Operating manual

VWR® OX 4100 H - D.O. Meter

EU cat. no	NA cat. no
664-0176	76460-506

CE

UK
CA

Legal Address of Manufacturer:

Europe

VWR International BV
Researchpark Haasrode 2020
Geldenaaksebaan 464
B-3001 Leuven
+32 16 385011
http://be.vwr.com

Importer to UK:

VWR International Ltd
Hunter Boulevard, Magna Park
Lutterworth, Leicestershire, LE17 4XN
http://uk.vwr.com

Country of origin: Germany.

United States

VWR International LLC
100 Matsonford Rd
Radnor, PA 19087
+1 800-932-5000
www.vwr.com

OX 4100 H - Contents

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 field and 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.

1.1   Authorized use

The authorized use of the meter consists exclusively of the measure-
ment of dissolved oxygen and temperature of liquid media in a field and
laboratory 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.

**Function and
operational safety**

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 opera-
tion.

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 envi-
ronment, 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 opera-
tion.

**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   The purchaser of this meter must ensure that the following laws and
purchaser   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 OX 4100 H compact precision dissolved oxygen (D.O.) meter enables you to perform D.O. measurements quickly and reliably.

The OX 4100 H provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.
The proven OxiCal calibration procedure supports you in your work with the D.O. meter.

