OPERATING MANUAL
ba77160e06 07/2017

Multi 3510 IDS

DIGITAL METER FOR DIGITAL IDS SENSORS (pH/ORP/D.O./COND)

WTW
a xylem brand

1 Overview

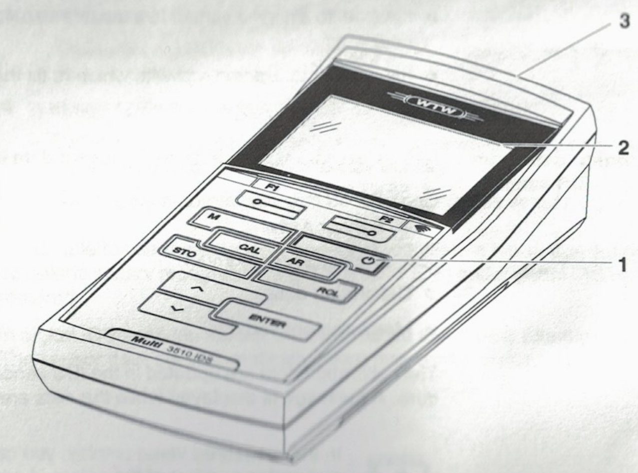
1.1 Multi 3510 IDS meter

The Multi 3510 IDS meter enables you to perform measurements (pH, U, ISE, conductivity, D.O. turbidity) quickly and reliably.

The Multi 3510 IDS provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.

The Multi 3510 IDS supports you in your work with the following functions:

- Automatic sensor recognition
- CMC (continuous measurement control)
- QSC (sensor quality control)
- Electronic access control
- Data transmission via the USB interface (USB-B).



1 Keypad
2 Display
3 Connectors

1.2 Sensors

A measuring system ready to measure consists of the Multi 3510 IDS meter and a suitable sensor.

Suitable sensors are IDS pH sensors, IDS ORP sensors, IDS conductivity sensors and IDS D.O. sensors.

Information on available IDS sensors and IDS adapters is given on the Internet .

You can also operate non-IDS sensors with the aid of an IDS adapter on the Multi 3510 IDS. The advantages of the sensor recognition, however, are not available in this case.

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
- Measurement settings

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.

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 further sensor data stored in the sensor with the [More] softkey (see section 4.1.5 SENSOR INFO, page 17).

1.2.2 Wireless operation of IDS sensors

With the aid of the adapters in the IDS WLM System, IDS sensors with plug head connectors (variant P) can be wirelessly connected to your Multi 3510 IDS.

Further information on the wireless operation of IDS sensors:

- Web resources
- Operating manual of the IDS WLM System.

1.2.3 IDS adapter for analog sensors

With the aid of an IDS adapter, you can also operate analog sensors on the Multi 3510 IDS. The combination of the IDS adapter and analog sensor behaves like an IDS sensor.
The measuring electronics with the stored adapter data are in the adapter head. The adapter data correspond to the sensor data.

Information on available IDS adapters is given on the Internet. Detailed information on the IDS adapter is given in the operating manual of the adapter.

1.2.4 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. Multi 3510 IDS) 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.

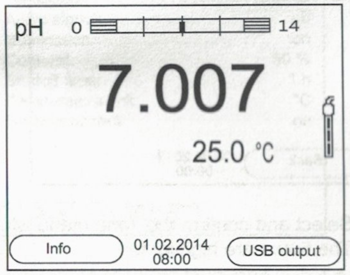
5 pH value

5.1 Measuring

5.1.1 Measuring the pH value

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 IDS pH sensor to the meter.
   The pH measuring window is displayed.
2. If necessary, select the measured parameter with **<M>**.
3. Adjust the temperature of the solutions and measure the current temperature if the measurement is made without a temperature sensor.
4. If necessary, calibrate or check the IDS pH sensor.
5. Immerse the IDS pH sensor in the test sample.



Stability control (AutoRead) & HOLD function

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

The measured parameter flashes on the display

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

You can start the *Stability control* manually at any time, irrespective of the setting for automatic *Stability control* (see section 10.6.3 AUTOMATIC STABILITY CONTROL, page 77) in the *System* menu.

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

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

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

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

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

Criteria for a stable measured value

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

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

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

5.1.2 Measuring the temperature

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

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

When operating a sensor without integrated temperature sensor, e.g. via an IDS pH adapter, you have to measure and enter the temperature of the test sample first.

