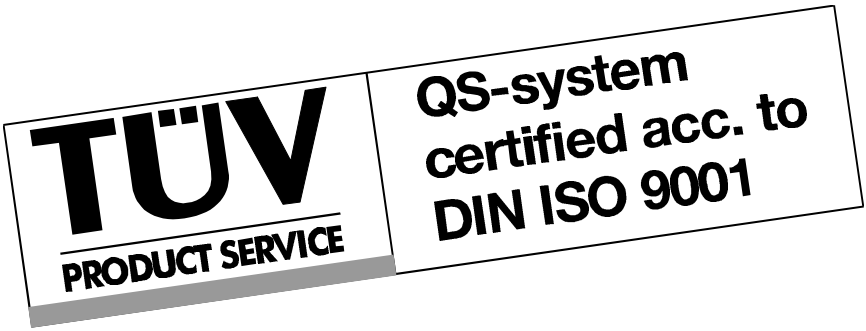
Operation manual

Multiparameter Instrument for pH/mV, dissolved oxygen and conductivity measuring technique

BA61102e

MultiLab P4


TÜV
PRODUCT SERVICE
QS-system
certified acc. to
DIN ISO 9001



These notes must be read before the instrument is put into service!

This instrument has been built and tested acc. to the German safety regulations for electronic test instruments IEC 1010,and left the factory in a technically and operationally perfect condition.

In order to maintain this condition and guarantee safe operation the user must observe the references and warning statements contained in this manual.

- Before switching on the instrument, check that the mains voltage selected matches the mains supply volts.

- Operation of the instrument is only allowed with accessories as specified in the chapter "Technical data" of this manual.
  For damages caused by using wrong accessories
  (eg.: wrong line adaptor) WTW does not guarantee.

- A correct function and operating reliability of the instrument can only be observed in climatic conditions as specified in chapter "Technical data" of this manual.

- If the instrument is brought from a cold to a warm place, an interference of the instrument function may occur by condensate. Before putting into operation the instrument, please wait until the instrument has room temperature.

  Opening of the instrument, adjustment, maintenance or repair must be carried out by qualified specialists who are aware of the dangers involved.

- If it is obvious that the instrument no longer conforms to the safety regulations then it must be put out of operation and secured against inadvertent use .

- If it is obvious that the instrument no longer conforms to the safety regulations then it must be put out of operation and secured against inadvertent use .

- The instrument no longer conforms to the safety regulations when e.g. the instrument
  - ❍ has been visually damaged,
  - ❍ no longer functions,
  - ❍ was stored for a long period under unsuitable conditions,
  - ❍ was subjected to bad transport conditions.

- In case of doubt send the instrument back to the manufacturer "Wissenschaftlich-Technische-Werkstätten GmbH" for repair or maintenance.

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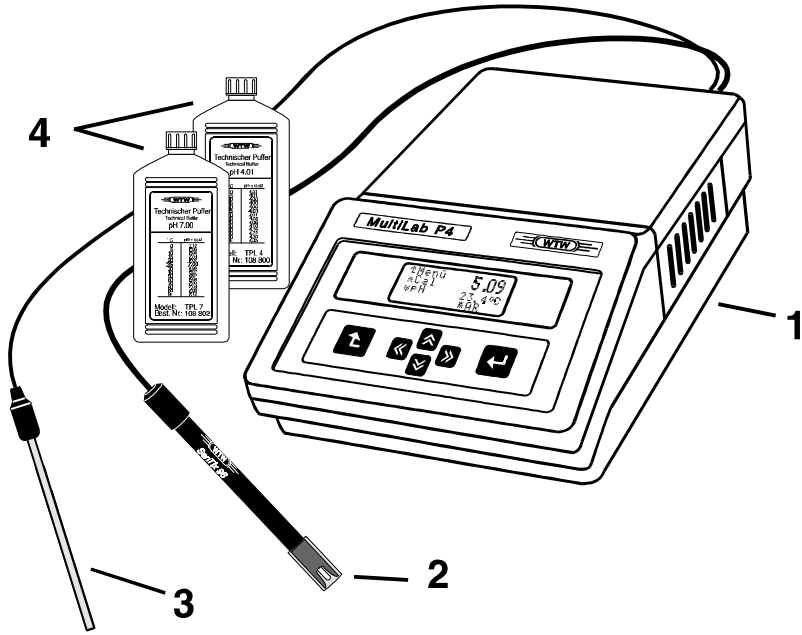
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This operation manual refers to the Software status C (20.12.95) and is subject to modifications without notice.

Recommended basic equipment for pH/ISE measurement



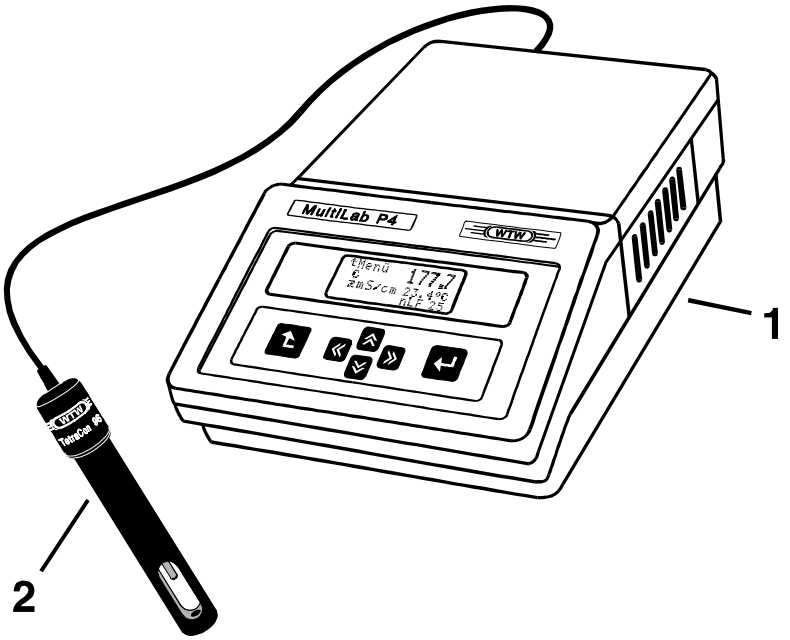
1 Multiparameter instrument MultiLab P4

2 Single or combined electrode

3 Temperature probe TFK 150

4 At least two standard buffer solutions or standard solutions

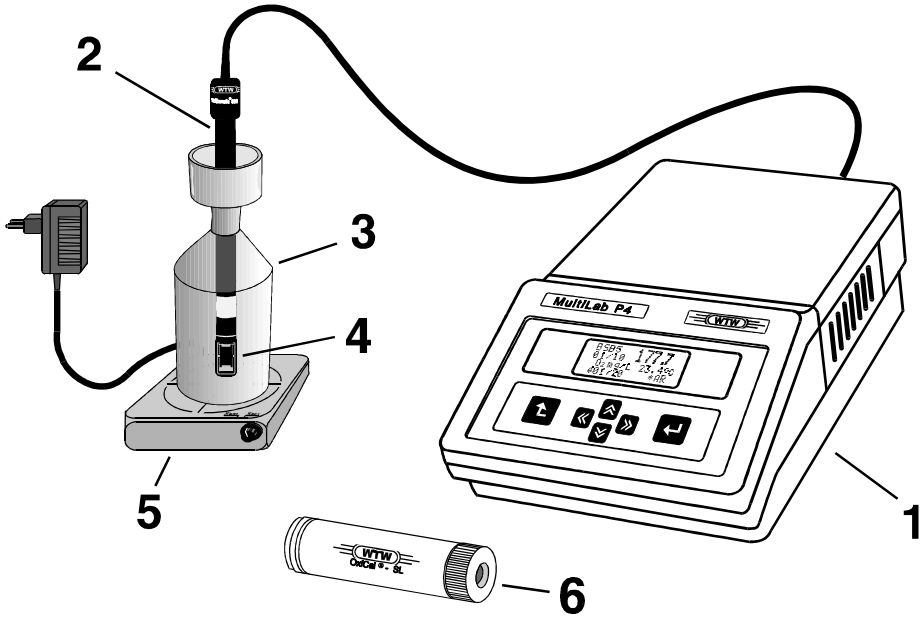
Recommended basic equipment for the conductivity measurement



1 Multiparameter instrument MultiLab P4

2 4 electrode standard measuring cell TetraCon® 96

Recommended basic equipment for the oxygen measurement



1 Multiparameter instrument MultiLab P4

2 Dissolved oxygen (D. O.) probe TriOxmatic® 300

3 Karlsruhe bottle KF 12

4 Stirring accessory RZ 300

5 Magnetic stirrer Oxi-Stirrer 300

6 Calibration beaker OxiCal® SL



Warning signs.



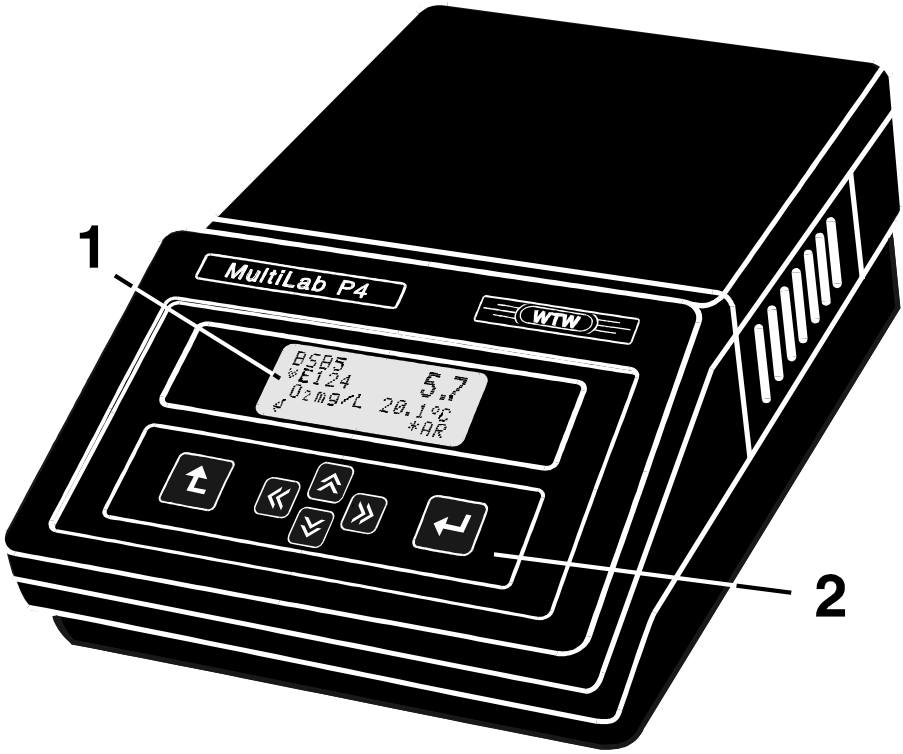
Actions of the user,
no instrument operation.

Displays in the text:

Display graphic	Signs are displayed in the MultiLab P4.
bold-cursive	Important notes, refer directly to the adjoining display.
bold	General emphasis for important information

General notes and information are framed.

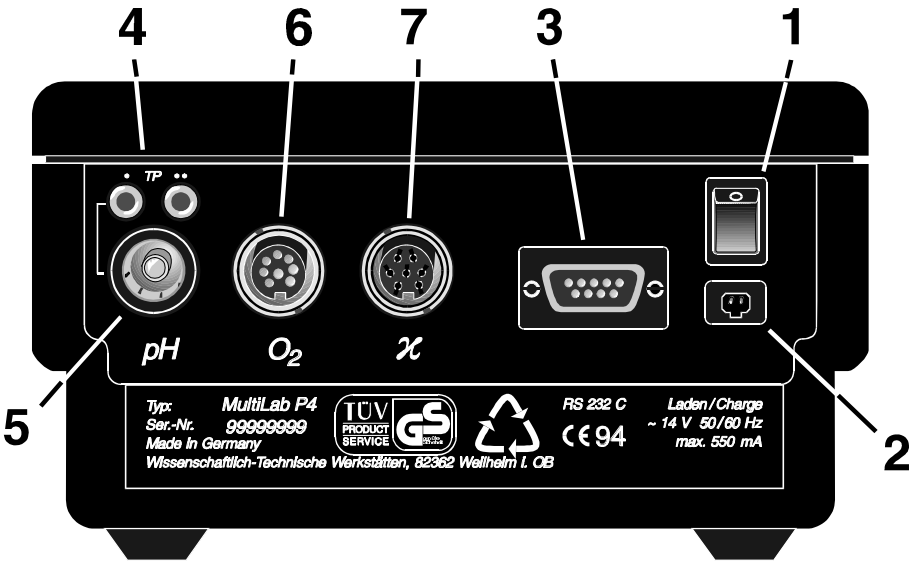
Front view



1 Display

2 Foil keyboard

Rear view



1 ON/OFF switch

2 Power supply socket for line adaptor

3 V24/RS232 C interface

4 Banana socket for temperature probe or reference electrode

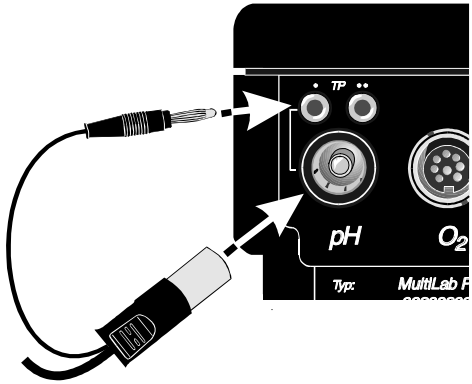
5 Socket for electrodes with plug acc. to DIN 19262

6 8 pin DIN socket for dissolved oxygen probe

7 7 pin DIN socket for conductivity measuring cell

pH electrodes

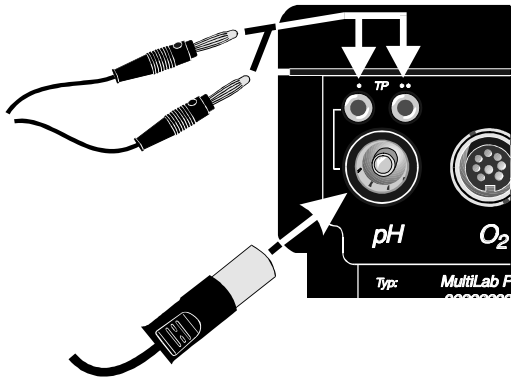
pH combined electrode with integrated temperature probe



Connect DIN plug of the **pH electrode** to the pH socket.