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

1 Keypad
2 Display
3 Connectors
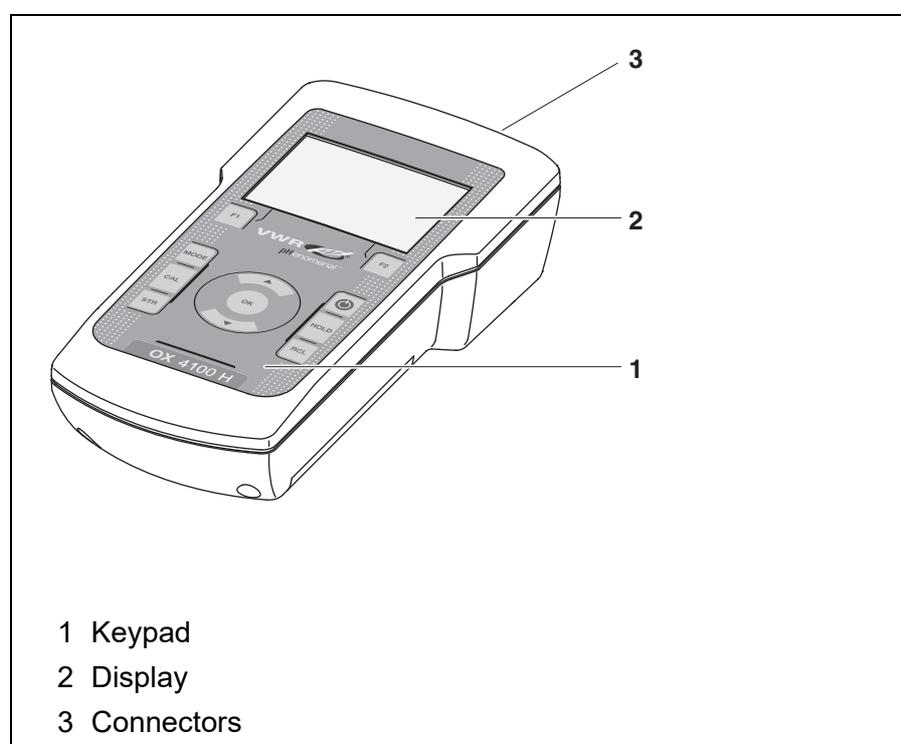
2.1   Keypad

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

2.2   Display

1 Status information

2 Measured value (with unit)

3 Measured parameter

4 Sensor symbol (calibration evaluation, calibration interval)

5 Measured temperature (with unit)

6 Status line

7 Softkeys and date + time
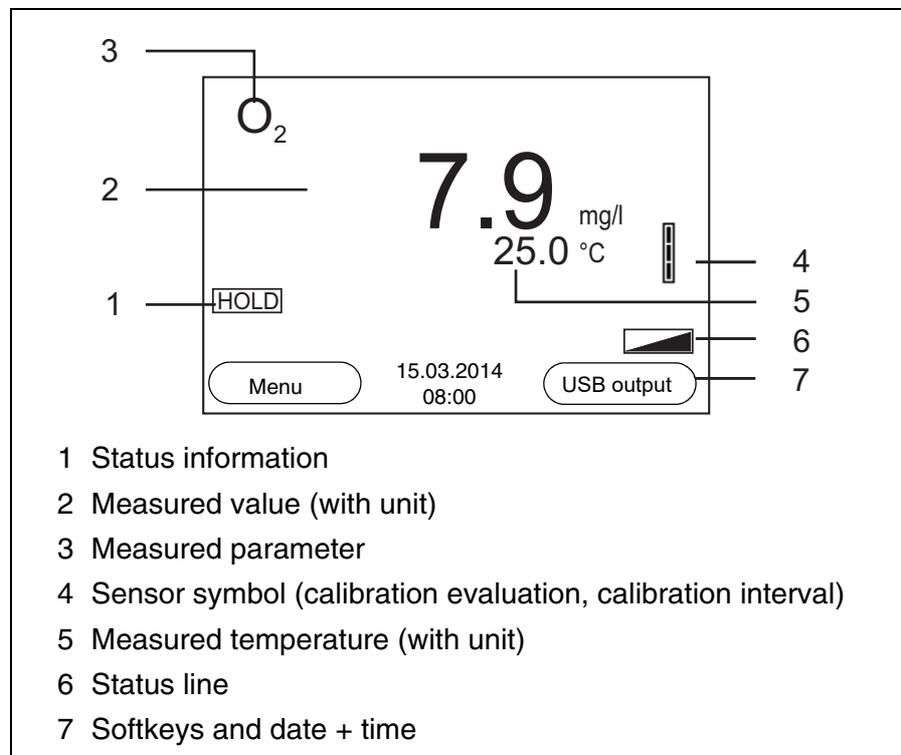
Function display indicators

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

1 D.O. sensor

2 USB B (device) interface

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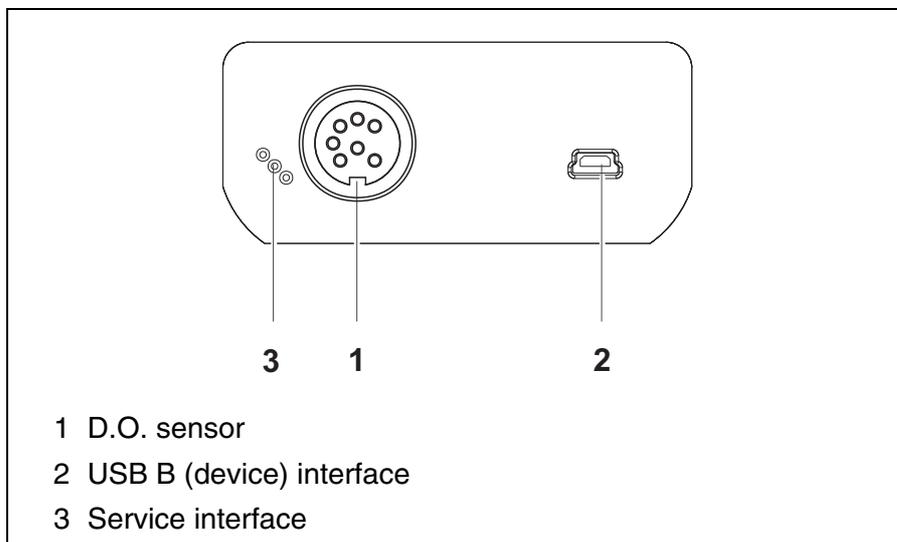
Caution
Only connect D.O. sensors to the meter that cannot return any
voltages or currents that are not allowed (> SELV and > current
circuit with current limiting).
Almost all customary D.O. sensors fulfill these conditions.

3   Technical data

3.1   General data

Dimensions	Approx. 180 x 80 x 55 mm	
Weight	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	-10 °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
	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

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

Guidelines and norms used	EMC	EU directive 2014/30/EU EN 61326-1 FCC Class A
	Meter safety	EU directive 2014/35/EU EN 61010-1
	IP protection class	EN 60529
	RoHS	EU directive 2011/65/EU

3.2   Measuring ranges, resolution, accuracy

Measuring ranges, resolution (depending on the sensor)

Variable	Measuring range	Resolution
Concentration [mg/l]	0 ... 20.00 (0 ... 20.0) 0 ... 90.0 (0 ... 90)	0.01 (0.1) 0.1 (1)
Saturation [%]	0 ... 200,0 (0 ... 200) 0 ... 600	0.1 (1) 1
D.O. partial pressure [mbar]	0 ... 200.0 (0 ... 200) 0 ... 1250	0.1 (1) 1
T [°C]	0 ... 50,0	0.1

Accuracy (± 1 digit)

Variable	Accuracy
Concentration [mg/l]	± 0.5 % of measured value at ambient temperature + 5 °C ... + 30 °C
Saturation [%]	± 0.5% of measured value when measuring in the range of ± 10 K around the calibration temperature
D.O. partial pressure [mbar]	± 0.5 % of measured value at ambient temperature + 5 °C ... + 30 °C

T [°C] / temperature sensor

NTC 30	± 0.1
PT 1000	± 0.1

Correction functions

Temperature compensation	Accuracy better than 2 % at 0 ... + 40 °C
Salinity correction	0 ... 70.0 SAL
Air pressure correction	Automatic through integrated pressure sensor in the range of 500 ... 1100 mbar

Note
The accuracy values specified here apply exclusively to the meter. The accuracy of the D.O. sensors has also to be taken into account.

4   Commissioning

4.1   Scope of delivery

● D.O. meter OX 4100 H

● 4 batteries 1.5 V Mignon type AA

● USB cable

● 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

● Switch on the meter

● Set the date and time

4.2.1   Inserting the batteries
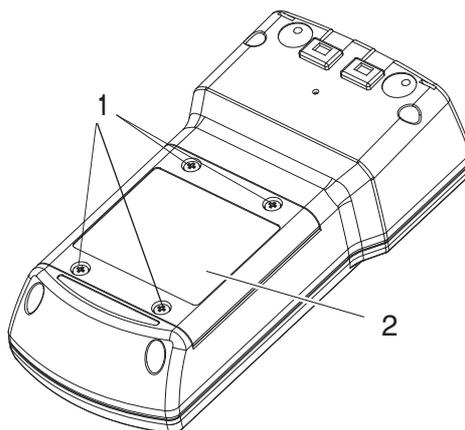
1	Unscrew the screws (1) on the underside of the meter.
2	Open the battery compartment (2) on the underside of the meter.

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.

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 compart-ment. |
| 4 | Close the battery compartment. |

4.2.2 Switching on the meter

| 1 | 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.
Subsequently, the meter switches to the measuring mode (measured value display). |

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 sec-
tion 5.3.1).

4.2.3 Setting the date and time

| 1 | See section 5.2.4 |

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.

```
O₂

        7.9 mg/l
        25.1 °C



  ( Menu )   15.03.2014   ( USB output )
                08:00
```
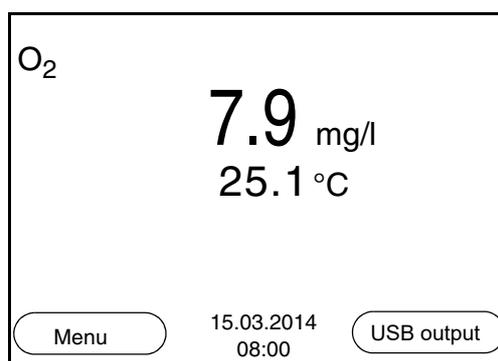
Switching off

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 switchoff function switches off the meter if no key is pressed for an adjustable period.