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

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

5.2 pH calibration

5.2.1 Why calibrate?

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

5.2.2 When do you have to calibrate?

- Routinely within the framework of the company quality assurance
- When the calibration interval has expired

5.2.3 Carrying out automatic calibration (AutoCal)

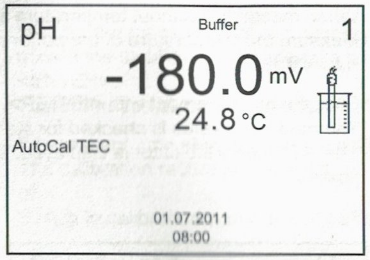
Make sure that in the sensor menu, *Buffer* menu, the buffer set is correctly selected (see section 10.1.1 SETTINGS FOR PH MEASUREMENTS, page 67).

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

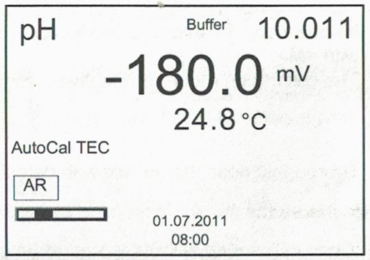
Below, calibration with Technical buffers (TEC) is described. When other buffer sets are used, other nominal buffer values are displayed. Apart from that, the procedure is identical.

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

1. Connect the pH sensor to the meter.
   The pH measuring window is displayed.
2. Keep the buffer solutions ready.
   When measuring without temperature sensor:
   Temper the buffer solutions or measure the current temperature.
3. Start the calibration with **<CAL>**.
   The calibration display for the first buffer appears (voltage display).



4. Thoroughly rinse the sensor with deionized water.
5. Immerse the sensor in the first buffer solution.
6. For measurements without temperature sensor
   (e.g. when using an IDS adapter):
   Measure the temperature of the buffer manually and enter it with **<▲><▼>**.
7. Start the measurement with **<ENTER>**.
   The measured value is checked for stability (stability control).
   The [AR] status indicator is displayed. The measured parameter flashes.



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

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

Continuing with two-point calibration

10. Thoroughly rinse the sensor with deionized water.
11. Immerse the pH sensor in buffer solution 2.

Calibration evaluation

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

Display	Calibration record	Zero point [mV]	Slope [mV/pH]
	+++	-15 ... +15	-60.5 ... -58.0
	++	-20 ... <-15 or >+15 ... +20	>-58.0 ... -57.0
	+	-25 ... <-20 or >+20 ... +25	-61.0 ... <-60.5 or >-57.0 ... -56.0
	-	-30 ... <-25 or ->+25 ... +30	-62.0 ... <-61.0 or >-56.0 ... -50.0
Clean the IDS sensor according to the sensor operating manual			
Error	*Error*	<-30 or >+30	<-62.0 or >-50.0
Error elimination (see section 14 WHAT TO DO IF..., page 91)			

For pH IDS sensors you can optionally enable a more finely graded calibration evaluation (QSC) (see section 5.2.8 QSC FUNCTION (SENSOR QUALITY CONTROL), page 38).

Calibration record (USB output)

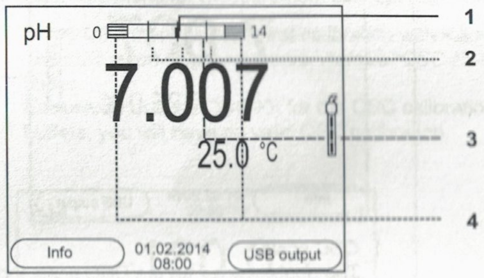
```
Multi 3510 IDS
Ser. no. 11292113

CALIBRATION pH
01.02.2014 15:55

Ser. no. 10501234
TECYSI
Buffer 1           4.01
Buffer 2           7.00
Buffer 3           10.01
Voltage 1          184.0 mV
Voltage 2          3.0 mV
Voltage 3          -177.0 mV
Temperatur 1       24.0 °C
Temperatur 2       24.0 °C
Temperatur 3       24.0 °C
Slope              -60.2 mV/pH
Asymmetry          4.0 mV
Sensor             +++

etc...
```


5.2.7 Continuous measurement control (CMC function)

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

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

The following information is displayed:



1 Currently measured pH value (needle)
2 Marking lines for all nominal buffer values used with the last valid calibration
3 Measuring range for which a valid calibration is available. Measured values in this range are suitable for documentation.
4 Measuring range for which no valid calibration is available (shaded). Measured values in this range are not suitable for documentation. Calibrate the meter with buffers covering this measuring range. If the current measured value is outside the calibrated range, this area is shaded stronger. If a measured value is outside the measuring range pH 0 - 14, overflow arrows are displayed at the left or right edge of the measuring range.