Connect banana plug to banana socket TP • .

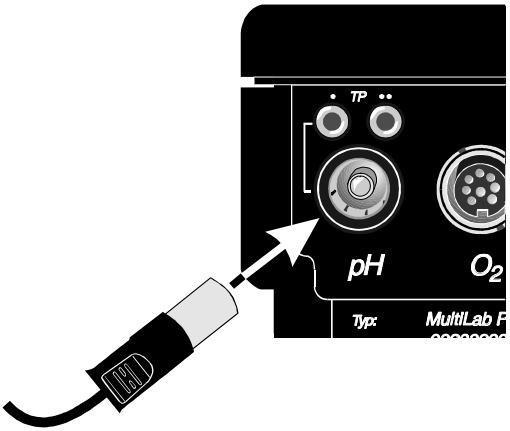
pH or Redox combined electrode with temperature probe TFK 150



Connect DIN plug of the **electrode** to the pH socket.

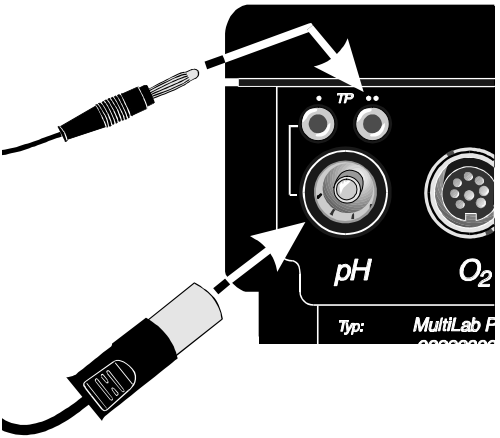
Connect banana plugs of the **temperature probe** to the banana sockets.

pH or Redox combined electrode



Connect DIN plug of the **electrode** to the pH socket.

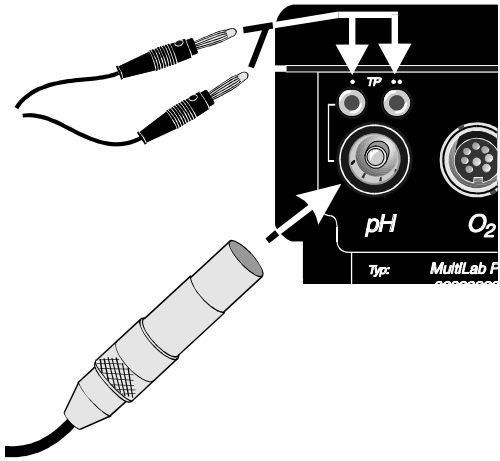
pH electrodes (pH and reference electrode)



Connect DIN plug of the **pH electrode** to the pH socket.

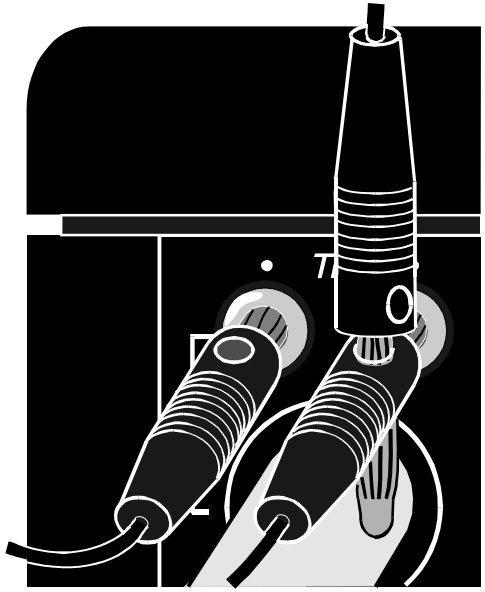
Connect banana plug of the **reference electrode** to banana socket TP ••.

Electrodes (e.g. ISE electrode) with temperature probe TFK 150



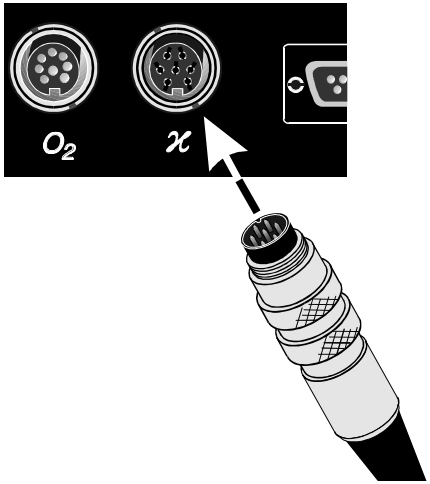
Connect DIN plug of the **measuring electrode** to the pH socket.

Connect banana plug of the **temperature probe** to the banana sockets.



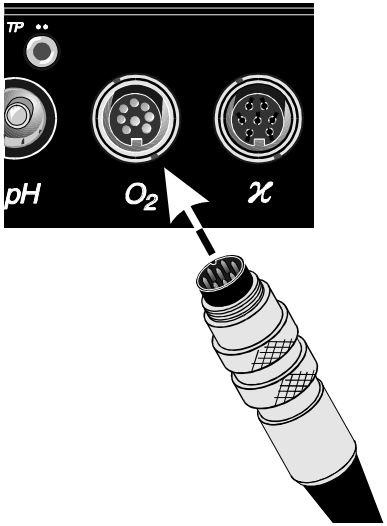
Slide banana plug of the **reference electrode** in the hole of the banana plug in socket TP ••.

Conductivity cell



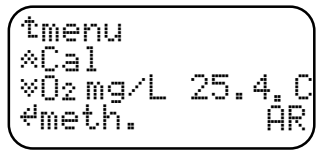
Connect plug of the **conductivity cell** to the 7 pin DIN socket and tighten.

Dissolved oxygen probe



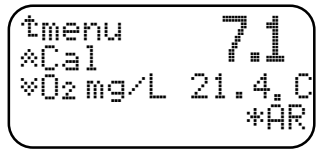
Connect plug of the **dissolved oxygen probe** to the 8 pin DIN socket and tighten.

Display (Examples of standard displays)



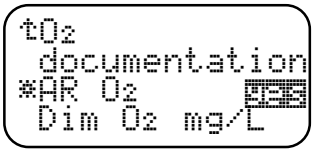
Information on
Measurement:
mg/L: Dimension.
AR: AutoRead switched on.

Information on
User guidance:
: Change to menu "Additional functions".
: Select method.
: Measurement of the selected method.
: Calibration of selected method.



Information on
test value:
7.1: Test value.
*AR: AutoRead terminated.

Information on
User guidance:
: Change to main menu.
: Determine test value of the next sample or repeat measurement.



Additional functions:
*: Function "***AutoRead O_2 yes"** preset.
Selection of other functions by depressing ↑ or ↓.
↵: Back to method.

Abbreviations in the display

F	Slope correction
Meth.	Selection of method
AR	AutoRead
TP	Temperatur probe
Ct1	Technical buffer solution 1
Ct2	Technical buffer solution 2
Cd1	DIN/NIST Buffer solution 1
Cd2	DIN/NIST Buffer solution 2
ASY	Asymmetry (ConCal)
SLO	Slope (ConCal)
C1	Concentration 1
C2	Concentration 2
S	Slope
CalDat	Calibration data
Cal	Calibration
Uasy	Asymmetry
pHasy	pH Asymmetry
dpH	Resolution pH
dmV	Resolution mV
.mV	Offset voltage
ISE F	Ion sensitive measurement Fluoride
ISE N	Ion sensitive measurement Ammonium
ISE	Ion sensitive measurement
cit	Indication form
Dim	Dimension

▓	Conductivity
Sal	Salinity
C	Cell constant
TC	Temperature coefficient
Tref	Reference temperature
nlF	Temperature function for natural water
C Cal	Determination of the cell constant
TC Cal	Determination of temperature function

Key operation



Single press of the keys:

➔ Call-up of the selected function or
➔ Changes numbers or preset adjustments by one step.



Accepts the adjustments.



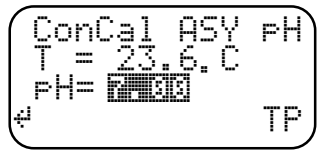
Accepts the adjustments.



Scroll mode with directional keys:
Depressing and holding scrolls all adjustable symbols or all cursor positions respectively.

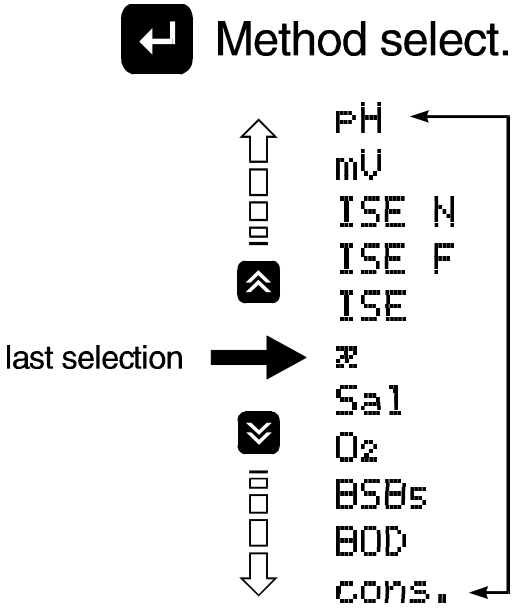
This mode is only switched on in case of the following menus:





Scroll mode for **pH** calibration procedure **ConCal**:
Setting of pH value for ASY and SLO.

Selection of method

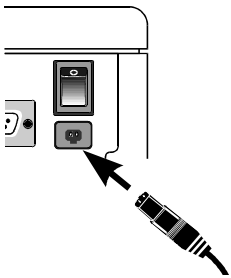


↵:Select method.
With ⁂ or ⁘ continuous scrolling of the method list.
The sequence of the methods may be selected user specific (s. chapter. "Configuration").
After switching on the instrument the last selected method is displayed.

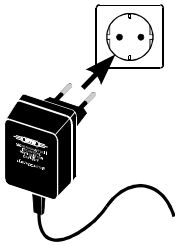
Sequence of methods may be set by the user

Mains power supply

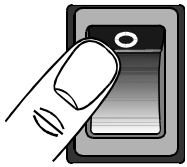
The line voltage and the working voltage indicated on the line adaptor must correspond!



Connect **line adaptor** to the **power supply socket** of the MultiLab P4.



Connect **line adaptor** to **mains socket**.



Switch on the MultiLab P4.

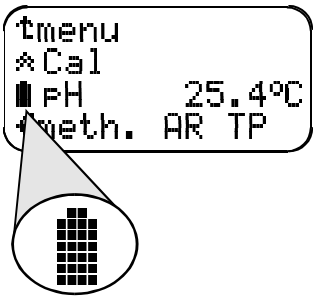
Only the pH electrode and the conductivity cell may be immersed into the same solution!
For first measurement after putting into operation the result of the test value is displayed some seconds later than during normal operation.

Accumulator charging

Charging the accumulator:
Connect line adaptor

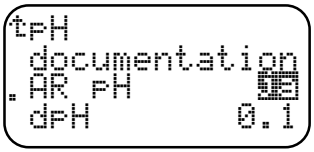
Charging time is approx. **16 hours** (**48 hours** for **first** putting into operation).
In case of no utilization the fully charged accumulator remains charged for approx.**3 months**.

A charging of the accumulator is necessary when the charging symbol is displayed, e.g.:



If this symbol is displayed the accumulator must be charged.

or

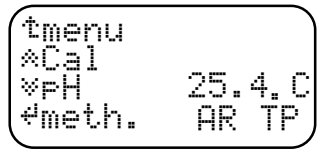


The charging symbol extinguishes approx. 3 min. after connecting the line adaptor.

Calibration with standard buffer solutions: "AutoCalTEC"

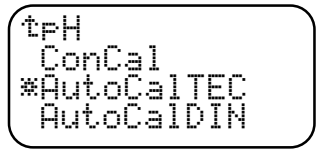


Connect pH electrode and temperature probe.



AR: Drift control for the pH measurement switched on. TP and the current temperature are only displayed when temperature probe connected.





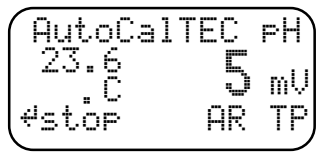
Select calibration procedure ***AutoCalTEC***.
3 calibration procedures are available.

For **AutoCalTEC** use two WTW-Technical buffer solutions , e.g. pH = 7.00 (25 °C) and pH = 4.01 (25 °C).
The data of four WTW Technical buffer solutions are stored in the meter: pH= 2.00, pH= 4.01, pH= 7.00 and pH= 10.00, all pH values at 25°C.



Immerse pH electrode and temperature probe into the **first** buffer solution.





Start measurement. Wait until ⁂ appears before AR (**Signal sound**).



Test value is "frozen".

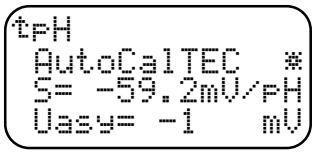


Rinse pH electrode and temperature probe and immerse into the **second** buffer solution.



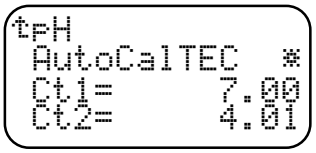


Start measurement.



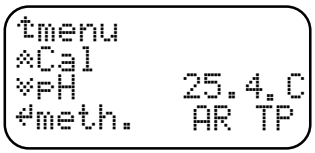
Wait until electrode data are displayed. The data are stored with date and time.





Display of the used buffers. ⁂ and ⁘ switches to-and-fro the calibration data.

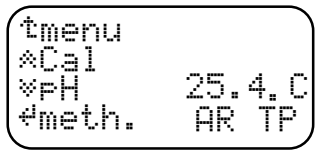




Back to pH menu.

The calibration data remain stored even if the instrument is switched off.

pH measurement with AutoRead (AR)



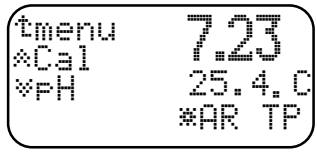


Rinse pH electrode and temperature probe and immerse into sample solution.