The automatic switchoff function is not active

● if the meter is supplied with power via a connected USB cable

● 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 OX 4100 H.

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 OX 4100 H 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 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>** (<u>short </u>keystroke)

- Open the *Storage & config* menu with the sensor-independent settings with **<F1__>** (<u>long </u>keystroke (approx. 2 s).

- Change the display in the measurement window by pressing **<MODE>** (e.g. D.O. concentration –> D.O. saturation index –> D.O. partial pressure –>).

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.

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

```
┌─ System ──────────────────┐
│ ┌───────────────────────┐ │
│ │ General               │ │
│ └───────────────────────┘ │
│   Interface               │
│   Clock                   │
│   Service information     │
│   Reset                   │
│                           │
│                           │
│  ╭────────╮   15.03.2014  │
│  │  Back  │       08:00   │
│  ╰────────╯               │
└───────────────────────────┘
```
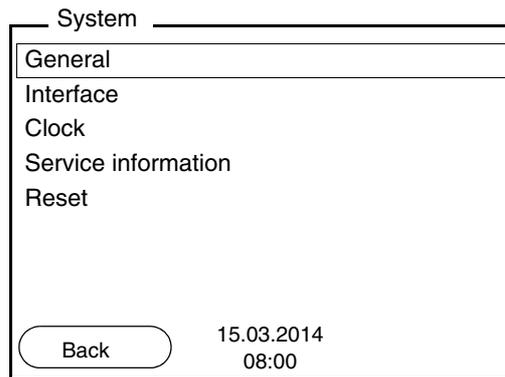
- <u>Settings</u>
  Settings are indicated by a colon. The current setting is displayed on the right-hand side. The setting mode is opened with **<OK>**. Subsequently, the setting can be changed with **<▲><▼>** and **<OK>**. Example:

```
┌─ General ─────────────────┐
│ ┌───────────────────────┐ │
│ │ Language:      Deutsch │ │
│ └───────────────────────┘ │
│   Beep:          Off      │
│   Illumination:  On       │
│   Contrast:      48 %     │
│   Switchoff time: 30 min  │
│                           │
│                           │
│  ╭────────╮   15.03.2014  │
│  │  Back  │       08:00   │
│  ╰────────╯               │
└───────────────────────────┘
```
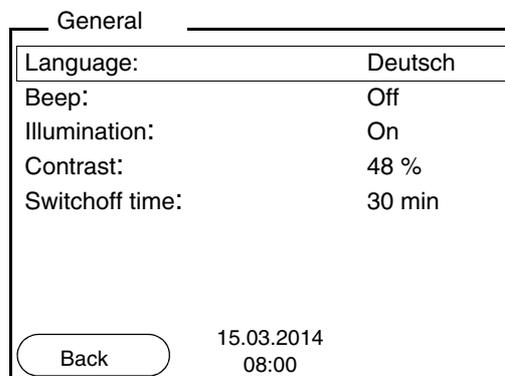
● <u>Functions</u>
Functions are designated by the name of the function. They are immediately carried out by confirming with **<OK>**.
Example: Display the *Calibration record* function.

```
┌─ O₂ ──────────────────────────┐
│ ┌───────────────────────────┐ │
│ │ Calibration record        │ │
│ └───────────────────────────┘ │
│ Calibration data storage      │
│ Calibration interval:   150 d │
│ Comparison meas.              │
│                               │
│                               │
│                               │
│                               │
│  ╭────────╮    15.03.2014     │
│  │  Back  │       08:00       │
│  ╰────────╯                   │
└───────────────────────────────┘
```

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

```
┌─ O₂ ──────────────────────────┐
│ ┌───────────────────────────┐ │
│ │ Calibration               │ │
│ └───────────────────────────┘ │
│ Temperature unit          °C  │
│ Sal correction            On  │
│ Salinity                 21.7 │
│ Stability control         On  │
│ Reset                         │
│                               │
│ i Air pressure = 941 mbar     │
│  ╭────────╮    15.03.2014     │
│  │  Back  │       08:00       │
│  ╰────────╯                   │
└───────────────────────────────┘
```

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.
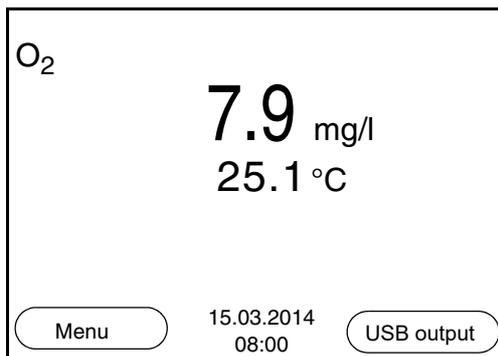
O$_2$