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

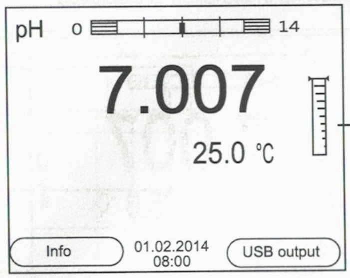
Lower limit:	Buffer with lowest pH value - 2 pH units
Upper limit:	Buffer with highest pH value + 2 pH units

5.2.8 QSC function (sensor quality control)

General information on the QSC function

The QSC function (Quality Sensor Control) is a new sensor evaluation for digital IDS sensors. It evaluates the condition of an IDS pH sensor individually and with a very fine grading.

The QSC scale shows the current sensor evaluation with an indicator on the display.



1 QSC scale
The double arrow on the QSC scale indicates the current sensor evaluation

In the USB output the sensor evaluation is given as a percentage (1-100).

The finely graded sensor evaluation of the QSC function promptly calls your attention to changes of the sensor.
Thus you can do what is necessary to restore the optimum measuring quality (e.g. clean, calibrate or replace the sensor).

Sensor evaluation with / without QSC function

With QSC function	Without QSC function (sensor symbol)
Very fine grading of the sensor evaluation (100 grades)	Rough grading of the sensor evaluation (4 grades)
The reference value is individually determined for each sensor during the QSC initial calibration.	A theoretical reference value is used for all sensors
Low tolerances for zero point and slope when using QSC buffer solutions	Greater tolerances for zero point and slope when using commercial buffer sets
Additional QSC calibration required (with special QSC buffer set)	No additional calibration required

QSC calibration

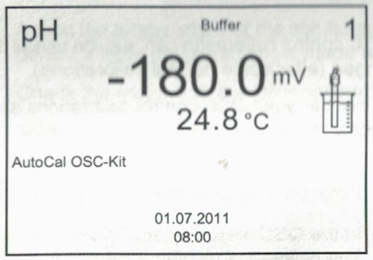
The QSC function is enabled by once carrying out an additional three-point calibration with special QSC buffer solutions. It covers the measuring range of the sensor (pH 2 to pH 11). The QSC initial calibration determines the actual condition of the sensor and stores it as a reference in the sensor.
To meet the high requirements of a QSC initial calibration, the QSC initial calibration should optimally be carried out with the initial commissioning of the sensor.

Carry out the normal calibrations for your special measuring range with your usual standard solutions as previously done.

> As soon as the QSC function was enabled for an IDS sensor, it is not possible to return to the sensor evaluation with the sensor symbol for this sensor.

Carrying out a QSC initial calibration

1. Open the menu for measurement settings with **<ENTER>**.
2. In the *QSC* menu, select *First calibration* with **<▲><▼>**.
   The calibration display appears. *AutoCal QSC-Kit* is displayed as the buffer.
   Exclusively use the QSC-Kit for the QSC calibration. If you use other buffers, you will have no valid QSC calibration.

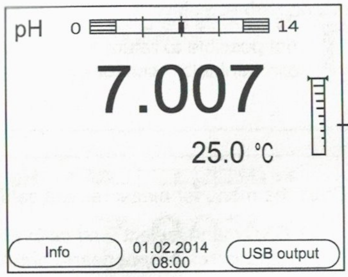


3. Calibration with the buffers of the QSC-Kit is done like a normal three-point calibration.
   Follow the user guide.

> Carry out the QSC initial calibration very carefully. It determines the reference value for the sensor. This reference value cannot be overwritten or reset.
> As soon as the QSC function was enabled, it is not possible to return to the sensor evaluation with the sensor symbol.

4. As soon as the three-point calibration has been successfully carried out you can decide whether to accept or discard the calibration as the QSC initial calibration.