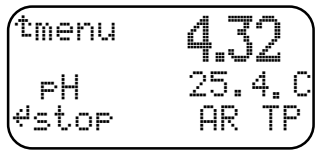


Select pH measurement. The measurement runs until a stable test value is reached (**Signal sound**).



Wait until * is displayed before AR.
The test values are "frozen".

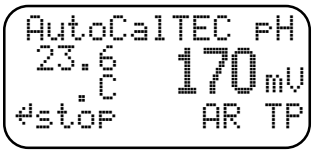




Next measurement.

Termination of measurement with AutoRead (AR) (Calibration or measurement)

Example: Calibration



Calibration is running.

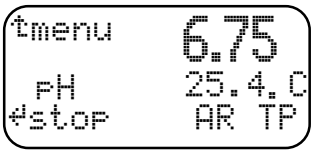




⇐

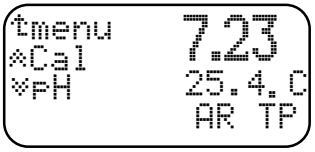
Termination of calibration: There is no ※ symbol behind AutoCal TEC, even if the calibration was terminated with <u>one</u> buffer only.

Example: pH measurement



pH measurement is running.



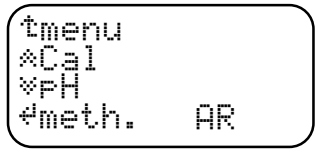


Termination of measurement, no ※ before AR.
⇐

Operation without temperature probe

The MultiLab P4 automatically recognizes whether a temperature probe is connected and displays TP and the temperature value.
If **no** temperature probe **is** connected, a temperature inquiry is **automatically** displayed before measurement of the buffer solutions.

Calibration without temperature probe





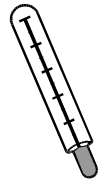


Select calibration.



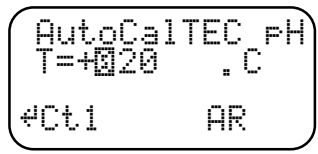
Immerse pH electrode into **first** buffer solution.





Determine temperature of sample solution.





Select input of temperature.





Enter temperature:

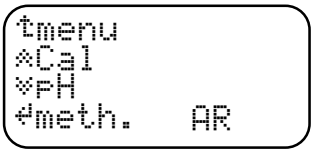
» «: Select figure.
˄ ˅: Set figure.



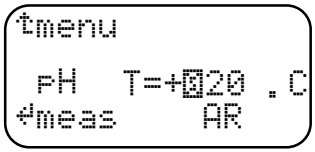


To go on: see Calibration with AutoCal TEC.

pH measurement without temperature probe





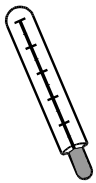


Select pH measurement without temperature probe.

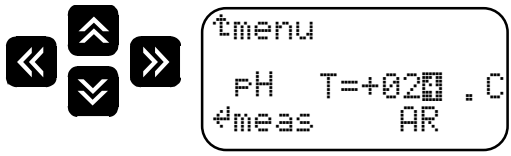


Immerse pH electrode into sample.





Determine temperature of sample solution.



Enter measured temperature value:

» «: Select figure.
^ v: Set figure.

Then: see "pH measurement with AutoRead".

Temperature compensation

Temperature dependent are:

- the slope of the electrode,
- the pH value of the sample and buffer solution
- the offset voltage of the electrode.

The temperature compensation considers the temperature influence on the slope of the pH electrode.

The pH value of measuring samples is displayed at the temperature of sample solution in conformity with DIN 38404.

The temperature dependent pH values of the 9 usable buffer solutions are stored for use with the AutoCal procedure.

The instrument requires the temperature of the buffer solution and the sample solution when calibrating or measuring pH. The temperature should be entered manually or acquired with a temperature probe.
The temperature difference between calibration and sample solution should not be more than 5K.

Further calibration functions

Summary of the calibration functions

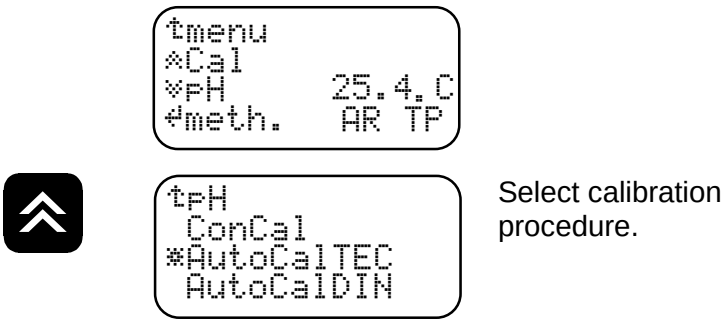
3 different calibration procedures are available:

1) **AutoCal TEC**:Calibration with two WTW technical buffer solutions

2) **AutoCal**: Calibration with two DIN/NIST buffer solutions.

3) **ConCal**: Conventional calibration with adjustment of asymmetry (Offset) at pH = 7 and slope with two buffer solutions.

AutoCal (DIN/NIST buffer solutions)



Select calibration procedure.

For AutoCal DIN use two buffer solutions acc. to DIN 19266, e.g. pH = 6.865 (25°C) and pH = 4.006 (25°C).
For the AutoCal DIN procedure the data of five DIN standard buffer solutions are stored:
pH = 1.679, pH = 4.006, pH = 6.865, pH = 9.180 and pH = 12.454 (buffer values at 25°C)



Select calibration procedure **AutoCalDIN**.



Rinse pH electrode and temperature probe and immerse into the **first** buffer solution.





Start measurement.

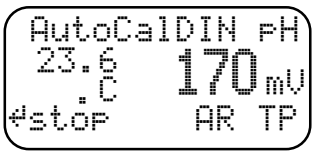


Wait until * appears before the AR. (**Signal sound**).

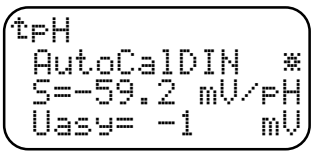


Rinse pH electrode and temperature probe and immerse into the **second** buffer solution.



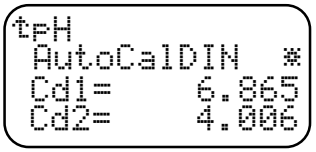


Start measurement.



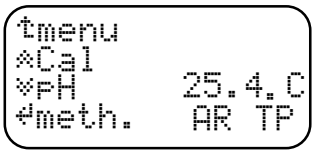
Wait until the electrode data are displayed. The data are stored with date and time.





Indication of used buffer. ⁂ and ⁘ switches to-and-fro between the calibration data.

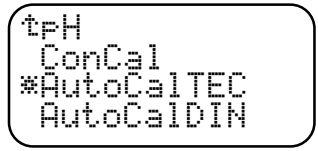




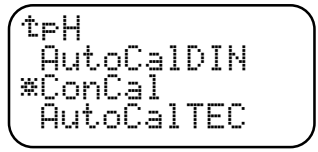
Back to pH measurement.

One and two point calibration
ConCal with two freely set buffer pH values

ConCal, the conventional calibration is done **manually**, i.e. the **drift control AR is automatically switched off**.







Select calibration procedure ***ConCal***.



Rinse pH electrode and temperature probe and immerse into a **neutral** buffer solution.





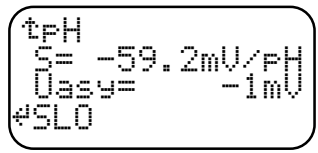
Start measurement.
Wait for stable test values.





Adjust pH value for the measured temperature.





Theoretical or last slope determined with another calibration mode and measured asymmetry.

↑: **End of the one point calibration** and back to measurement.

↵: Two point calibration: Continue calibration (see below)



Rinse pH electrode and temperature probe and immerse into **second** buffer solution.





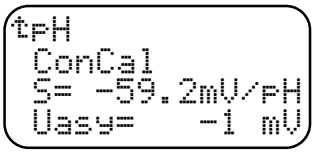
Start measurement.
Wait for stable test values.





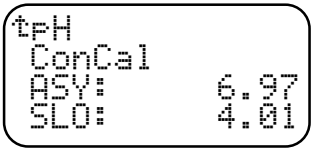
Adjust pH value for the measured temperature.





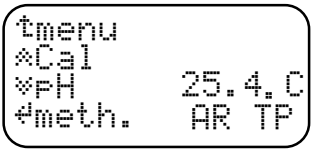
Display of electrode data.
The data are stored with date and time.





Indication of pH values of the used buffer solutions.
⇗ and ⇘ switch to-and-fro between the calibration data.





Back to pH menu.

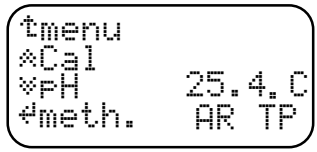
Additional functions

Switching on/off the drift control AR (AutoRead)

The drift control AR can be switched on or off for the pH measurement.
If the drift control is switched on AR is displayed.

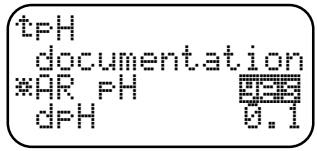
Note:
The drift control AR is separately switchable for pH and oxygen-measurement!

AutoRead AR:
Measuring period 30 s up to 10 minutes, max. drift < 0.1 mV/30s



pH menu.





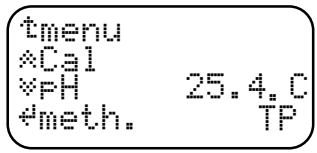
Menu "additional functions" of pH measurement:
yes: Drift control ***AR*** selected.





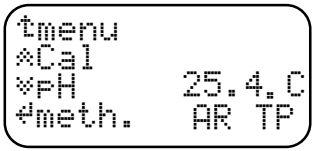
Switch off drift control.
no: Drift control ***AR*** switched off.





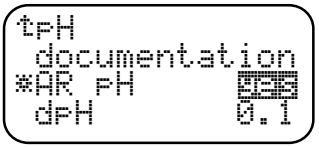
Back to pH menu.

Resolution of the pH measurement



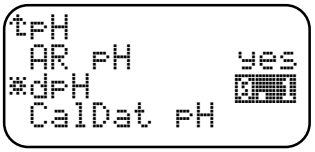
pH menu.





Select menu "Additional functions".





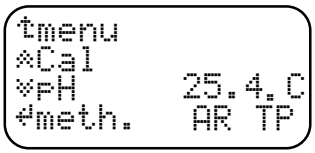
Select resolution ***dpH***.





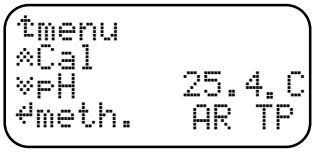
Set resolution.
Selectable: ***dpH 0.01***, ***dpH 0.1***.





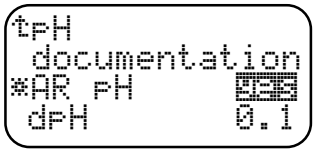
Back to pH menu.

Reading the calibration data



pH menu.





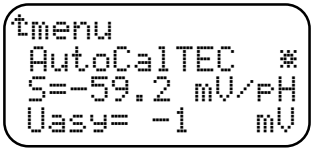
Select menu "Additional functions".





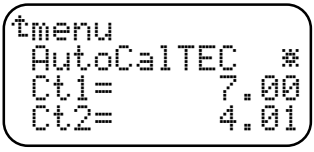
Select ***CalDat pH***.





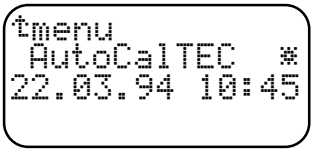
Indication of ***calibration data***.





Indication of the used ***buffer solutions***.





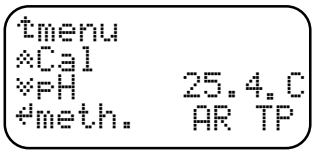
Indication of ***calibration date***.





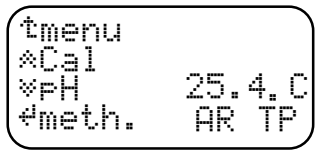
Back to menu "Additional functions".





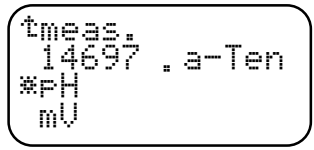
Back to pH menu.

Absolute mV measurement



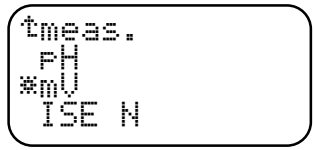
pH menu.





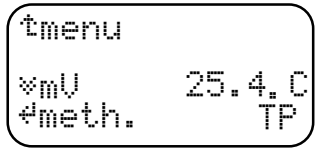
Method change.
pH measurement selected.





Select ***mV measurement***.

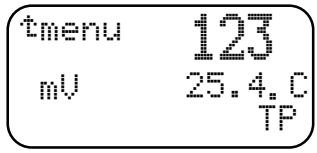




Entry to ***mV measurement***.

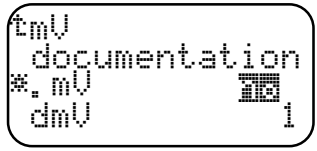
⇐ Temperature probe connected.





Start measurement.
mV measurement runs ***continuously***.



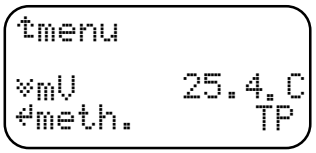


Back to menu "Additional functions of mV measurement".

Documentation of test values: refer to chapter documentation

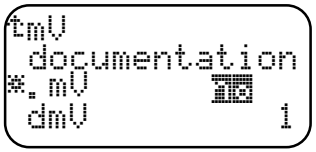
Relative mV measurement against offset voltage without temperature compensation





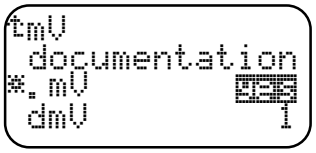
mV menu.





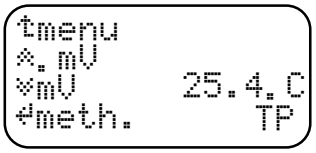
Menu "additional functions" of mV measurement: ***Offset voltage*** . mV ***no*** selected.