7.9 mg/l

25.1 °C

Menu   15.03.2014
08:00   USB output

2	Using **<F1__>**/[Menu], open the *Storage & config* menu. The instrument is in the setting mode.

Storage & config

System

Data storage

Back   15.03.2014
08:00
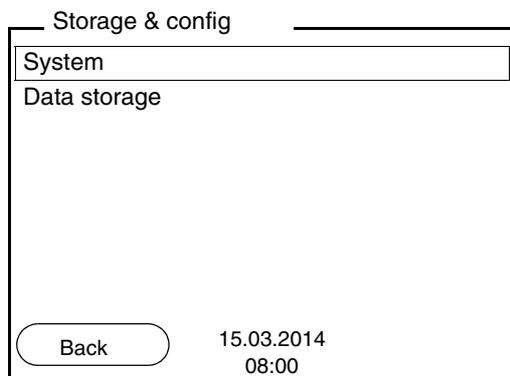
3	Select the *System* submenu with **<▲><▼>**. The current selection is displayed with a frame.
4	Open the *System* submenu with **<OK>**.

```
 ____ System _____
| General                              |
| Interface                            |
| Clock                                |
| Service information                  |
| Reset                                |
|                                      |
|                                      |
|                                      |
|   Back            15.03.2014         |
|                   08:00              |
|_____|
```
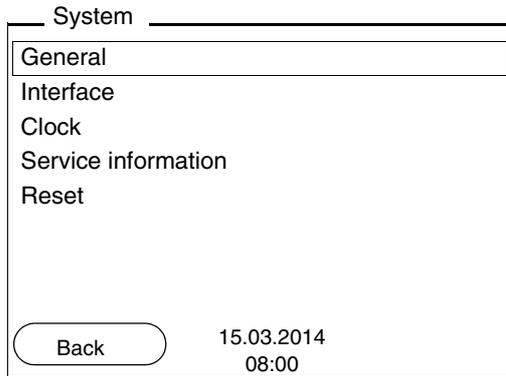
5	Select the *General* submenu with **<▲><▼>**. The current selection is displayed with a frame.
6	Open the *General* submenu with **<OK>**.

```
 ____ General _____
| Language:                    Deutsch |
| Beep:                            Off |
| Illumination:                     On |
| Contrast:                       48 % |
| Switchoff time:               30 min |
|                                      |
|                                      |
|                                      |
|   Back            15.03.2014         |
|                   08:00              |
|_____|
```
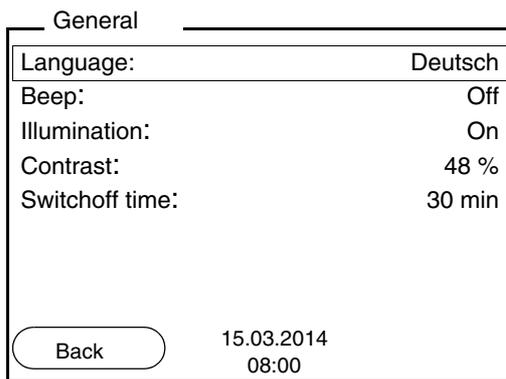
7	Open the setting mode for the *Language* with **<OK>**.

```
 ____ General _____
| Language:                    Deutsch |
| Beep:                            Off |
| Illumination:                     On |
| Contrast:                       48 % |
| Switchoff time:               30 min |
|                                      |
|                                      |
|                                      |
|   Back            15.03.2014         |
|                   08:00              |
|_____|
```
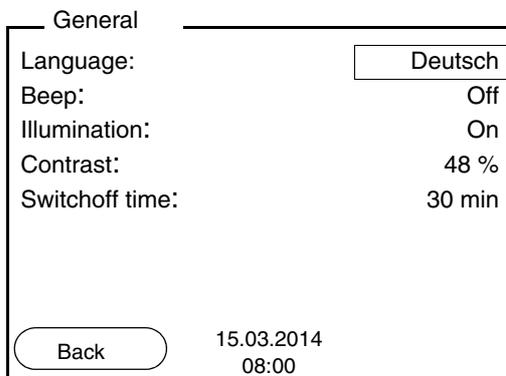
8	Select the required language with **<▲><▼>**.

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

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: Using **<F1___>**/*[Menu]*, open the *Storage & config* menu. The instrument is in the setting mode.
2	Select and confirm the *System* / *Clock* menu with **<▲><▼>** and **<OK>**. The setting menu for the date and time opens up.
3	Select and confirm the *Time* menu with **<▲><▼>** and **<OK>**. The hours are highlighted.

```
        Clock
Date format:                    dd.mm.yyyy
Date:                           15.03.2014
Time:                             14:53:40



    Back            15.03.2014
                      08:00
```

4	Change and confirm the setting with **<▲><▼>** and **<OK>**. The minutes are highlighted.
5	Change and confirm the setting with **<▲><▼>** and **<OK>**. The seconds are highlighted.
6	Change and confirm the setting with **<▲><▼>** and **<OK>**. 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 **<F1>**/[Back]. or Switch to the measured value display with **<MODE>**. 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 con-
dition

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
System / *General* / *Language*	*Deutsch* *English* (more)	Selects the menu lan- guage
System / *General* / *Beep*	*On* *Off*	Switches on/off the beep on keystroke
System / *General* / *Illumination*	*Auto* *On* *Off*	Switches the display illumi- nation on/off
System / *General* / *Contrast*	0 ... 100 %	Changes the display con- trast
System / *General* / *Switchoff time*	10 min ... 24 h	Adjusts the switch-off time
System / *Interface* / *Baud rate*	1200, 2400, 4800, 9600, 19200	Baud rate of the data inter- face

Menu item	Setting	Explanation
System / *Interface* / *Output format*	*ASCII* *CSV*	Output format for data transmission For details, see section 5.6
System / *Interface* / *Decimal separator*	*Dot (xx.x)* *Comma (xx,x)*	Decimal separator
System / *Interface* / *Output header*		Output of a header for *Output format*: *CSV*
System / *Clock*	*Time* *Date* *Date format*	Time and date settings (see section 5.2.4)
System / *Service information*		Hardware version and software version of the meter are displayed.
System / *Reset*	-	Resets the system settings to the delivery condition (see section 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 OX 4100 H 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 5.4.3).

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 Dissolved oxygen

5.4.1 General information

You can measure the following parameters:

- D.O. concentration

- D.O. saturation index ("D.O. saturation")

- D.O. partial pressure

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 D.O. sensor Oxy 11 has an integrated temperature sensor.

Preparatory activities

Perform the following preparatory activities when you want to measure:

1	Connect the D.O. sensor to the meter. The D.O. measuring screen is displayed.
2	Calibrate or check the meter with the sensor.

Note
Incorrect calibration of D.O. sensors will result in incorrect measured values. Calibrate at regular intervals.