The QSC initial calibration is completed. The sensor is calibrated. If you want to calibrate with special buffers for your measurements, you can subsequently carry out a normal calibration with your buffers. The reference values determined with the QSC calibration are also used for the evaluation of normal calibrations. In the measured value display, the QSC scale of the QSC function is always displayed. A double arrow on the QSC scale indicates the current sensor evaluation.



1 QSC scale
The double arrow on the QSC scale indicates the current sensor evaluation

Carrying out a QSC control calibration

A QSC control calibration can, e.g. be useful if the sensor evaluation noticeably changed (after some normal calibrations).

You can carry out QSC control calibrations at greater intervals than normal calibrations.

1. Open the menu for measurement settings with **<ENTER>**.
2. In the *QSC* menu, select *Control calibration* with **<▲><▼>**.
   The calibration display appears. *AutoCal QSC-Kit* is displayed as the buffer.
   Exclusively use the QSC-Kit for the QSC calibration. If you use other buffers, you will have no valid QSC control calibration.
3. Follow the user guide.
   The calibration is carried out like a normal three-point calibration. As soon as the three-point calibration has been successfully carried out you can decide whether to accept or discard the calibration as the QSC control calibration.

6 ORP

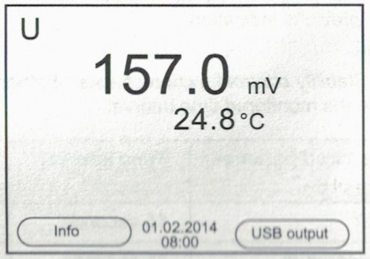
6.1 Measuring

6.1.1 Measuring the ORP

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.

IDS ORP sensors are not calibrated. However, you can check IDS ORP sensors using a test solution.

1. Connect the ORP sensor to the meter.
   The ORP measuring window is displayed.
2. Adjust the temperature of the solutions and measure the current temperature if the measurement is made without a temperature sensor.
3. Check the meter with the ORP sensor.
4. Immerse the ORP sensor in the test sample.



Stability control (AutoRead) & HOLD function

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

The measured parameter flashes on the display

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

You can start the *Stability control* manually at any time, irrespective of the setting for automatic *Stability control* (see section 10.6.3 AUTOMATIC STABILITY CONTROL, page 77) in the *System* menu.

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

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

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

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

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

Criteria for a stable measured value

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

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

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

6.1.2 Measuring the temperature

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

When operating a sensor without integrated temperature sensor, you first have to measure and enter the temperature of the sample.

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

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

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

6.2 ORP calibration

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

7 Dissolved oxygen

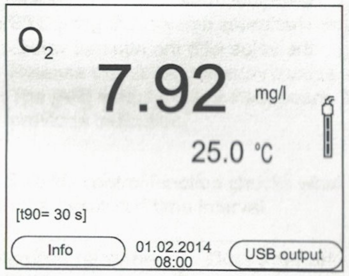
7.1 Measuring

7.1.1 Measuring D.O.

1. Connect the IDS 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 IDS 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].

Salinity correction

When measuring the D.O. concentration [mg/l] 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 10.3.1 SETTINGS FOR D.O. SENSORS (MENU FOR MEASUREMENT AND CALIBRATION SETTINGS), page 71).

Air pressure correction

The integrated air pressure sensor of the Multi 3510 IDS measures the current air pressure. The air pressure is automatically used for air pressure correction during calibrating and for the display of the oxygen saturation [%] parameter.

current air pressurewhen an IDS D.O. sensor is connected.You can view the current air pressure in the sensor menu when an IDS D.O. sensor is connected. Press the **<ENTER>** key in the measured value display. The current air pressure is displayed as an info message.

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 10.6.3 AUTOMATIC STABILITY CONTROL, page 77) 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 is output to the interface. Measurement data meeting the stability control criterion is marked by AR.

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

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

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

Measured parameter	Time interval	Stability in the time interval
D.O. concentration	20 seconds	Δ : better than 0.03 mg/l
D.O. saturation	20 seconds	Δ : better than 0.4 %
D.O. partial pressure	20 seconds	Δ : Better than 0.8 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.

7.1.2 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.

7.2 FDO® Check procedure

7.2.1 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.

7.2.2 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

7.2.3 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.

i 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, %.

