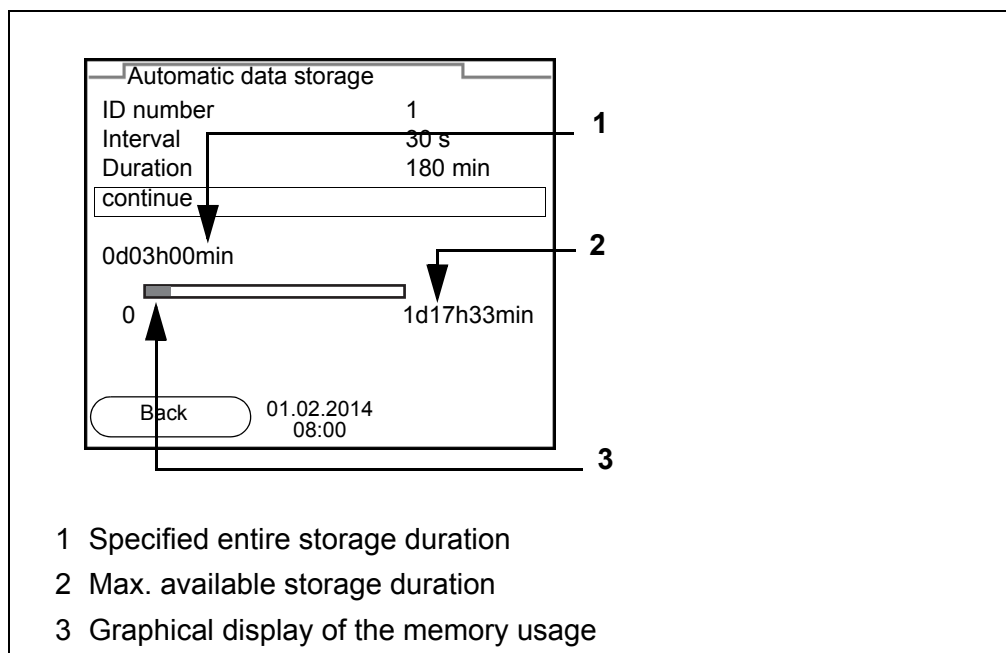
When all memory locations are occupied, it is not possible to continue storing. Then you can e.g. store the data from the memory to a PC (see section 7.3.1 EDITING THE MEASUREMENT DATA MEMORY, page 42) and subsequently erase the data memory (see section 7.3.2 ERASING THE MEASUREMENT DATA MEMORY, page 43).

7.2 Automatic data storage at intervals

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

Configuring the automatic storage function

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



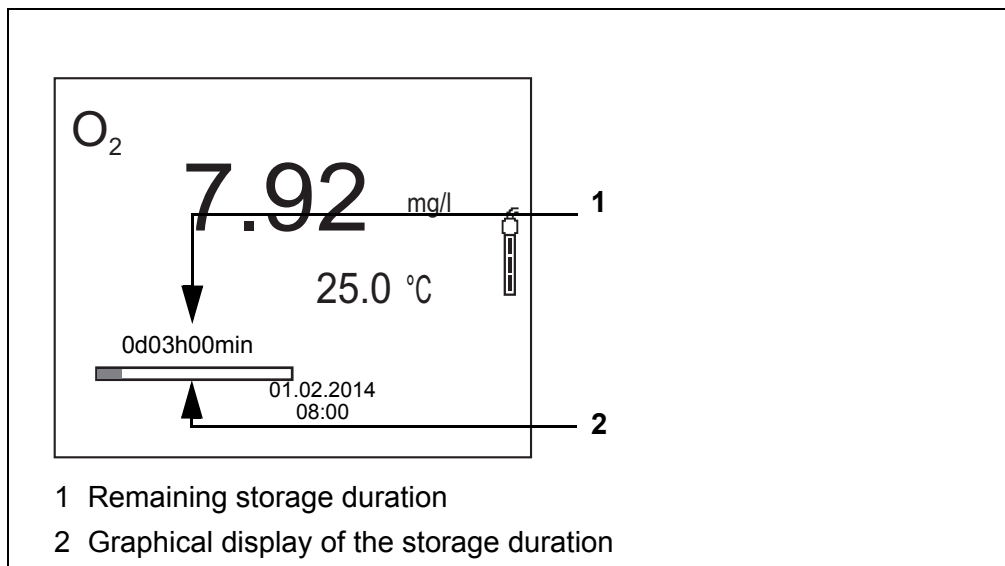
Settings

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

Menu item	Possible setting	Explanation
<i>ID number</i>	1 ... 10000	ID number for the dataset series.
<i>Interval</i>	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 memory locations. The upper limit is restricted by the storage duration.
<i>Duration</i>	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 memory locations.