5.4.2 Measuring

You can carry out D.O. measurements as follows:

1	Perform the preparatory activities according to section 5.4.1.
2	Immerse the D.O. sensor in the test sample.

O$_2$

7.9 mg/l

25.1 °C

[SAL]

Menu   15.03.2014 08:00   USB output
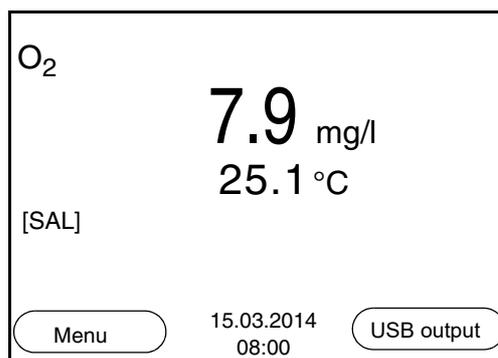
Selecting the displayed measured parameter

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

● D.O. concentration [mg/l]

● D.O. saturation [%]

● D.O. partial pressure [mbar].

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 window.

Note
You can switch the salinity correction on or off and enter the salinity in the menu for calibration and measurement settings (see section 5.4.3).

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
D.O. concentration	20 seconds	Δ : better than 0.05 mg/l
D.O. saturation	20 seconds	Δ : better than 0.6 %
D.O. partial pressure	20 seconds	Δ : Better than 1.2 mbar
Temperature	15 seconds	Δ : better than 0.5 °C

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

Hold function

1	Freeze the measured value with **<HOLD>**. The [HOLD] status indicator is displayed. The HOLD function is active.
2	Release the frozen measured value again with **<HOLD>** or **<MODE>**. The [HOLD] status display disappears. The display switches back to the previous indication.

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

Overview

The following settings are possible for D.O. sensors:

● Salinity correction

● Salinity (salinity equivalent)

● Calibration interval

● Comparison meas.

● Automatic *Stability control*

Settings

The settings are available in the menu for measurement and calibration settings. 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
Calibration / Calibration record	-	Displays the calibration record of the last calibration.
Calibration / Calibration data storage	-	Displays the last calibration records.
Calibration / Calibration interval	1 ... 999 d	*Calibration interval* for the D.O. sensor (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol in the measuring screen.
Calibration / Comparison meas.	*On* *Off*	Enables to adjust the measured value with the aid of a comparison measurement, e.g. Winkler titration. For details, see section 5.4.4.
Sal correction	*On* *Off*	Manual salt content correction for concentration measurements.
Salinity	0.0 ... 70.0	Salinity or salinity equivalent for the salt content correction. This function is only available for concentration measurements if the manual salt content correction is switched on.
Stability control	*On* *Off*	Switches on or off the automatic stability control during measurement (see section 5.3.3)
Temperature unit	°C °F	Temperature unit, degrees Celsius or degrees Fahrenheit. All temperature values are displayed with the selected unit.
Reset	-	Resets all sensor settings to the delivery condition (see section 5.8.1).

5.4.4   D.O. calibration

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.

When to calibrate?
- After connecting another D.O. sensor
- When the sensor symbol flashes (after the calibration interval has expired).

Calibration procedures   The OX 4100 H 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 factor. When the correction multiplier is active, the *[Factor]* indicator appears in the measuring window.

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 5.4.5). 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

```
OX 4100 H
Ser. no. 08502113

CALIBRATION O2
15.03.2014 08:00:33

Oxy 11
Relative slope          0.88
Temperature             25.0 °C
Sensor +++

etc...
```

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	Relative slope
	+++	S = 0.8 ... 1.25
	++	S = 0.7 ... 0.8
	+	S = 0.6 ... 0.7
Error	*Error*	S < 0.6 or S > 1.25

Eliminate the error according to
chapter 7 WHAT TO DO IF...

**Calibration in
water vapor
saturated air
(air calibration vessel)**

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

Proceed as follows to calibrate the instrument:

1	Connect the D.O. sensor to the meter.
2	Put the D.O. sensor into the air calibration vessel.

Note
The sponge in the air calibration vessel must be moist (not wet). Leave the sensor in the air calibration vessel for a time long enough to adjust.

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

O₂

0.88
25.1 °C

OxiCal

15.03.2014
08:00

4	Start the measurement with **<OK>**. 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 **<OK>**. The calibration record is displayed and output to the interface.
6	Using **<F1>**/*[Continue]* or **<OK>**, switch to the measured value display.

Calibration by means of a *Comparison meas.*

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

Note
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 **<OK>**. 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 **<OK>**. The factor that was set last is displayed.

```
O₂
        7.9 mg/l
        0.973
OxiComp


         15.03.2014
           08:00
```
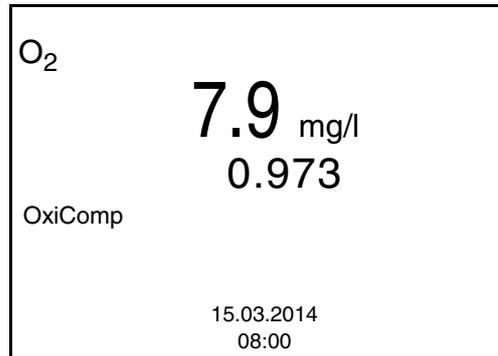
| 6 | Using **<▲ > <▼ >**, set the correction factor to adjust the displayed concentration value to the nominal value (value of the comparison measurement). Subsequently, accept the correction factor with **<OK>**. The meter switches to the measured value display. The status display *[Factor]* is active. |

5.4.5 Displaying calibration records

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

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 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
Calibration / *Calibration data storage* / *Display* or *Data storage* / *Calibration data storage* / *Display*	-	Displays the calibration record. Further options: ● Scroll through the calibration records with **<▲><▼>**. ● Output the displayed calibration record to the interface with **<F2>**/ *[USB output]*. ● Quit the display with **<F1>**/*[Back]* or **<OK>**. ● Switch directly to the measured value display with **<MODE>**.
Calibration / *Calibration data storage* / *Output to USB* or *Data storage* / *Calibration data storage* / *Output to USB*	-	Outputs the calibration records to the interface.