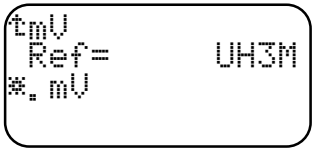
Select ***Offset voltage*** . mV ***yes***.





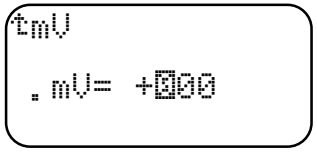
Back to mV menu.





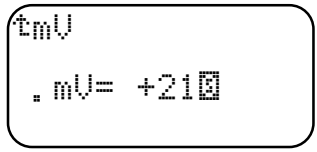
Offset voltage in the range -999 mV to +999 mV. (Standard resolution).





Select setting of offset voltage.

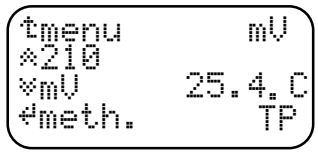




Set offset voltage.

» «: Select figure
^ v: Set figure.





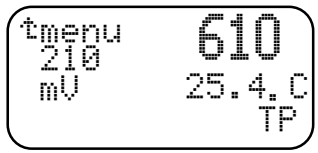
Back to mV menu.

Effect of the offset voltage:

Test value + Offset voltage = Displayed value

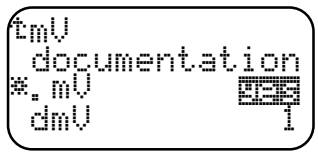
Example 1: 400 mV + 210 mV = 610 mV
Example 2:- 549 mV + 436 mV = - 113 mV





Start measurement.
Measurement runs continuously.





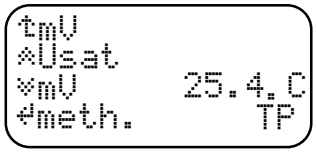
Back to menu "Additional functions of mV measurement".

Documentation of test values: refer to chapter documentation

Relative measurement against Ag/AgCl-reference electrode with temp. compensation

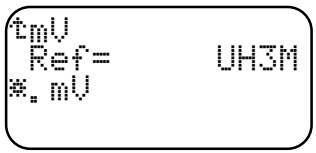
Note: Offset voltage ▪ mV ***yes*** must be selected before (see previous chapter: "Relative mV measurement against offset voltage without temperature compensation".)

Example:
Measurem. of the Redox-potential with Redox combined electrode.

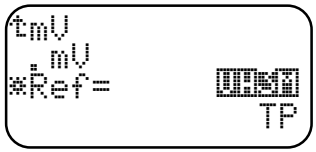


mV menu.



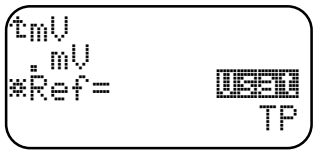






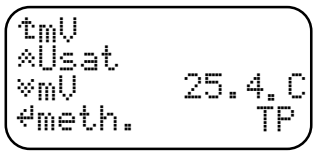
Set Ag/AgCl-reference voltage with temperature compensation and kind of electrolyte solution.





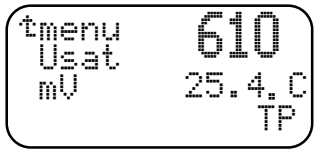
Select reference electrode.
Selection:
UH3M: 3M KCl,
UH1M: 1M KCl,
Usat: 3M KCl saturated with AgCl.





Back to mV menu.



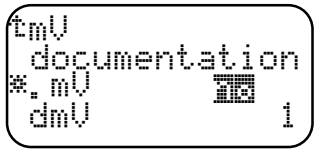


The measurement is done continuously under consideration of the temperature dependence of the used reference electrode.

When no temperature probe is connected the temperature compensation is performed after manual input of temperature!

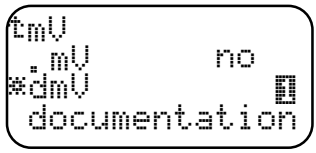
High resolution mV measurement





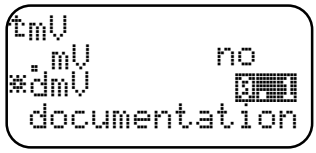
Menu "additional functions" of mV measurement: Offset voltage ***no*** selected.





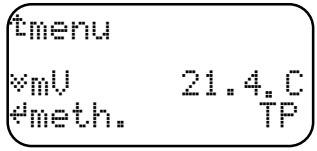
Select ***resolution*** dmV.





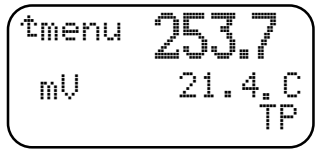
Set ***resolution.***
Selectable***: 0.1 mV***
1 mV.





Back to mV menu.



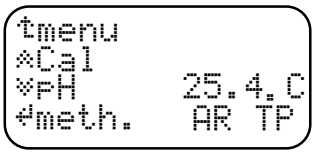


Start measurement.
The ***mV measurement*** is continuously performed with ***higher resolution***.

Calibration of the ammonium electrode*

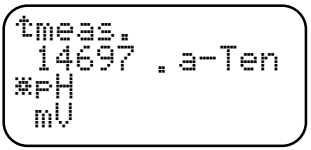
* e. g. WTW electrode NH500/2

Basic adjustment **without calibration**.
Two-point calibration **without temperature compensation**.
From two pairs of values the instrument calculates the axial intercept and the slope of the characteristcs.
Basis of the calculation is the Nernst equation U=U0+Slg(c).
The temperature difference between calibration- and sample solution should not exceed 2 K. The displayed temperature only has a control function.



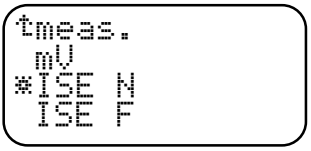
pH menu.





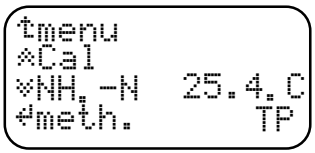
Method change.





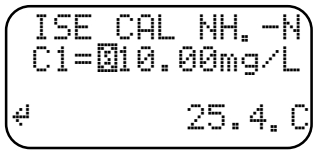
ISE N = Select ***Ammonium*** (***NH_4-N)*** measurement.





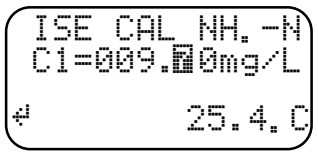
Enter ***NH_4-N*** menu.





Select calibration.



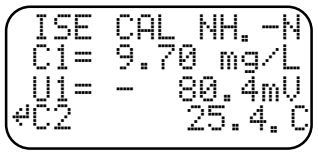


Enter concentration of the first standard solution.
» «: Select figure
^ v: Set figure.



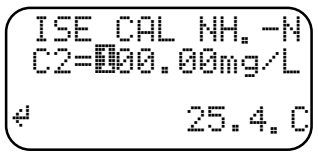
Rinse electrode and temperature probe and immerse into the **first** standard solution.





Start measurement. Wait for stable test values.



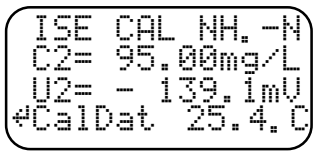


Enter concentration of the second standard solution.
» «: Select figure
^ v: Set figure.



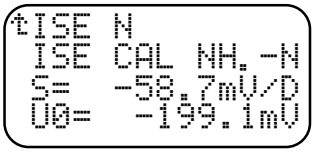
Rinse electrode and temperature probe and immerse into the **second** standard solution.





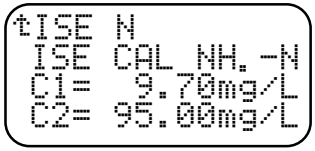
Start measurement. Wait for stable test values.





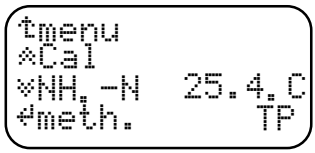
Display of ***calibration data*** which are stored with date and time.





Indication of the used ***standard solutions***.
⩓ and ⩔ switch to-and-fro between the calibration data.



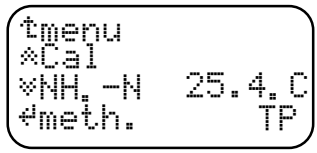


Back to ***NH_4-N*** menu.

Measurement

As standard the concentration is displayed in mg/l NH4-N or mg/l NH4.

After calibration:

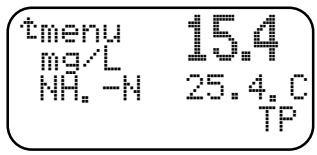


NH_4-N menu.



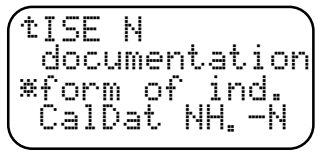
Rinse electrode and temperature probe and immerse into sample solution.





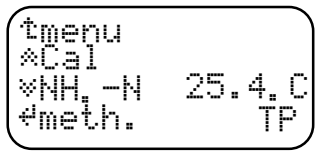
Start measurement.
NH_4-N measurement runs continuously.





Back to menu "additional functions" of the Ammonium measurement.

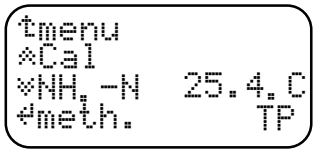




Back to ***NH_4-N*** menu.

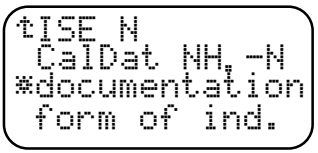
Additional functions

Adjustment of indication form



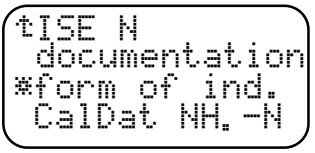
NH_4-N menu.





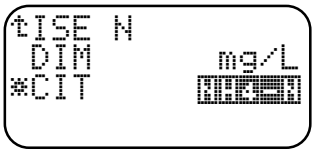
Menu "Additional functions".





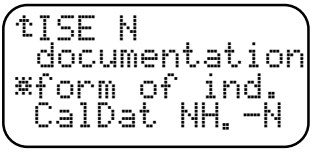
Select ***indication form***.





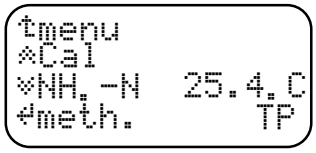
Enter menu indication form.
With » « select indication form:
NH_4 or ***NH_4-N***.





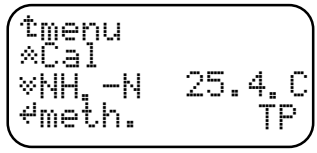
Back to menu "additional functions" of the Ammonium measurement.





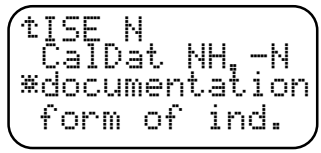
Back to ***NH_4-N*** menu.

Reading of the calibration data



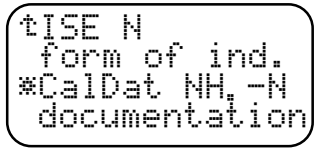
NH_4-N menu.





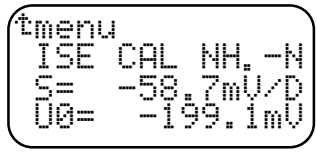
Select menu "additional functions" of the Ammonium measurement.





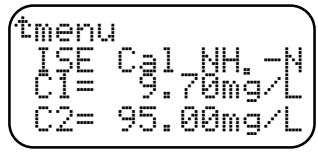
Select ***CalDat NH_4-N***.





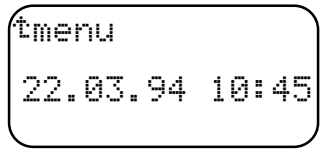
Display of calibration data ***Slope S*** and ***Axial section U0***.





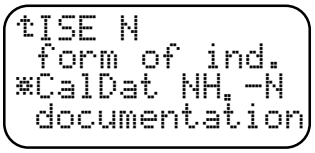
Display of the used ***standard solutions***.





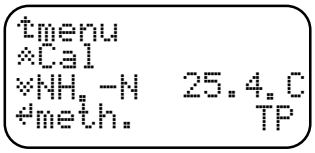
Display of ***calibration date***.





Back to menu "additional functions" of NH_4 measurement.

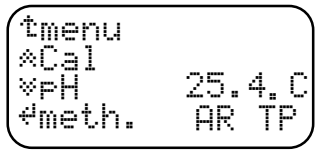




Back to ***NH_4-N*** menu.

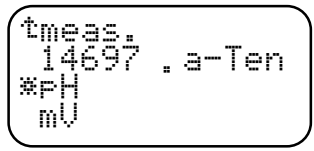
Calibration

Two-point calibration **without temperature compensation**.
From two pairs of values the instrument calculates the axial intercept and the slope.
The temperature difference between calibration and sample solution should not exceed 2 K.



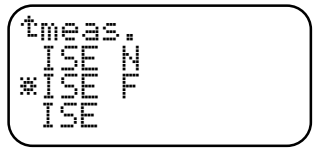
pH menu.





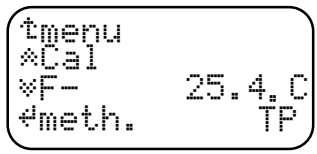
Method change.





ISE F = Select ***Fluoride*** measurement.





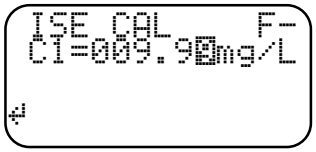
Confirm ***Fluoride*** measurement.





Select calibration.



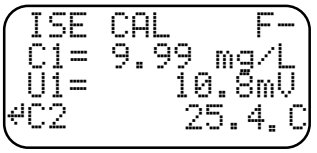


Enter the concentration of the first standard solution.
» «: Select figure
^ v: Set figure.



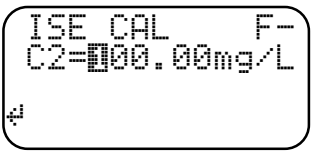
Rinse electrode and temperature probe and immerse into the **first** standard solution.