Starting the automatic storage function

To start the automatic storage function, select *continue* with \blacktriangle \blacktriangledown and confirm with \langle ENTER \rangle . The meter switches to the measured value display.



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

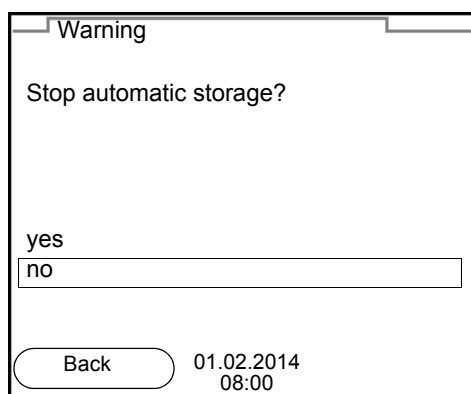


If the automatic data storage function is activated *only the following keys are active*: \langle M \rangle , \langle STO_ \rangle and \langle On/Off \rangle . The other keys and the automatic switch-off function are deactivated.

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 \langle STO_ \rangle key.
The following window appears.



2. Using \blacktriangle \blacktriangledown , select *yes* and confirm with \langle ENTER \rangle .
The meter switches to the measured value display.
The automatic data storage function is terminated.

7.3 Measurement data memory

7.3.1 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.

Editing the data memory

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

Open the manual or automatic memory directly with the **<RCL>** or **<RCL_>** key.



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. Further options: <ul style="list-style-type: none"> ● Scroll through the datasets with <▲><▼>. ● Output the displayed dataset to the interface with <F2>/[USB output]. ● Quit the display with <F1>/[Back].
<i>Data storage / Manual data storage / Output to RS232/ USB</i>	-	Outputs all stored measurement data to the interface.
<i>Data storage / Manual data storage / Erase</i>	-	Erases the entire manual measurement data memory. Note: All calibration data remain stored when this action is performed.

**Display presentation
of a dataset**

Manual data storage	3 of 64	◆
01.02.2014 07:43:33 ID number: 1		
FDO 925	14010001	
SC-FDO 925	11200001	
Ox 7.88 mg/l	24.8 °C AR	+++
t90 = 30 s		
Back	01.02.2014 08:00	USB output

**Representation of a
dataset
(USB output)**

```

01.02.2014 07:43:33
Oxi 3310 IDS (Oxi 3315)
Ser. no. 1135001

ID number 2

FDO 925
Ser. no. 1125001
SC-FDO 925 11200001
Ox 7.88 mg/l 24.8 °C AR, S: +++

-----

01.02.2014 07:43:53
Oxi 3310 IDS (Oxi 3315)
Ser. no. 1135001

ID number 2

FDO 925
Ser. no. 1125001
SC-FDO 925 11200001
Ox 6.12 mg/l 24.8 °C AR, S: +++

-----

etc...

```

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]**.

7.3.2 Erasing the measurement data memory

Erasing the measurement data memory (see section 7.3.1 EDITING THE MEASUREMENT DATA MEMORY, page 42).

7.3.3 Measurement dataset

A complete dataset consists of:

- Date/time
- Meter name, series number
- Sensor name, series number
- ID number
- 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:
 - 4 levels (+++, ++, +, -, or no evaluation)

7.3.4 Storage locations

The Oxi 3310 IDS (Oxi 3315) meter has two measurement data memories. The measured values recorded either manually or automatic are stored separately in individual measurement data memories.

Memory	Maximum number of datasets
<i>Manual data storage</i>	500
<i>Automatic data storage</i>	4500

8 Transmitting data (USB interface)

8.1 Outputting current measurement data

1. Output the current measurement data to the USB-B interface with **<F2>**[*USB output*].

8.2 Transmitting data (to a PC)

The meter has a USB-B interface (*USB Device*) e.g. to connect a PC.

Via the USB-B interface (*USB Device*) you can store data to a PC or printer and update the meter software.

8.3 Connecting the PC / USB-B interface (*USB Device*)

Connect the Oxi 3310 IDS (Oxi 3315) to the PC via the USB-B interface.