Example:

```
OX 4100 H
Ser. no. 08502113

CALIBRATION O2
15.03.2014 08:00:33

Oxy 11
Relative slope          0.88
Temperature             25.0 °C
Sensor +++

etc...
```

5.5   Data memory

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

● Manual storage (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 Auto-Read criterion was met while storing (stable measured value). Otherwise, the *AR* display is missing.

● Calibration evaluation: +++, ++, +, -, or no evaluation

Memory locations   The OX 4100 H meter has two measurement data memories. The measured values recorded either manually or automatic are stored separately in individual measurement data memories.

Data memory	**Maximum number of datasets**
Manual data storage	200
Automatic data storage	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 <u>shortly</u>. The menu for manual data storage appears.

```
┌─── Manual data storage 4 From 200 ───┐
│                                        │
│  15.03.2014  11:24:16                  │
│  O2 7.9 mg/l    24.8 °C  AR  +++       │
│                                        │
│                                        │
│  ID number:                         1  │
│ ┌────────────────────────────────────┐│
│ │ Continue                           ││
│ └────────────────────────────────────┘│
│  ╭──────────╮      15.03.2014          │
│  │  Back    │        08:00             │
│  ╰──────────╯                          │
└────────────────────────────────────────┘
```

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:

```
┌─── Warning ────────────────────────────┐
│                                         │
│  Data storage full. Erase?             │
│                                         │
│                                         │
│  Yes                                    │
│ ┌─────────────────────────────────────┐│
│ │ No                                  ││
│ └─────────────────────────────────────┘│
│  ╭──────────╮      15.03.2014           │
│  │  Back    │        08:00              │
│  ╰──────────╯                           │
└─────────────────────────────────────────┘
```

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. |

Automatic data storage

ID number	1
Interval	30 s
Duration	180 min

Continue

0d03h00min

Specified entire storing duration

Max. available storing duration

0   1d17h33min

Back   15.03.2014
                        08:00

Graphical display of the memory usage
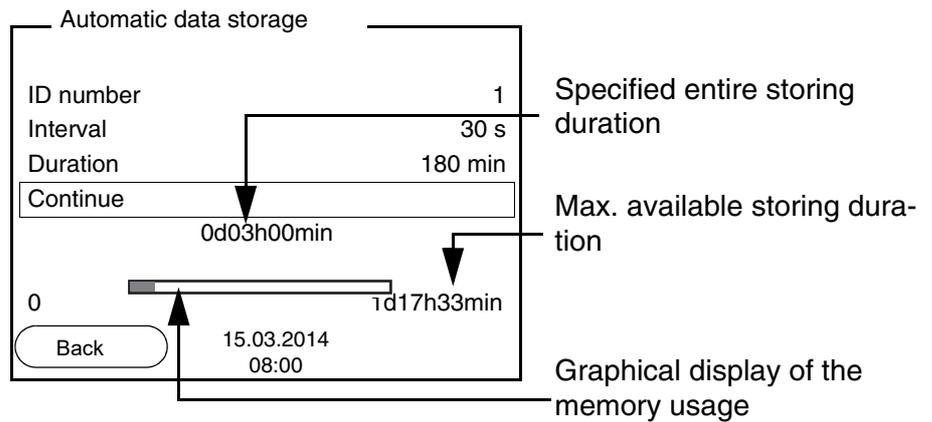
Settings   You can configure the automatic data storing function with the following settings:

Menu item	Possible setting	Explanation
ID number	1 ... 10000	ID number for the dataset series.
Interval	1 s, 5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min	Storing interval. The lower limit of the storing interval can be restricted by the number of free memory locations. The upper limit is restricted by the storing duration.

Menu item	Possible setting	Explanation
Duration	*1 min* ... x min	Storing duration. Specifies after which time the automatic data storing should be terminated.
		The lower limit of the storing duration is restricted by the storing interval. 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.

O₂ — Remaining storing duration

7.9 mg/l
25.0 °C

[SAL]
0d03h00min

— Graphical display of the storing duration

Eco mode   15.03.2014
                  08:00
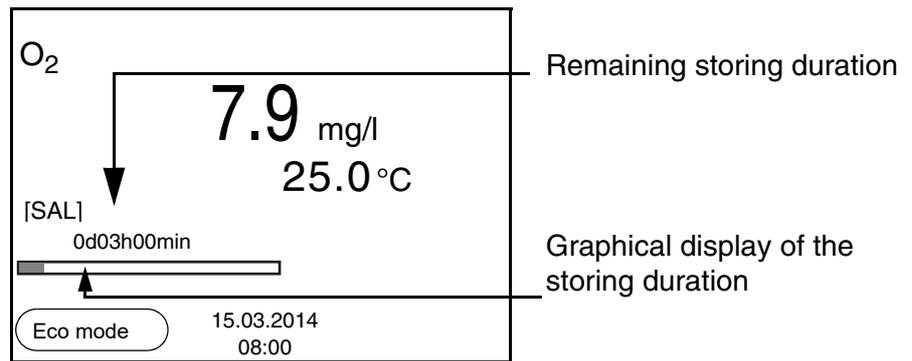
The active automatic data storing function can be recognized by the progress bar in the status line. The progress bar indicates the remaining storing duration.