Start measurement. Wait for stable test values.



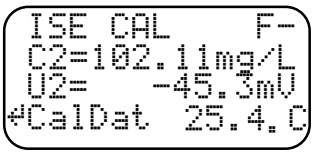


Select concentration of the second calibration standard solution.
» «: Select figure
^ v: Set figure.



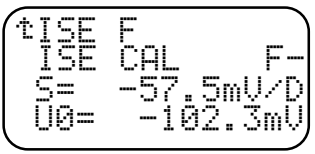
Rinse electrode and temperature probe and immerse into the **second** standard solution.





Start measurement. Wait for stable test values.





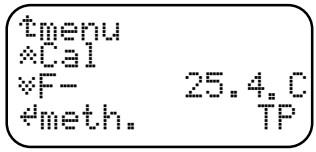
Display of ***calibration data***.





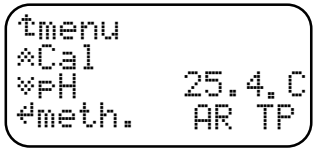
Indication of the used ***standard solutions***.
⁂ and ⁘ switch to-and-fro between the calibration data.





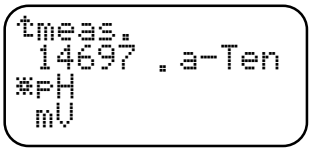
Back to fluoride menu.

Measurement



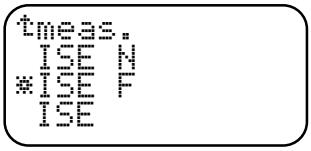
pH menu.





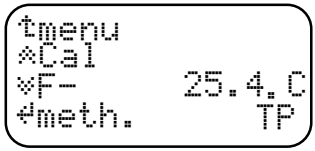
Method change.





`ISE F` = Select ***Fluoride*** measurement.



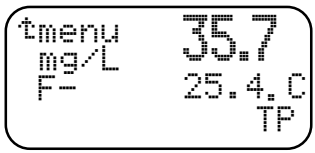


Entry to ***Fluorid*** menu.



Rinse electrode and temperature probe and immerse into sample solution.

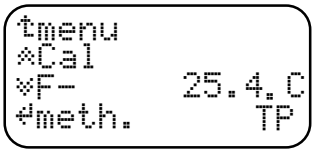




Start measurement.
Fluoride measurement runs ***continuously***.

Additional functions

Reading of the calibration data



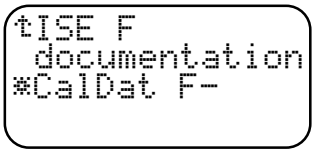
Fluoride menu.





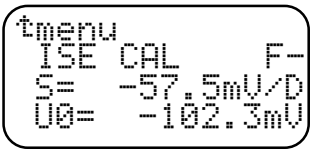
Select additional functions.





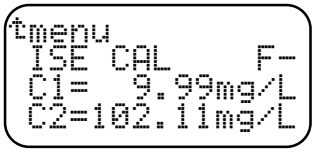
Select ***CalDat F-***.





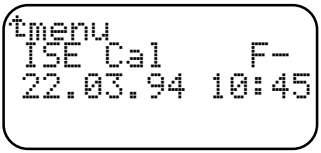
Display of ***calibration data***.





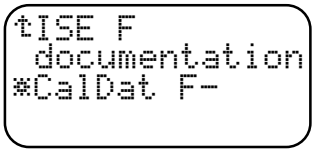
Indication of used ***standard solutions***.





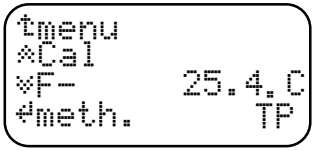
Display of ***calibration date***.





Back to menu "additional functions" of Fluoride measurement.

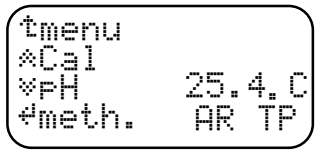




Back to fluoride menu.

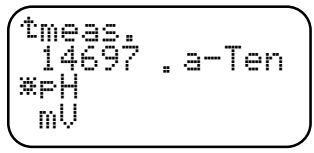
Calibration

Two-point calibration **without temperature compensation**.
From two pairs of values the instrument calculates the axial intercept and the slope of the characteristic.
The temperature difference between calibration and sample solution should not exceed 2 K.



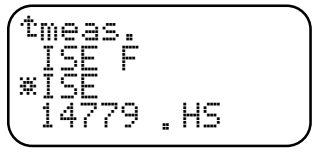
pH menu.





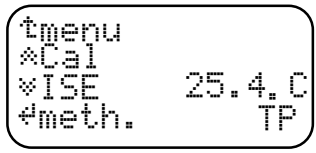
Method change.





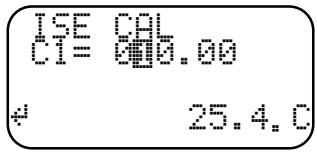
ISE = Select ***ionselective*** measurement.





Entry to ***ISE*** menu.





Select calibration.



```
ISE CAL
C1= 11.00

↵          25.4.C
```

Enter the concentration of the first calibration standard solution.
» «: Select figure
» »: Set figure.



Rinse electrode and temperature probe and immerse into the **first** standard solution.



```
ISE CAL
C1=    11.20
U1=     10.8mV
↵C2        25.4.C
```

Start measurement. Wait for stable test value.



```
ISE CAL
C2= 100.00

↵          25.4.C
```

Enter the concentration of the second calibration standard solution.
» «: Select figure
» »: Set figure.



Rinse electrode and immerse into the **second** standard solution.



```
ISE CAL
C2=   102.10
U2=    -45.3mV
↵CalDat  25.4.C
```

Start measurement. Wait for stable test value.



```
↑ISE
 ISE CAL
 S=  -57.5mV/D
 U0=  -102.3mV
```

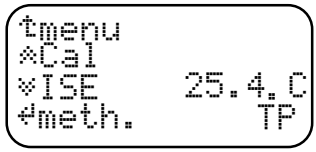
Display of ***calibration data***.



```
↑ISE
 ISE CAL
 C1=     11.20
 C2=    102.10
```

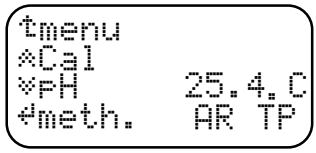
Indication of used ***standard solutions***. » and « switch to-and-fro between the calibration data.





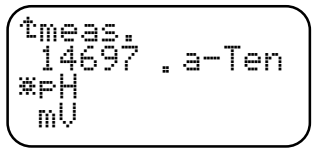
Back to ISE menu.

Any ionselective measurement



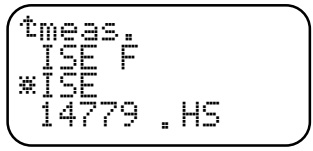
pH menu.





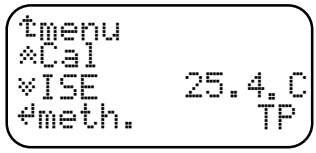
Method change.





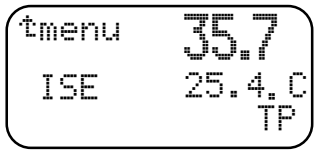
ISE = Select ***ionselective*** measurement.





Entry to the ***ISE*** menu.

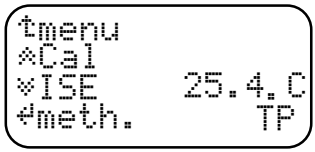




Start measurement.
ISE measurement runs ***continuously***.

Additional functions

Reading of the calibration data



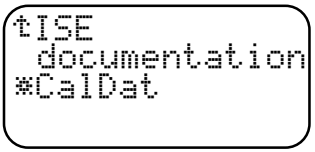
ISE menu.





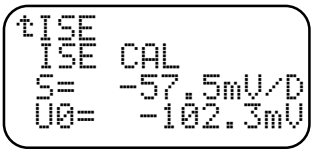
Menu "Additional functions" of ISE measurement selected.





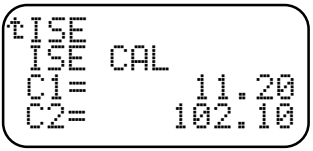
Select ***CalDat***.





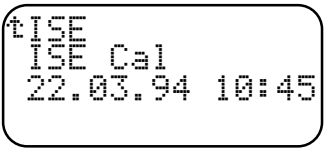
Display of the ***calibration data***.





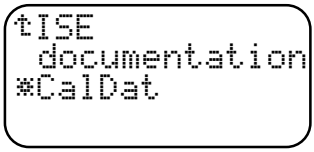
Indication of the used ***standard solutions***.





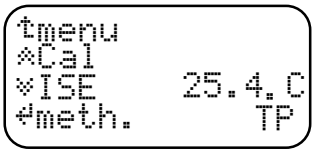
Display of the ***calibration date***.





Back to menu "additional functions".





Back to ISE measurement.

Connectable measuring cells

Recommended measuring cells:

Description	Model	O. no.
Standard conductivity meas.cell. 4-electrode measuring cell with integrated temperature probe	***TetraCon® 96***	**301 244**
Instrument meas. range	Cell constant cm^{-1}	
3 µS/cm... 300 mS/cm	0.609 $\pm$ 1.5%	

Description	Model	O. no.
Conductivity measuring cell with integrated temperature probe and flow through beaker	***LR 01/T***	**302 520**
Instrument meas. range	Cell constant cm^{-1}	
0.001 µS/cm... 300 µS/cm	0.1 $\pm$ 2%	

Description	Model	O. no.
Trace conductivity measuring cell with integrated temp.probe	***LR001/T***	**302 530**
Instrument meas. range	Cell constant cm^{-1}	
0.001 µS/cm... 30 µS/cm	0.01 $\pm$ 2%	

Description	Model	O. no.
4-electrode conductivity measuring cell, glass/platinum with integrated temp. probe	***TetraCon® L***	**301 255**
Instrument meas. range	Cell constant cm^{-1}	
50 µS/cm... 300 mS/cm	approx. 1	

Preparation

Measurement settings required:

1. **Cell constant C** (dependent on the type of the meas. cell; required after change of meas. cell).
2. **Temperature function TC** (dependent on type of measuring solution)
3. **Reference temperature: 25°C** (recommended acc. to DIN 38404 part 4)

Measurement solution type	Temperature function TC	Reference temperature
natural water (ground-, surface- and drinking water)	set nlF	to be set
distilled water	set nlF	to be set
Other aqueous solutions	determine	to be set
Salinity (seawater)	automatic nlF acc. to IOT*	automatic 20°C
non-aqueous solutions	determine	to be set

*International Oceanographic Table
(UNESCO Technical Papers in marine sciences 36)

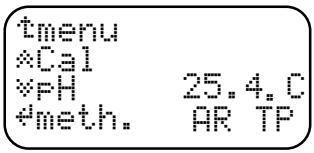
Measurement



Set the cell constant C, the temperature function TC and the reference temperature correctly first !

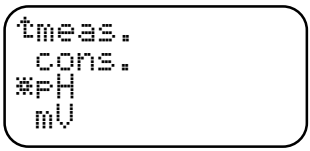


Rinse meas. cell with a part of the sample and immerse into the solution.



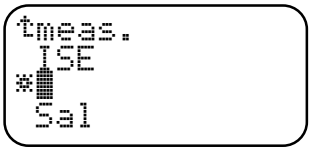
pH menu.





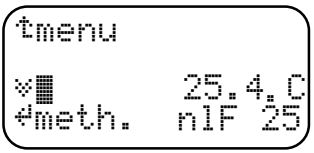
Method change.





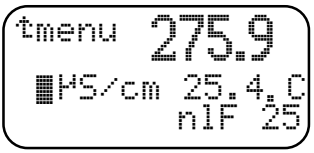
Select ***conductivity measurement.***





Menu ***conductivity measurement***.





Conductivity measurement runs ***continuously***.

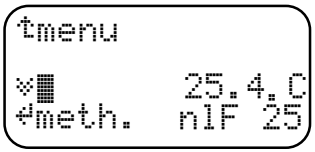
The conductivity menu comprises the following points:

1. Adjust ("**C**") or determine ("**C Cal**") **cell constant** with subsequent selection of meas. range. Only the meas. ranges which are valid for the actual cell constant are displayed.
2. Adjust **temperature function** ("**TC**") or determine ("**TC Cal**").
3. Set **reference temperature Tref**.
4. **Documentation**.

Setting of cell constant C and measuring range

Possible measuring ranges:

Measuring range	Recommended measuring cells			
	LR001/T	LR01/T	TetraCon® 96	TetraCon® L
0.000 - 3.000 µS/cm	☑	☑		
0.00 - 30.00 µS/cm	☑	☑		
0.0 - 300.0 µS/cm		☑	☑	☑
0 - 3000 µS/cm			☑	☑
0.00 - 30.00 mS/cm			☑	☑
0.0 - 300.0 mS/cm			☑	☑
0 - 70 (Salinity)			☑	☑



Method **conductivity measurement**.





Menu "additional functions" for conductivity measurement.
C: Select cell constant.





Entry to ***setting of cell constant.***

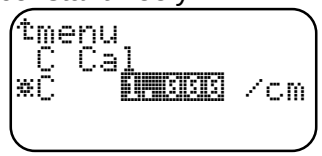




Select cell constant
Selectable are ***0.01 /cm, 0.1/cm and 1.000/cm.***

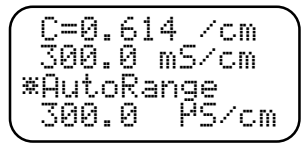
To set the cell constant freely:





Select position 1.000:
Freely adjustable cell constant. Setting range 0.500... 1.500/cm
» «: Select figure
^ v: Set figure.





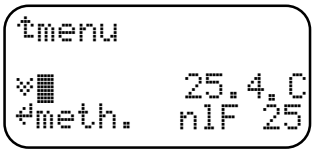
With ^ and v select:
Automatic selection of measuring range ***AutoRange*** or one of the following ***fixed measuring ranges***:
up to 300.0 µS/cm,
up to 3000 µS/cm,
up to 30.00 µS/cm,
up to 3.000 µS/cm,
up to 30.00 mS/cm,
up to 300.0 mS/cm,
up to 70 (Salinity).