Installation of the USB driver on the PC

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

- PC with at least one free USB connection and CD-ROM drive
- Windows 2000, Windows XP, Windows Vista or 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 Oxi 3310 IDS (Oxi 3315) to the PC via the USB-B interface.
The meter is listed as a virtual COM interface among the connections in the Windows instrument manager.
4. Set the same transmission data at the connected instrument (PC):
 - Baud rate: to be selected in the range 1200 ... 19200
 - Handshake: RTS/CTS
 - Set at the PC only:
 - Parity: none
 - Data bits: 8
 - Stop bits: 2

8.4 Options for data storage to a PC

Via the USB-B interface you can store 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 sensors	Manual	<ul style="list-style-type: none"> ● With <F2>/[USB output]. ● Simultaneously with every manual data storage process (see section 7.1 MANUAL STORAGE, page 39).
	Automatic, at intervals	<ul style="list-style-type: none"> ● With <F2__>/[USB output]. Then you can set the transmission interval. ● Simultaneously with every automatic data storage process (see section 7.2 AUTOMATIC DATA STORAGE AT INTERVALS, page 40).
Stored measured values	Manual	<ul style="list-style-type: none"> ● Displayed dataset with <F2>/[USB output] after calling up from the memory. ● All datasets with the <i>Output to RS232/USB</i> function. (see section 7.3.1 EDITING THE MEASUREMENT DATA MEMORY, page 42).
Calibration records	Manual	<ul style="list-style-type: none"> ● Calibration record with <F2>/[USB output] (see section 5.3.6 CALIBRATION DATA, page 31).
	Automatic	<ul style="list-style-type: none"> ● 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, measuring datasets, calibration records).

8.5 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.

9 Maintenance, cleaning, disposal

9.1 Maintenance

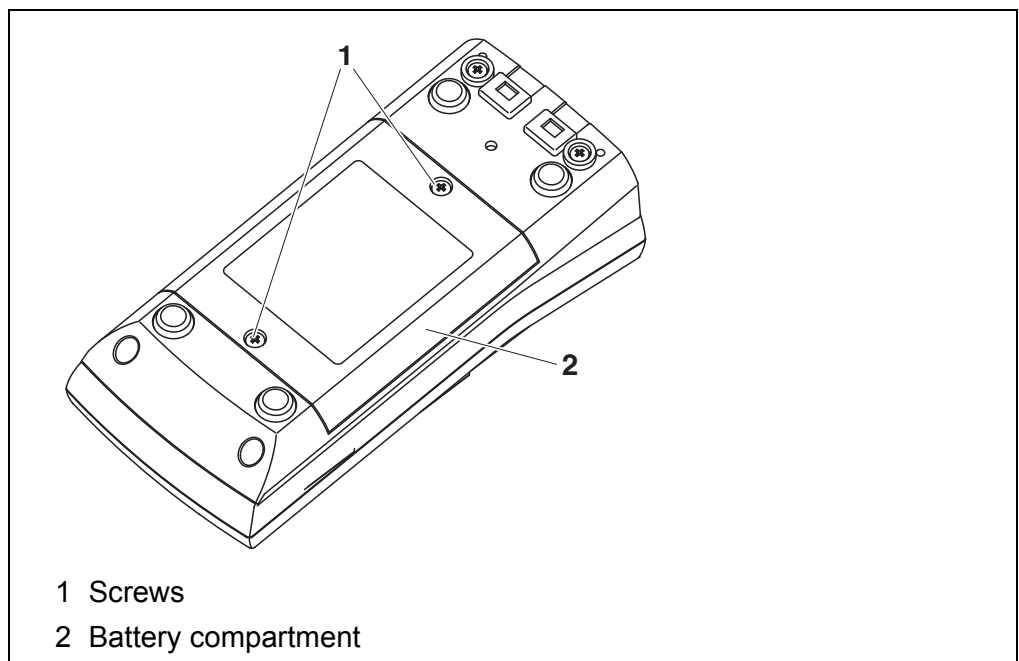
9.1.1 General maintenance activities

The only maintenance activity required is replacing the batteries.



See the relevant operating manuals of the IDS sensors for instructions on maintenance.

9.1.2 Replacing the batteries



1. Unscrew the two screws (1) on the underside of the meter.
2. Open the battery compartment (1) on the underside of the meter.
3. 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.



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.

4. Place four batteries (type Mignon AA) in the battery compartment.
5. Close the battery compartment (2) and tighten the screws (1).
6. Set the date and time
(see section 4.4.5 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 22).



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.

9.2 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.

9.3 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.

9.4 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.