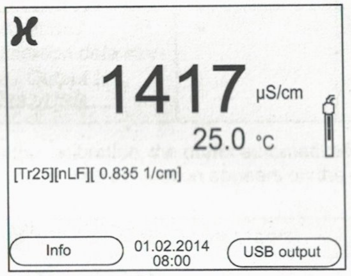
8 Conductivity

8.1 Measuring

8.1.1 Measuring the conductivity

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 conductivity sensor to the meter.
   The conductivity measuring window is displayed.
   The measuring cell and cell constant for the connected IDS conductivity sensor are automatically taken over.
2. If necessary, select the measured parameter ϰ with **<M>**.
3. Immerse the conductivity sensor in the test sample.



Selecting the displayed measured parameter

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

- Conductivity [µS/cm] / [mS/cm]
- Resistivity [Ω·cm] / [kΩ·cm] / [MΩ·cm]
- Salinity SaL [ ]
- Total dissolved solids TDS [mg/l] / [g/l]

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

Stability control (AutoRead) & HOLD function

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

The measured parameter flashes on the display

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

You can start the *Stability control* manually at any time, irrespective of the set-

ting for automatic *Stability control* (see section 10.6.3 AUTOMATIC STABILITY CONTROL, page 77) in the *System* menu.

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

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

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

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

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

Criteria for a stable measured value

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

Measured parameter	Time interval	Stability in the time interval
Conductivity ϰ	10 seconds	Δ ϰ: better than 1.0% of measured value
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.

8.1.2 Measuring the temperature

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

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

8.2 Temperature compensation

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

You can select one of the following temperature compensation methods:

- **Nonlinear temperature compensation** (***nLF***) according to EN 27 888
- **Linear temperature compensation *(Lin)*** with adjustable coefficients of 0.000 ... 3.000 %/K
- **No temperature compensation (off)**

The reference temperature and temperature compensation are set in the menu for the parameter, conductivity (see section 10.4.1 SETTINGS FOR IDS CONDUCTIVITY SENSORS, page 73).

Application tips

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

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

8.3 Calibration

8.3.1 Why calibrate?

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

8.3.2 When to calibrate?

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

8.3.3 Determining the cell constant (calibration in control standard)

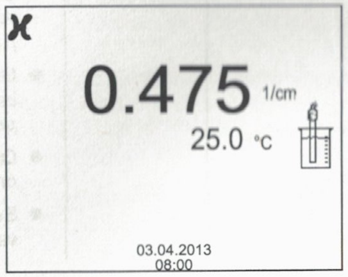
You can determine the actual cell constant of the IDS conductivity sensor by calibrating with the control standard in the following range:
0.450 cm^{-1} ... 0.500 cm^{-1} (e.g. TetraCon 925, nominal cell constant 0.475 cm^{-1})

The cell constant is determined in the control standard, 0.01 mol/l KCl.

In the delivery condition, the calibrated cell constant of the IDS sensor is set to 0.475 cm^{-1} (conductivity measuring cell, TetraCon 925).

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

1. Connect the conductivity sensor to the meter.
2. In the measured value display, select the conductivity parameter with **<M>**.
3. Start the calibration with **<CAL>**.
   The cell constant that was calibrated last is displayed.



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).
6. Set the date and time (see section 4.5.5 EXAMPLE 2 ON NAVIGATION: SETTING THE DATE AND TIME, page 24).

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.

13.2 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.

13.3 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.

13.4 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.

14 What to do if...

14.1 pH

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

Error message ***OFL, UFL***

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

Error message, ***Error***

Cause	Remedy
IDS pH sensor:	
– The values determined for zero point and slope of the pH sensor are outside the allowed limits.	– Recalibrate
– Junction contaminated	– Clean junction
– pH sensor broken	– Exchange IDS pH sensor
Buffer solutions:	
– The used buffer solutions do not agree with the set buffer set	– Set different buffer set or – Use different buffer solutions
– Buffer solutions too old	– Use only once. Note the shelf life
– Buffer solutions depleted	– Change solutions

No stable measured value

Cause	Remedy
IDS pH sensor:	
– Junction contaminated	– Clean junction
– Membrane contaminated	– Clean membrane

Cause	Remedy
Test sample:	
– pH value not stable	– Measure with air excluded if necessary
– Temperature not stable	– Adjust temperature if necessary

Cause	Remedy
IDS pH sensor + test sample:	
– Conductivity too low	– Use suitable IDS pH sensor
– Temperature too high	– Use suitable IDS pH sensor
– Organic liquids	– Use suitable IDS pH sensor