Back to menu "Additional functions" of conducitivity measurement.

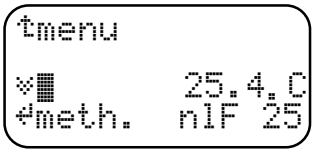




Back to conductivity menu.

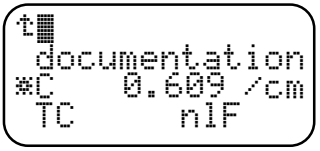
Determination of cell constant C: "C Cal"

For meas. cells with cell constant from approx. 0.5/cm to 1.5/cm.



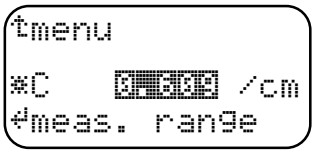
Conductivity menu.





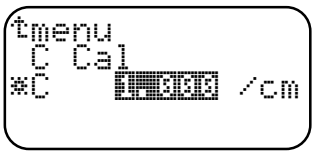
Menu "additional functions" for conductivity measurem.





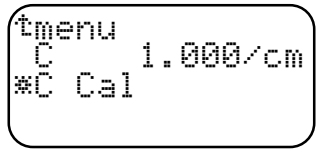
Entry to "Setting of cell constant". Pre-adjustment: ***fixed cell constant 0.609/cm***.





Select ***freely adjustable cell constant***.



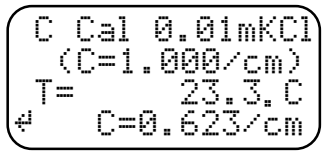


Select C Cal.



Immerse measuring cell into 0.01m KCl.

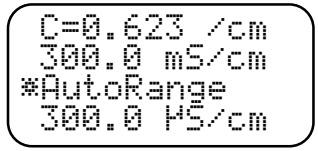




Measure.
⇐previous cell constant

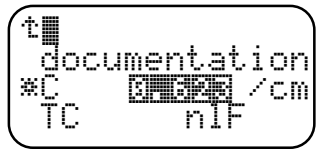
⇐***determined cell constant.***





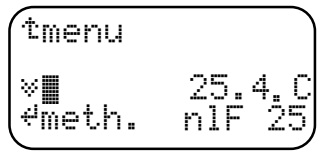
Select measuring range.
With ⩔ ⩓ select automatic selection of measuring range or fixed measuring range.





Back to menu "Additional functions".

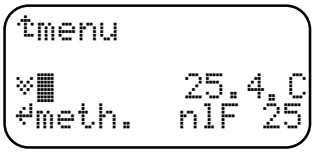




Back to conductivity menu.

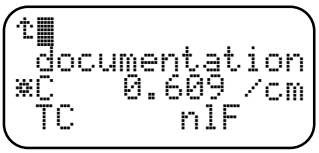
Setting of temperature function TC

Note: We recommend to use a linear temperature function for the temperature compensation only with measurements in the range of ± 10 K around the reference temperature.



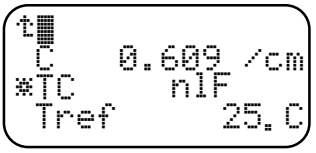
Conductivity menu.





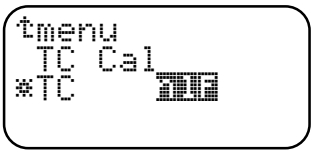
Menu "additional functions" for conductivity measurement.





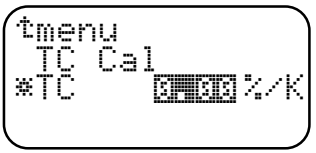
Select ***Temperature function nlF***.





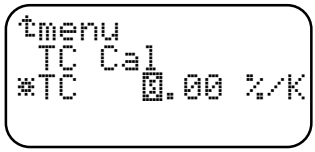
Select ***Change of temperature function***.





Select ***Linear temperature function***.





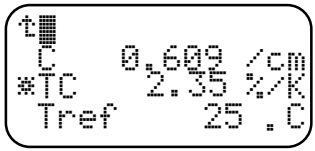
Set value.
≫ ≪: Select figure
≪ ≫: Set figure.
Setting range
0.00... 3.50 %/K





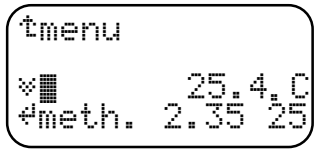
Confirm input.





Back to menu "additional functions".





Back to conductivity menu.

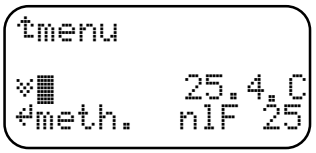
Determination of the coefficient for a linear temperature function: "TC Cal"

To determine a linear temperature function select **start and end temperature** so that

- the set reference temperature **Tref** is bracketed
- the end temperature is maximum 10 K and minimum 20 K above the start temperature.

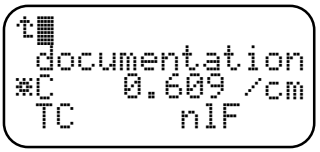


Rinse measuring cell with a part of the sample solution and immerse into the solution.
Temper sample to **temperature 1** (= set reference temperature T_{ref}).



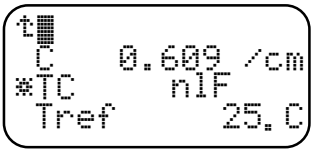
Conductivity menu.





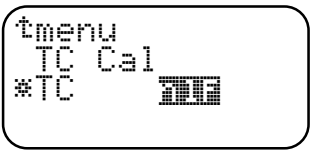
Menu"additional functions".





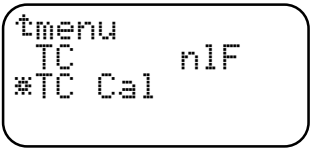
Select ***temperature function nlF***.





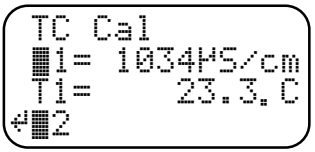
Entry to ***change of temperature function.***





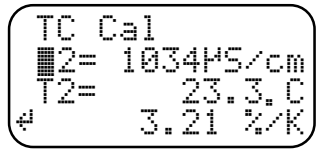
`TC Cal`: Select ***determination*** of a ***linear temperature function***.





Start procedure. Wait for stable measurement.



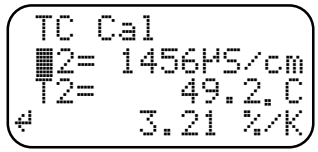


Store pair of values 1.
Start determination of ***pair of values 2***.



Temper sample to t**emperature 2** (maximum 20°C above start temperature).

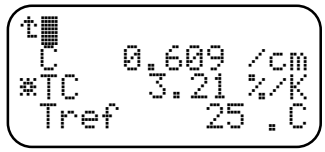




Wait for stability of measured value .

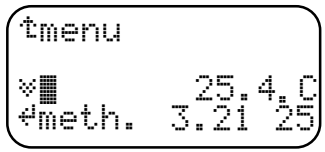
⇐determined temperature coefficient





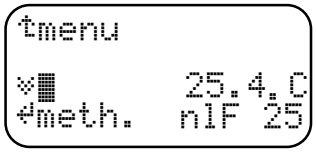
Accept *calculated* ***temperature coefficient.*** Back to menu "Additional functions".





Back to conductivity menu.

Selection of reference temperature Tref



Conductivity menu.





Menu "additional functions" of conductivity measurement.





*Select **reference temperature 25°C***.





*Set **reference temperature 20°C***.





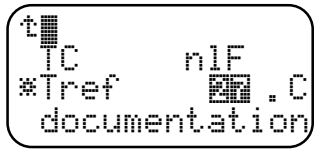
*Select **freely adjustable reference temperature***





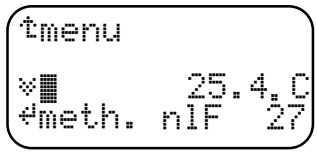
Set reference temperature.
» «: Select figure
» «: Set figure.





Confirm setting.

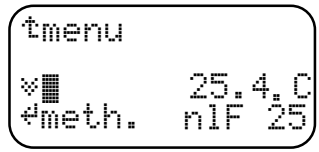




Back to Conductivity menu.

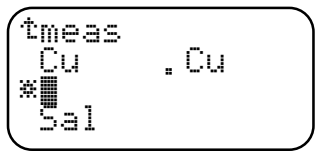
Measurement of salinity

General information on salinity measurement:
Application report no. 53021.



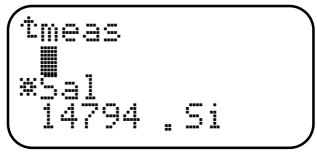
Conductivity menu.





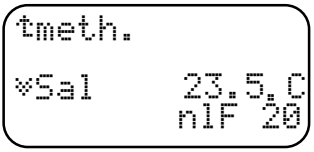
Change method.





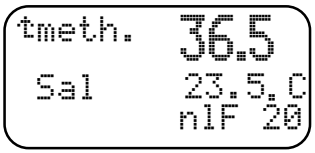
*Select **salinity***.





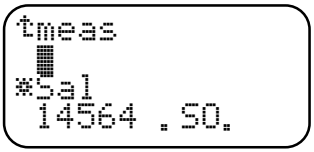
Selection confirmed.





Start measurement.
Salinity measurement runs ***continuously.***





Change method.

Further information on conductivity measurement

- Supervision of conductivity systems according to ISO 9000; GLP requirements.
  WTW application report no. 395054
- Conductometric salinity measurement.
  WTW application report no. 993109
- Temperature compensation of conductivity values.
  WTW application report no. 1194055

Calibration with OxiCal®-SL or OxiCal®-P

Note: **The dissolved oxygen probe has to be sufficiently polarized for calibration!**

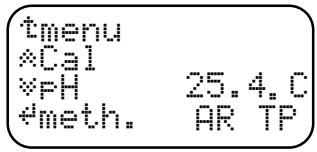
Polarisation time (Meter switched on, probe connected):

- With initial setup or after cleaning: approx. 25-50 minutes,
- With short interruptions up to 1 h: approx. 5-20 minutes



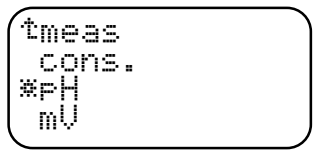
Dry D. O. probe approx. ¼ hour befor calibration, put it into air-calibration beaker OxiCal®and tighten (protection of temperature adjustment between probe and air calibration beaker)!

Note: Sponge in the OxiCal® air calibration beaker must always be moist (not wet!)



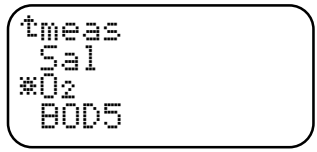
pH measurement set.





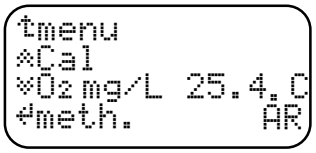
Method change.





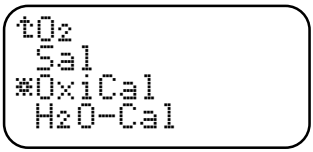
Select ***oxygen measurement.***





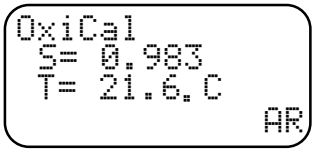
Menu ***Oxygen measurement.***



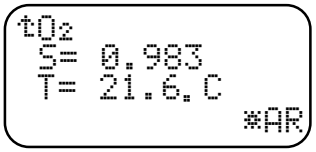


Select ***calibration function*** OxiCal.



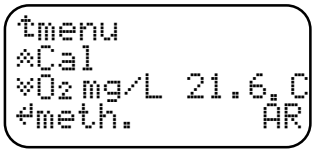


Start calibration in air calibration beaker.
AR: Measured values "running".
Admissible slope:
S = 0.6... 1.25.



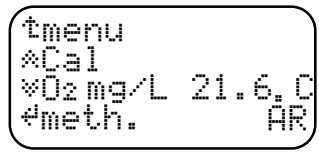
Wait until ✻ appears before the AR.
Calibration finished (**signal sound**). The determined data are stored.





Back to menu oxygen measurement.

Measurem. of oxygen concentration in water

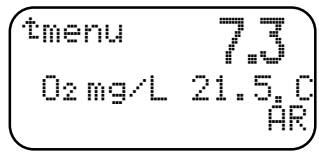


Menu oxygen measurement.

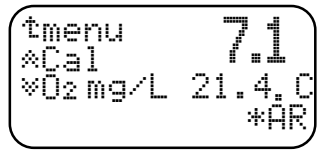


Immerse D. O. probe into sample solution !
Care for incident flow!





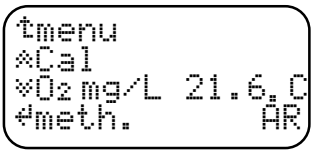
Start measurement.
AR = Measurement with AR is running.
Interruption is possible by changing to menu.



Wait until ※ appears before the AR. Measured values stored (**signal sound**).
No ※: AutoRead not reached.

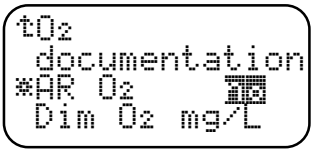
Documentation of meas. values: refer to chapter documentation.

Measurement of oxygen concentration without AutoRead



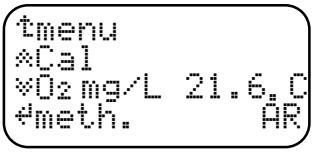
Menu oxygen measurement.





Select menu "additional functions" of oxygen measurement.
Mit » or « select ***AutoRead no.***



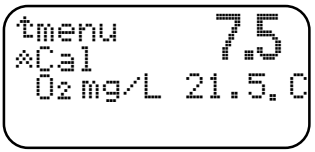


Confirm and go back to menu oxygen measurement.



Immerse D. O. probe into sample solution!
Care for incident flow!





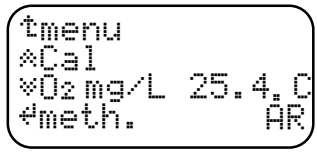
Measurement is running ***continuously***.
Interruption is possible by changing to menu or to calibration.