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                              │
 └─────────────────────────────────┘
  ╭──────────╮      15.03.2014
  │  Back    │         08:00
  ╰──────────╯
```

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

Display presentation of a dataset

```
┌──────────────────────────────────────┐
│ Manual data storage      3 of 64   ▲  │
│                                    ▼  │
│                                       │
│ 15.03.2014  11:24:16  ID number: 1    │
│                                       │
│  O2 7.9 mg/l 25.1 °C  AR  +++         │
│  Sal 6.5                              │
│                                       │
│                                       │
│  ⟨  Back  ⟩        15.03.2014         │
│                       08:00           │
└──────────────────────────────────────┘
```
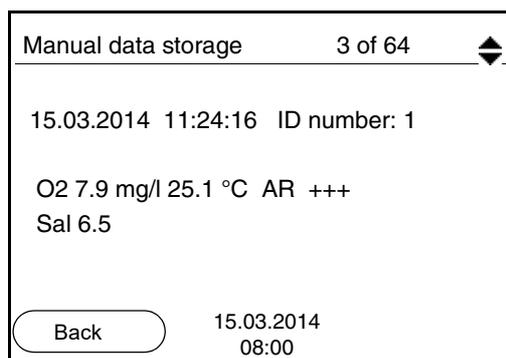
Example

```
15.03.2014 09:27:20
OX 4100 H
Ser. Nr. 12345678

ID number 1
O2                      7.9 mg/l
Temperature             25.0 °C  AR  +++
Sal                     6.5
_____