Obviously incorrect measured values

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

14.2 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 sensor

14.3 Conductivity

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 suitable IDS conductivity sensor

Error message, *Error*

Cause	Remedy
– Sensor contaminated	– Clean the sensor and replace it if necessary
– Calibration solution not suitable	– Check the calibration solutions

14.4 Turbidity

Implausible turbidity values

Cause	Remedy
– There are gas bubbles (e.g. air bubbles) in front of the measurement window	– Remove the gas bubbles, e.g. by immersing the sensor at an angle

Cause	Remedy
– Incorrect calibration,e.g.: – Unsuitable calibration standard solutions (e.g. too old) – Unsuitable calibration environment (e.g. gas bubbles, reflection, light)	– Check the calibration
– Minimum depth of immersion not observed	– Heed the minimum depth of immersion of the sensor (2 cm)

Error message, OFL

Cause	Remedy
– Measured value outside the measuring range	– Select a suitable measuring medium

Measured values too low

Cause	Remedy
– Measurement window soiled	– Clean the measurement window

Measured values too high

Cause	Remedy
– Reflection at the walls or bottom of the measuring vessel	– Keep the minimum distance of the sensor towards the walls and bottom of the measuring vessel (see section 9.1.1 MEASURING THE TURBIDITY, page 60)
– Incidence of light	– Use a light-proof measuring vessel

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

14.5 General information

Sensor symbol flashes

Cause	Remedy
– Calibration interval expired	– Recalibrate the measuring system

Cause	Remedy
– Batteries almost empty	– Replace the batteries (see section 13.1 MAINTENANCE, page 89)

Display

Instrument 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
– E. g., a question by the service department	– Switch on the meter. – Open the menu, **<ENTER_>** / *Storage & config* / *System* / *Service information*. The instrument data are displayed. or – Connect the sensor. Press softkey [**<F1>***Info***<F1>**] / [*More*] The sensor data are displayed (see section 4.1.5 SENSOR INFO, page 17)

16.2 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 Multi 3510 IDS, and the Multi 3510 IDS 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 Multi 3510 IDS).

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 Multi 3510 IDS meter.
4. Using the USB interface cable, connect the Multi 3510 IDS to a USB interface (virtual COM port) of the PC.
5. Switch on the Multi 3510 IDS.
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 Multi 3510 IDS 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 95).

17 Glossary

pH/ORP

Asymmetry see zero point

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

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

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

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

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

Slope The slope of a linear calibration function.

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

Conductivity

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

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

Reference temperature Fixed temperature value to compare temperature-dependent measured values. For conductivity measurements, the measured value is converted to a conductivity value at a reference temperature of 20 °C or 25 °C.

Resistivity, ρ Short name for the electrolytic resistivity. It corresponds to the reciprocal value of the electrical conductivity.

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.

Temperature coefficient Value of the slope α of a linear temperature function.

$$\varkappa_{T_{Ref}} = \varkappa_{Meas} * \frac{1}{1 + \alpha * (T - T_{Ref})}$$

Temperature compensation Name of a function that considers the temperature influence on the measurement and converts it accordingly. Depending on the measured parameter to be determined, the temperature compensation functions in different ways. For conductimetric measurements, the measured value is converted to a defined reference temperature. For potentiometric measurements, the slope value is adjusted to the temperature of the test sample but the measured value is not converted.

Dissolved oxygen

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".

Relation of the D.O. partial pressure in the test sample to the D.O. partial pressure of air at the current air pressure.
Example: 100% means that the test sample and the ambient air have the same D.O. partial pressure – air and test sample are balanced.

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.

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

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).

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

Measured value The measured value is the special value of a measured parameter to be determined. It is given as a combination of the numerical value and unit (e. g. 3 m; 0.5 s; 5.2 A; 373.15 K).

Molality Molality is the quantity (in Mol) of a dissolved substance in 1000 g solvent.

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

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

Stability control (AutoRead) Function to control the measured value stability.

Standard solution The standard solution is a solution where the measured value is known.
It is used to calibrate a measuring system.

Temperature function Name of a mathematical function expressing the temperature behavior of a test sample, a sensor or part of a sensor.

Test sample Designation of the test sample ready to be measured. Normally, a test sample is made by processing the original sample. The test sample and original sample are identical if the test sample was not processed.

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