Other calibration procedures and corrections

H_2O-Cal: Calibration in air-saturated water

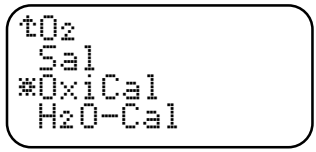


Immerse D. O. probe into air-saturated water!
Care for incident flow!



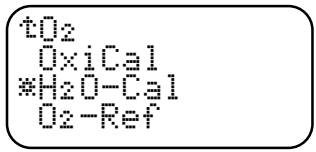
Menu oxygen measurement.





Select calibration.



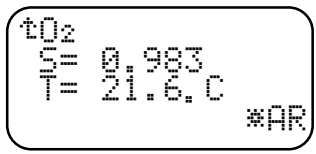


*Select **calibration procedure H_2O-Cal***.



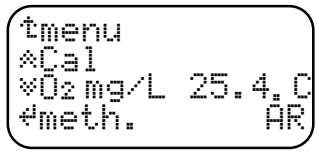


Start calibration in air-saturated water.
AR: Meas. values "running".



Wait until * appears before AR: Calibration terminated (**signal sound**). The determined data are stored.





Confirm calibration and back to menu oxygen measurement.

O_2 Reference: Calibration against a known (titrated) concentration value

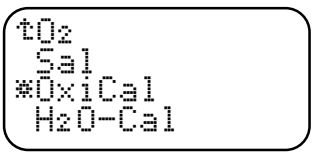
Information on the **solubility function**:
The solubility of oxygen depends on the solvents, the dissolved agents and the temperature. Oxygen partial pressure and temperature are measured. The concentration is calculated according to the solubility function for pure water (or seawater respectively) stored in the instrument.
The solubility factor indicates the relative concentration difference to pure water (or seawater).

Except for pure water the displayed concentration value is valid for solutions of the same composition at calibration temperature only.



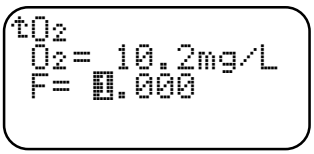
Immerse D. O. probe into solution with known oxygen concentration!
Care for incident flow!





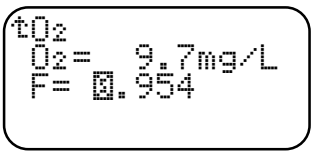
Select calibration.
With ⩓ or ⩔ select calibration procedure ***O_2 reference***.





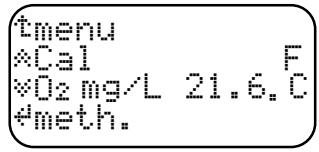
Confirm selection.
Display of the ***current oxygen concentration***.





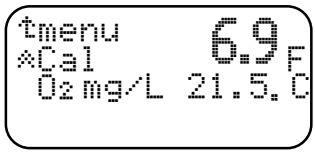
Change factor until the correct oxygen concentration is set.
» «: Select figure
⩓ ⩔: Set figure.





Confirm value and back to menu oxygen measurement.





Start measurement.
Measurement runs continuously.
F signals the ***measurement with solubility factor***.



The adjusted **solubility factor** remains **active even after switching off the instrument!**

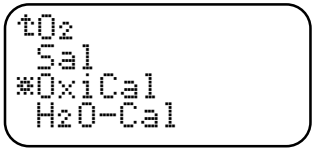
The solubility factor has no influence on the oxygen partial pressure and the saturation measurement.

Salinity correction (no calibration procedure)



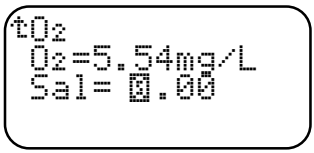
Immerse D. O. probe into air-saturated water!
Care for incident flow!





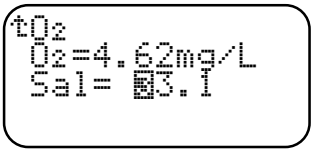
Select calibration.
With ⩓ or ⩔ select salinity.





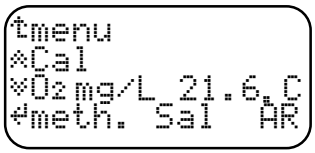
Confirm selection.
Display of the ***current oxygen concentration***.





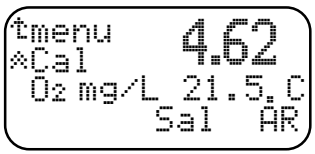
Set *salinity value* for the water.
» «: Select figure
^ v: Set figure.





Confirm setting and back to menu oxygen measurement.





Start oxygen concentration measurement.
Measurement runs continuously.
`Sal` signals the ***measurement with salinity correction***.

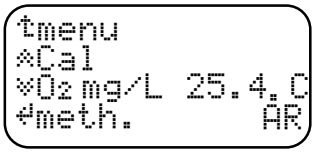


The adjusted **salinity remains active even after switching off the instrument!**

The salinity correction has no influence on the oxygen partial pressure and the saturation measurement.

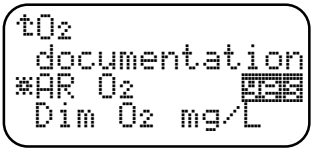
Additional functions

Switching AutoRead on and off



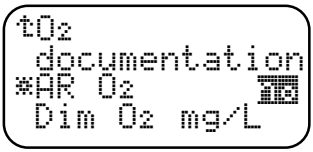
Menu oxygen measurement.





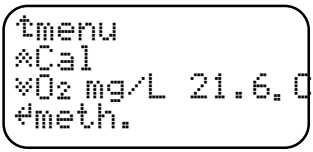
Select menu "additional functions".





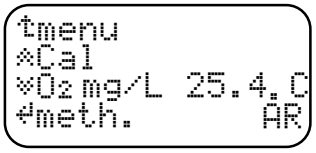
Select ***AutoRead no***.





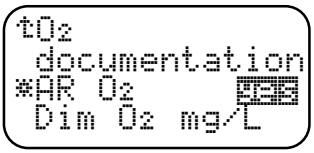
Confirm and back to measurement.

Dimension change and resolution



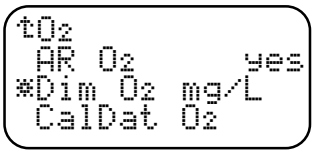
Menu oxygen measurement.





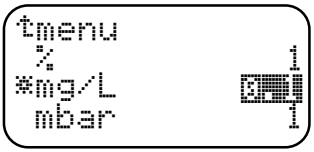
Select menu "additional functions".





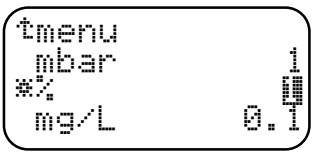
Select ***dimension***.





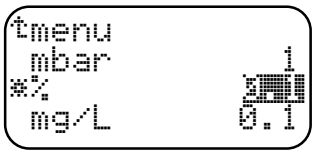
Enter menu Dimension.





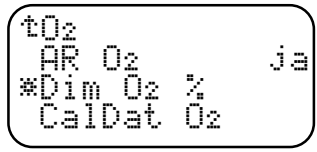
Select dimension.





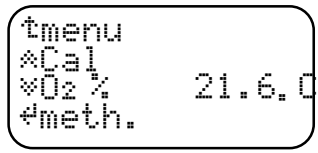
Select ***resolution***.





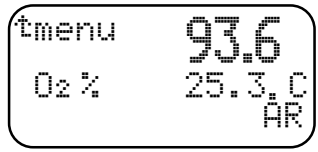
Confirm and back to menu.





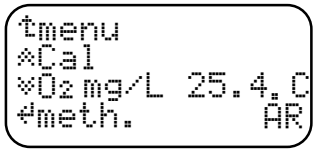
Back to menu oxygen measurement.





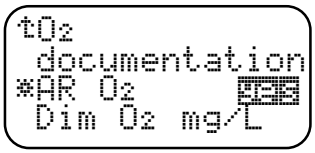
Start measurement. Measurement runs continuously.

Reading of calibration data



Menu oxygen measurement.





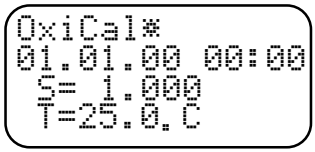
Select menu "additional functions".





Select ***CalDat O_2***.





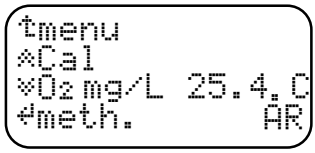
Display of ***calibration data***.
The display shows the default values.





Back to menu "Additional functions".





Back to menu oxygen measurement.

The MultiLab P4 contains 2 measuring programs to determine the BOD_5:

Method

1. **BSB_5 measuring program according to DIN 38409 part 51:** BSB5
   (German display indications)
2. **BOD_5 measuring program according to ISO 5815:** BOD
   (English display indications)

The users select the measuring program adequate for their application range.

The differences between the two measuring programs lie especially in the formulas and procedures used in the evaluation, which are required by above mentioned standards.
These evaluation regulations are realized according to standards in the MultiLab P4.

The **operation** of both measuring programs is the same (exception: For BOD_5 according to ISO 5815 single determinations are sufficient => for final measurement only 1 bottle is required per dilution or dilution water respectively).
The description of the operation course is, therefore, restricted to the BSB_5 determination according to DIN 38409.

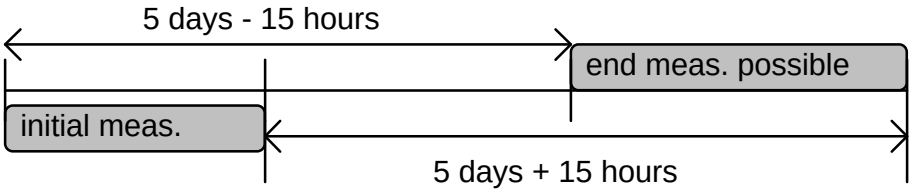
The display indications in the operation course are **German** (BSB_5) or **English** (BOD). For these measuring programs it is **not possible** to change the language setting via the "Configuration" menu.

Note: It is only possible to change from the BSB_5 to the BOD_5 measuring program when there **are no measured values stored** in the memory!
Otherwise the error message "BSB5 active" or "BOD5 aktiv" appears.
If the user nevertheless wants to change the measuring program the stored BSB_5 / BOD_5 values are to be erased first (submenu "erase").

BSB 5 measuring program according to DIN 38409 part 51

Max. storage location: 1800 meas. values.
Max. sample quantity: 100.
Max. dilutions: 5.
Double end value determination.
Bottle number 000 means: this bottle doesn't exist or the data should be erased.

Time interval:



The duration of the initial measurement is unlimited. After start of the end measurement this duration is also unlimited.

If required, pressing ↑ during program operation causes:



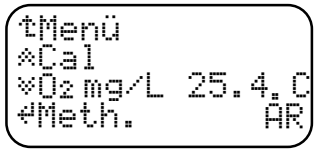
Leave BSB5 program without storing.

"nein/ja" (no/yes)



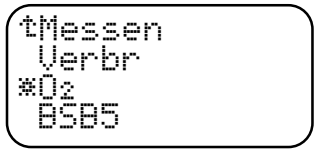
Please check the quality of the used dissolved oxygen probe before measurement.

Initial measurement



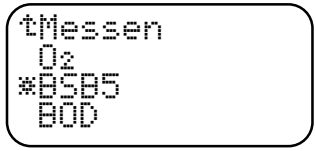
Menu oxygen measurement.





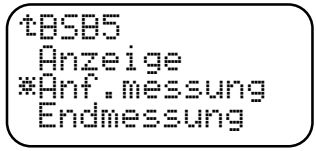
Select method change.





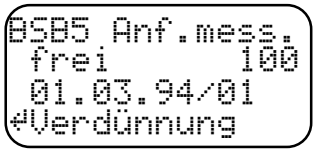
Select ***BSB5***.





Select ***BSB5 "Anf.messung"*** *(initial measurement)*





Confirm selection.
100 free samples.
Automatic numerating according to date.





Select quantity of ***dilutions***.
Given number 5.
Adjustment range 1 to 5.
With ⩓ or ⩔ set number.

Display when dilution water has not yet been measured:





Measurement of dilution water selected.

Display when dilution water has already been measured:

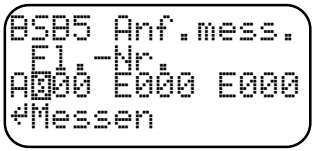




Selection between ***dilution water*** ("Verd. wasser") and ***sample measurement*** *("Probe")* with ⩓ or ⩔.

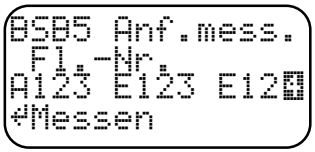
Measurement of dilution water:





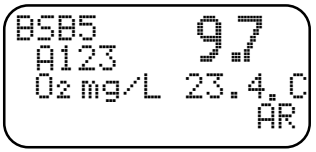
Select ***measurement of dilution water***.



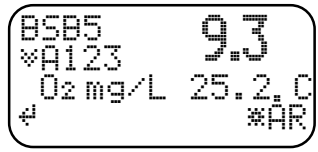


Enter ***bottle numbers*** (Fl.-Nr.) for initial and end measurement of the dilution water.
⩒ ⩓: Select figure
⩓ ⩔: Set figure.



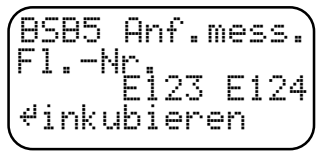


Confirm setting and ***start measurement*** for bottle number A123.



Wait until * appears besides AR: (**signal sound**). With ⌄⌄ a re-measurement is possible.





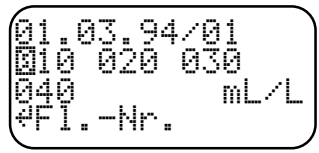
Measured value of the dilution water with date and time is stored.



Incubate!

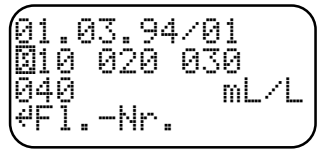
Measurement of dilutions starts:





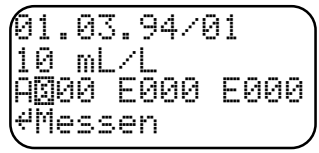
Proposition for dilution. Default values as displayed, or indication of last input values.