10 What to do if...

10.1 Dissolved oxygen



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
– Measured value outside the measuring range	– Use a suitable IDS D.O. sensor

Error message, *Error*

Cause	Remedy
– Sensor contaminated	– Clean the sensor
– Measured temperature value outside the operating conditions (display of OFL/UFL instead of a temperature value)	– Keep to the temperature range for the test sample
– Defective sensor	– Replace the sensor

10.2 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 9.1 MAINTENANCE, page 47)

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 or IDS sensor	Cause	Remedy
	<ul style="list-style-type: none"> - E.g., a question by the service department 	<ul style="list-style-type: none"> - Switch on the meter. - Open the menu, <ENTER_> / <i>Storage & config / System / Service information</i>. The instrument data are displayed. <p>or</p> <ul style="list-style-type: none"> - Connect the sensor. Press softkey [<F1>Info<F1>] / <i>[More]</i> The sensor data are displayed (see section 4.1.5 SENSOR INFO, page 16)

11 Technical data

11.1 Measuring ranges, resolution, accuracy

Measuring ranges, accuracy	Variable	Measuring range	Accuracy
	Air pressure (absolute)*	300 ... 1100 mbar	± 4 mbar

* Available only if a D.O. sensor is connected



Further data are given in the documentation of your sensor.

11.2 General data

Dimensions	Oxi 3310 IDS (Oxi 3315):	Approx. 180 x 80 x 55 mm
Weight	Oxi 3310 IDS (Oxi 3315):	Approx. 0.4 kg
Mechanical structure	Type of protection	IP 67
Electrical safety	Protective class	III
Test certificates	CE	
Ambient conditions	Storage	- 25 °C ... + 65 °C
	Operation	+5 °C ... + 55 °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
	Operational life	Approx. 100 h*

* The operational life is shorter if the display illumination is switched on permanently

USB interface (device)	Type	USB 1.1 USB-B (Device), PC
	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
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Guidelines and norms used

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 UL 61010-1 CAN/CSA-C22.2#61010-1
IP protection class	EN 60529

12 Firmware update

12.1 Firmware update for the meter Oxi 3310 IDS (Oxi 3315)

You can find available firmware update files for your meter on the Internet. With the "Firmware Update " program and a PC you can update the firmware of the Oxi 3310 IDS (Oxi 3315) to the newest version.

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

For the update via the USB-B 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 Oxi 3310 IDS (Oxi 3315)).

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 are displayed there.
2. In the windows start menu, open the update folder and start the firmware update program for the meter
3. Using the USB interface cable, connect the Oxi 3310 IDS (Oxi 3315) to a USB interface (virtual COM port) of the PC.
4. Switch on the Oxi 3310 IDS (Oxi 3315).
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 up to 5 minutes. A terminatory message is displayed after a successful programming process. The firmware update is completed.
7. Disconnect the Oxi 3310 IDS (Oxi 3315) from the PC.
The Oxi 3310 IDS (Oxi 3315) 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 OR IDS SENSOR, PAGE 50).

12.2 Firmware-Update for IDS Sensors

With the "Firmware Update" program and a PC you can update the firmware of an IDS sensor to the newest version.

You can find available firmware update files for your IDS sensor on the Internet.

For updating, connect the IDS sensor to the Oxi 3310 IDS (Oxi 3315), and the Oxi 3310 IDS (Oxi 3315) to a PC.

For the update via the USB-B 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 Oxi 3310 IDS (Oxi 3315)).

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 sensor (or sensor type), the new data are displayed there.
2. In the windows start menu, open the update folder and start the firmware update program for the IDS sensor
3. Connect the IDS sensor to the Oxi 3310 IDS (Oxi 3315) meter.
4. Using the USB interface cable, connect the Oxi 3310 IDS (Oxi 3315) to a USB interface (virtual COM port) of the PC.
5. Switch on the Oxi 3310 IDS (Oxi 3315).
6. In the firmware update program, start the update process with OK.
7. 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 up to 5 minutes. A terminatory message is displayed after a successful programming process. The firmware update is completed.
8. Disconnect the Oxi 3310 IDS (Oxi 3315) from the PC.
Meter and sensor are ready for operation again.

After switching the meter off and on you can check whether the sensor has taken over the new software version (see YOU WANT TO KNOW WHICH SOFTWARE VERSION IS IN THE METER OR IDS SENSOR, PAGE 50).

13 Glossary

Dissolved oxygen

OxiCal®	WTW name for a procedure to calibrate D.O. measuring systems in water vapor saturated air.
Salinity	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.
Salt content	General designation for the quantity of salt dissolved in water.
D.O. partial pressure	Pressure caused by the oxygen in a gas mixture or liquid.
D.O. (oxygen) saturation	Short name for the relative D. O. saturation.
Slope (relative)	Designation used by WTW in the D.O. measuring technique. It expresses the relation of the slope value to the value of a theoretical reference sensor of the same construction type.

General information

Resolution	Smallest difference between two measured values that can be displayed by a meter.
AutoRange	Name of the automatic selection of the measuring range.
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.
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).
Measured parameter	The measured parameter is the physical dimension determined by measuring, e.g. pH, conductivity or D.O. concentration.
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.
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.

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.

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

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