15.03.2014 09:56:24
OX 4100 H
Ser. Nr. 12345678

ID number 1
```

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 D.O. sensors	Manual	• With **<F2>**/*[USB output]*. • Simultaneously with every manual storing process (see section 5.5.1).
	Automatic, at intervals	• With **<F2__>**/*[USB output]*. Then you can set the transmission interval. • Simultaneously with every automatic storing process (see section 5.5.2).
Stored measured values	Manual	• Displayed dataset with **<F2>**/*[USB output]* after calling up from the memory. • All datasets with the *Output to USB* function. For details, see section 5.5.3.
Calibration records	Manual	• Calibration record with **<F2>**/*[USB output]*. For details, see section 5.6.
	Automatic	• At the end of a calibration procedure.

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 OX 4100 H to the PC via the USB interface.

Attention
The USB interface is not galvanically isolated.
When a grounded PC is connected, measurements cannot be per-
formed 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. Follow the Windows installation instructions as necessary.
3	Connect the OX 4100 H to the PC via the USB interface. The meter is listed as a virtual COM interface among the con- nections in the Windows instrument manager.

5.7   MultiLab Importer

With the aid of the MultiLab Importer software, you can record and eval-
uate 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 D.O. measurements are reset to the default settings with the *Reset* function:

Setting	Default settings
Cal. interval	14 d
Measured parameter	D.O. concentration
Relative slope (S_{Rel})	1,00
Salinity (value)	0,0
Salinity (function)	Off
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, display the required parameter in the measured value display and press the **<F1>**/[Menu] or **<OK>** key.

5.8.2   Resetting the system settings

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

Setting	Default settings
Language	English
Beep	On
Baud rate	4800 Baud
Output format	ASCII
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 D.O. sensors for instructions on maintenance.

6.1.1   Replacing the batteries
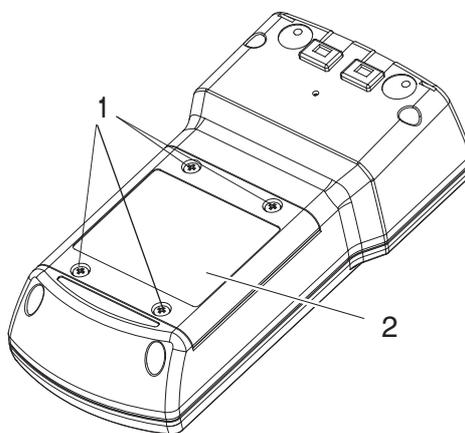
1	Unscrew the screws (1) on the underside of the meter.
2	Open the battery compartment (2) on the underside of the meter.
3	Remove the batteries from the battery compartment.

Caution
Make sure that the poles of the batteries are positioned correctly. The ± signs on the batteries must correspond to the ± 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.

4	Place four batteries (type Mignon AA) in the battery compartment.
5	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

Measuring cells	Order no. (Catalogue No.)	
	EU	**NA**
pHenomenal OXY 11 OXYGEN SENSOR PHENOMENAL 3M 8 PIN	664-0042	76470-820

Accessories	EU	NA
COMMUNICATION KIT (CD-ROM, USB cable, Manual)	662-1225	76470-840
MAINTENANCE KIT OXYGEN	664-0049	76460-466

7   What to do if...

Error message,
OFL

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

Error message,
Error

Cause	Remedy
– D.O. sensor contaminated	– Clean D.O. sensor and replace it if necessary

Sensor symbol flashes

Cause	Remedy
– Calibration interval expired	– Recalibrate the measuring system

Display

Cause	Remedy
– Batteries almost empty	– Replace the batteries (see section 6.1 MAINTENANCE)

Meter does not react to keystroke

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

You want to know which software version is in the meter

Cause	Remedy
– E.g., a question by the service department	– Switch on the meter. Open the menu, **<F1___>** / [Menu] / *Storage & config* / *SystemService information*. The instrument data are displayed.

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 OX 4100 H 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 OX 4100 H).

Program installation

1	Install the downloaded firmware update on a PC. An update folder is created in the Windows start menu. If an update folder already exists for the meter (or meter type), the new data is displayed there.

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 OX 4100 H to a USB interface (virtual COM port) of the PC.
4	Switch on the OX 4100 H.
5	In the firmware update program, start the update process with OK.
6	Follow the instructions of the firmware update program. During the programming process, a corresponding message and a progress bar (in %) are displayed. The programming process takes approx. three minutes. A terminatory message is displayed after a successful programming process. The firmware update is completed.
7	Disconnect the OX 4100 H from the PC. The OX 4100 H 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 page 49).

9   Lists

This chapter provides additional information and orientation aids.

Specialist terms   The glossary briefly explains the meaning of the specialist terms. How-
                            ever, 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).

D.O. partial pressure   Pressure caused by the oxygen in a gas mixture or liquid.

D.O. saturation   Short name for the relative D.O. saturation.

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).

OxiCal®   Procedure to calibrate D.O. measuring systems in water vapor satu-
                   rated air.

Reset   Restoring the original condition of all settings of a measuring system.

Resolution   Smallest difference between two measured values that can be
                      displayed by a meter.

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.
Slope (relative)	Relation of the slope value to the value of a theoretical reference snesor of the same construction type.
Stability control	Function to control the measured value stability.
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.

Index

10   Technical service

Web resources

Visit the VWR website at www.vwr.com for:

● Complete technical service contact information

● Access to VWR's Online Catalogue, and information about accesso-
ries and related products

● Additional product information and special offers

Contact us:
For information or technical assistance contact your local VWR repre-
sentative or visit www.vwr.com.

11   Warranty

VWR 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 misapplica-
tion, 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.

Items being returned must be insured by the customer against possible
damage or loss. This warranty shall be limited to the aforementioned
remedies. IT IS EXPRESSLY AGREED THAT THIS WARRANTY
WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU
OF THE WARRANTY OF MERCHANTABILITY.

12   Compliance with local laws and regula-
tions

The customer is responsible for applying for and obtaining the neces-
sary regulatory approvals or other authorizations necessary to run or
use the product in its local environment. VWR will not be held liable for
any related omission or for not obtaining the required approval or
authorization, unless any refusal is due to a defect of the product.

Local VWR offices in Europe and Asia Pacific

Austria
VWR International GmbH
Graumanngasse 7
1150 Vienna
Tel.: +43 01 97 002 0
info.at@vwr.com

Belgium
VWR International BV
Researchpark Haasrode 2020
Geldenaaksebaan 464
3001 Leuven
Tel.: +32 016 385 011
vwr.be@vwr.com

Canada
VWR International
2360 Argentia Road
Mississauga, Ontario L5N 5Z7
Tel.: +1 800 932 5000
Canada_Orders@vwr.com

China
VWR (Shanghai) Co., Ltd
Bld.No.1, No.3728 Jinke Rd,
Pudong New District
Shanghai 200123- China
Tel.:+400 821 8006
info_china@vwr.com

Czech Republic
VWR International s. r. o.
Veetee Business Park
Pražská 442
CZ - 281 67 Stríbrná Skalice
Tel.: +420 321 570 321
info.cz@vwr.com

Denmark
VWR International A/S
Tobaksvejen 21
2860 Søborg
Tel.: +45 43 86 87 88
info.dk@vwr.com

Finland
VWR International Oy
Valimotie 9
00380 Helsinki
Tel.:+358 09 80 45 51
info.fi@vwr.com

France
VWR International S.A.S.
Le Périgares – Bâtiment B
201, rue Carnot
94126 Fontenay-sous-Bois cedex
Tel.: 0 825 02 30 30* (national)
Tel.: +33 (0) 1 45 14 85 00 (international)
info.fr@vwr.com
* 0,18 € TTC/ min + prix appel

Germany
VWR International GmbH
Hilpertstraße 20a
D - 64295 Darmstadt
Tel.: 0800 702 00 07* (national)
Tel.: +49 (0) 6151 3972 0 (international)
info.de@vwr.com
*Freecall

Hungary
VWR International Kft.
Simon László u. 4.
4034 Debrecen
Tel.: +36 (52) 521-130
info.hu@vwr.com

India
Avantor Performance Materials India Limited
17th Floor, Building No. 5, Tower C
DLF Cyber City Phase – III
Gurgaon - 122002, Haryana
Tel.: +91-1244-65-6700
help@avantorinc.com

Ireland
VWR International Ltd
International (Northern Ireland) Ltd
Northwest Business Park
Ballycoolin
Dublin 15
Tel.: +353 01 88 22 222
sales.ie@vwr.com

Italy
VWR International S.r.l.
Via San Giusto 85
20153 Milano (MI)
Tel.: +39 02-3320311
info.it@vwr.com

Korea
VWR International ~
17, Daehak 4-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do
Tel.: +82 31 645 7256
saleskorea@avantorsciences.com

The Netherlands
VWR International B.V.
Postbus 8198
1005 AD Amsterdam
Tel.: +31 020 4808 400
info.nl@vwr.com

Mexico
VWR International, S.de R.L. de C.V.
Km. 14.5 Carretera
Tlalnepantla-Cuautitlán
Col. Lechería
Tultitlán Edo. de México
CP 54940
Tel.: +52 (55) 5005 0100
vwrmx@vwr.com

Middle East & Africa
VWR International FZ-LLC
DSP Laboratory Complex
125, Floor 01
Dubai, United Arab Emirates
Tel.: +971 4 5573271
info.mea@vwr.com

Norway
VWR International AS
Brynsalleen 4
0667 Oslo
Tel.: +47 22 90 00 00
info.no@vwr.com

Poland
VWR International Sp. z o.o.
Limbowa 5
80-175 Gdansk
Tel.: +48 58 32 38 200
info.pl@vwr.com

Portugal
VWR International –
Material de Laboratório, Lda
Centro Empresarial de Alfragide
Rua da Indústria, nº 6
2610-088 Amadora
Tel.: +351 21 3600 770
info.pt@vwr.com

Singapore
VWR Singapore Pte Ltd
18 Gul Drive
Singapore 629468
Tel: +65 6505 0760
sales.sg@vwr.com

Spain
VWR International Eurolab S.L.U.
C/ Tecnología 5-17
A-7 Llinars Park
08450 - Llinars del Vallès
Barcelona
Tel.: +34 902 222 897
info.es@vwr.com

Sweden
VWR International AB
Fagerstagatan 18a
163 94 Stockholm
Tel.: +46 (0) 8 621 34 00
kundservice.se@vwr.com

Switzerland
VWR International GmbH
Lerzenstrasse 16/18
8953 Dietikon
Tel.: +41 (0) 44 745 13 13
info.ch@vwr.com

UK
VWR International Ltd
Customer Service Centre
Hunter Boulevard - Magna Park
Lutterworth
Leicestershire
LE17 4XN
Tel.: +44 (0) 800 22 33 44
uksales@vwr.com

United States
VWR International, LLC
100 Matsonford Road
Building One Suite 200
Radnor, PA 19087
Tel.: +1 800 932 5000
VWRCustomerService@vwr.com