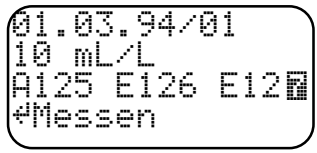
Change proposition for dilution as occasion demands.





Bottle numbers.



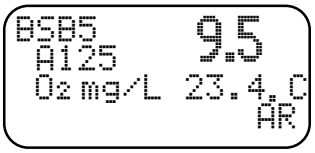


Enter bottle numbers.
⌄⌄ ⌃⌃: Select figure
⌃⌃ ⌄⌄: Set figure.

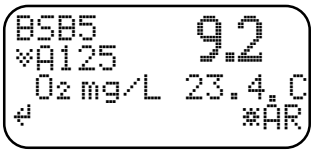


Immerse oxygen probe into bottle A125.





Start measurement.
Sample 01.03.94/01
Dilution 1:100
Bottle number A125.



Wait until ⁂ appears besides AR
(**signal sound**).

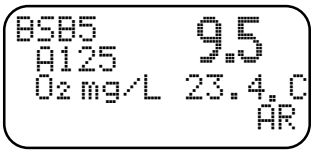




Store measured value and start time. Start next measurement.

or





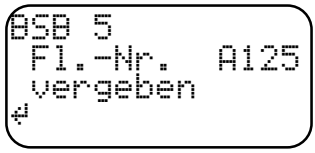
Re-measurement.



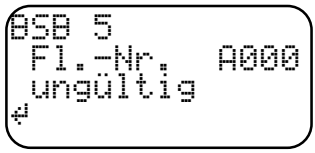
Incubate!

Perform **measurement for all dilutions**.

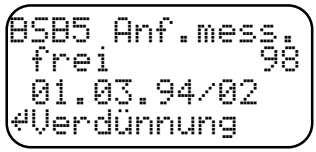
B**ottle number** entered **twice**:



Invalid bottle number:



After the **initial measurements have been finished**:



BSB 5 initial measurement ("Anf. messung") selected. 98 free samples.



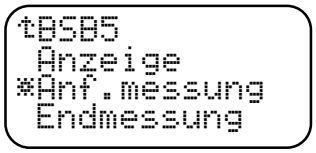


Back to BSB 5 menu.

Re-measurement after all measurements have been finished is not possible.

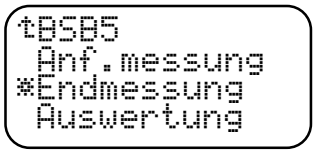
Final measurement

When the final measurement is called up the numbers of all samples ready for final measurement will appear.
Dependent on the selected bottle number the instrument automatically changes to the corresponding sample characterization.
Possibly two measurements of dilution water have to be performed.



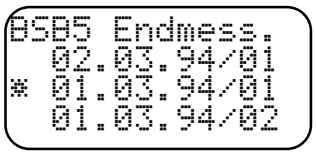
BSB 5 menu.





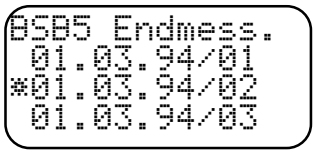
Select BSB 5 ***final measurement*** *("Endmessung")*.





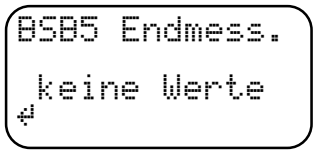
Entry to BSB 5 final measurement. Display of ***samples for final measurement***.



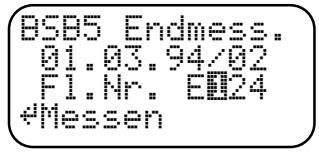


Select sample.

If there is **no sample** for final measurement, the following is displayed:





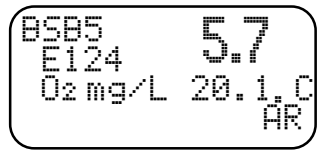


Instrument proposes a bottle, e.g. E124.
Given number may be changed.

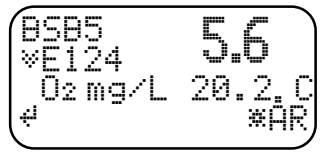


Immerse probe into bottle no. E124.





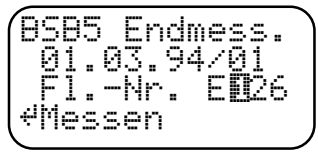
Start measurement for e.g. bottle E124.



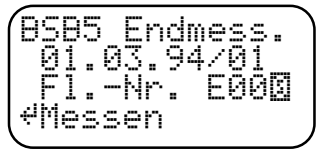
Wait until ※ appears before the AR (**signal sound**).

The MultiLab P4 controls the quantity of final measurements.

Missing bottles: Overwriting **with 000** erases bottle number.

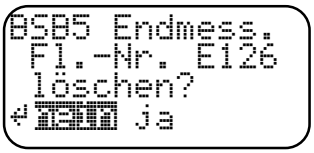






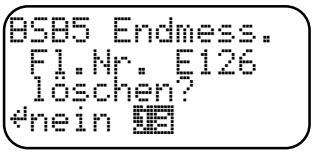
Lost or defective bottle: Overwrite number 126 with 000.





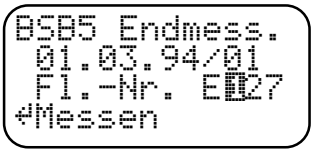
Safety query.





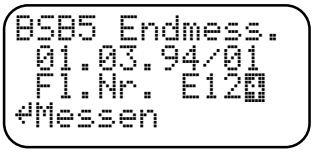
Confirm erasure.





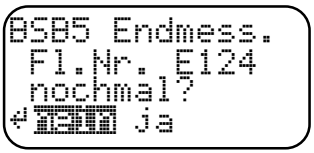
Ask for next measurement. Proposition of next bottle.

Re-measurement:



Bottle number has already been measured. ***Enter*** bottle number ***again***.

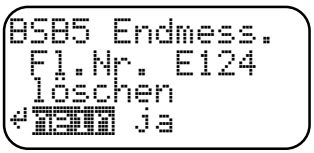




Do not measure bottle ***again*** has been selected.

The different possibilities:

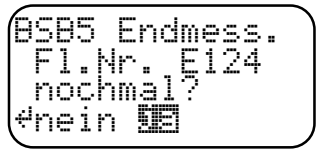




Do not erase bottle no. has been selected.

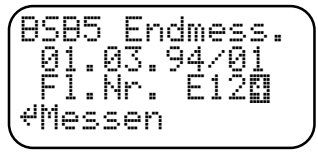
or





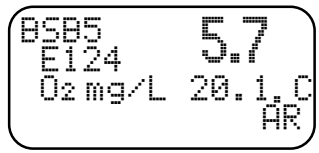
Measure bottle ***again*** has been selected.





Re-measurement of bottle e.g. E124 selected.





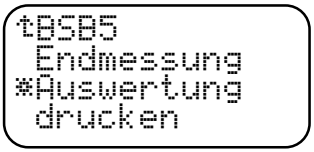
Re-measurement of bottle 124 started.

Evaluation



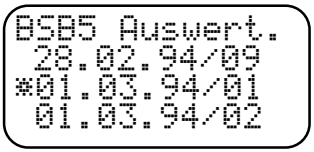
BSB 5 menu.





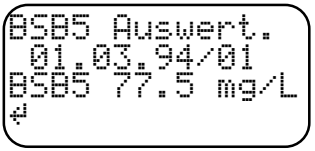
Select BSB 5 ***evaluation*** ("Auswertung").





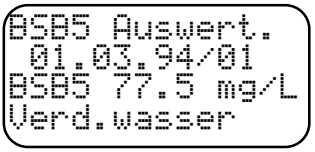
BSB 5 evaluation selected. Display of ***data records for evaluation***. With ⩔ or ⩒ select data record.





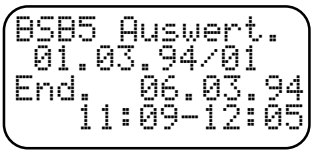
Display of the determined ***BSB5 value.***





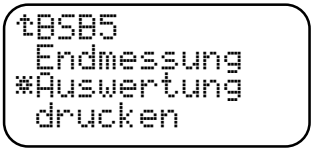
Display of all ***single data.*** The display corresponds to the printout.





Display of further data.





Terminate evaluation and back to BSB 5 menu.

Display of measured values



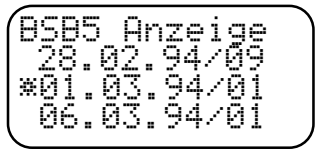
BSB 5 menu.





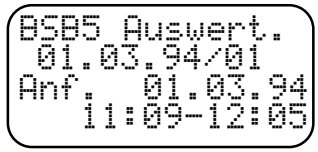
Select BSB 5 ***indication*** ("Anzeige").





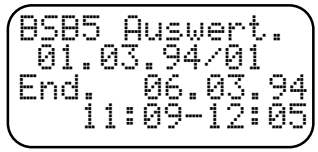
Display ***of all data records*** (also initial measurements of just started BSB determinations).





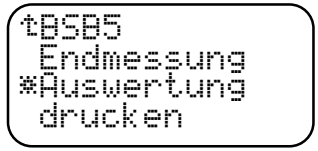
Display of ***single data***. The display corresponds to the printout.





Display of further data.



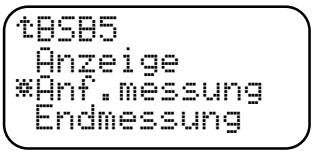


Back to BSB 5 menu.

Erasure of measured values

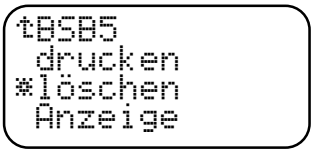
Display of all samples with the following characterization:

	non-marked samples:	**inclomplete**, e.g. missing final measurements.
▪	**hook**:	already **evaluated** samples.
?	**question mark**	:"data garbage", i.e. incomplete samples that **cannot be evaluated**.



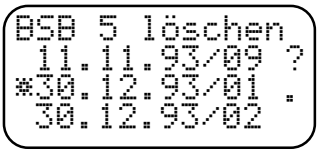
BSB 5 menu.





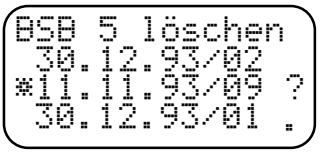
Select ***erasure*** ("löschen") of BSB 5 values.





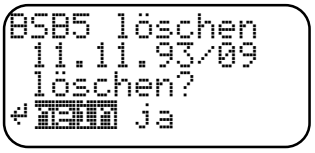
Display of all samples.





Select data record for ***erasure***.





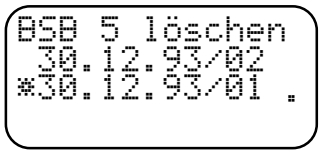
Safety inquiry for ***not yet evaluated*** samples.





Select erasure ("ja").

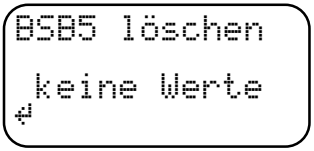




Confirm erasure.

Erase until:





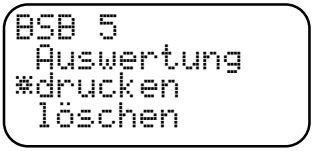
Printing of BSB5 measurements

The **printer adjustment** is valid for **all** measuring procedures, it is not possible to change the adjustment in the BSB5 program.



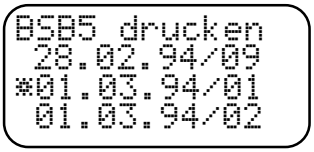
BSB 5 menu.





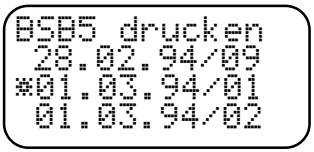
Select ***printing*** ("drucken") of BSB 5.





Select sample.





Print.

Example of an evaluation (80 characters per line)

Sample:01.03.94/01

Initial measurement: 01.03.94 10:43-12:05
Final meas.: 06.03.94 14:05-15:10

BSB5:**184 mg/l**

	Sample volume Vi in 1 l dilution ml/l	Sample part ϕi ml/ml	Oxygen concentration mg/l Beginning	End 1	End 2	Oxygen demand mg/l 1	2
Dilution water	0	0	8.5	7.7	7.6	0.8	0.9
1. dilution	10	0.01	8.4	5.7	5.8	2.7	2.6
2.dilution	20	0.02	8.4	3.9	3.9	4.5	4.5
3.dilution	30	0.03	8.3	1.9	2.0	6.4	6.3
4.dilution	40	0.04	8.2	(0.8)	(0.9)	(7.4)	(7.3)
5.dilution	50	0.05	8.1	(0.2)	(0.3)	(7.9)	(7.8)

	Bottle no.	Bottle no.	Bottle no.
Dilution water	123	123	124
1. dilution	125	126	127
2.dilution	128	129	130
3.dilution	131	132	133
4.dilution	134	135	136
5.dilution	137	138	139

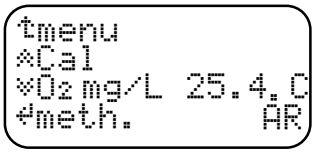
Exceptions (in brackets) have not been used for evaluation.

Example of an evaluation (27 characters per line):

```
Sample:          01.03.94/01
Initial meas.:
01.03.94        10:43-12:05
Final meas.:
06.03.94        14:05-15:10
BSB5:              184 mg/l
Dilution water
A123:              8.5 mg/l
E123:              7.7 mg/l
E124:              7.6 mg/l
1.dilution
A125:              8.4 mg/l
E126:              5.7 mg/l
E127:              5.8 mg/l
2.dilution
A128:              8.4 mg/l
E129:              3.9 mg/l
E130:              3.9 mg/l
3.dilution
A131:              8.3 mg/l
E132:              1.9 mg/l
E133:              2.0 mg/l
4.dilution
A134:              8.2 mg/l
E135:            (0.8) mg/l
E136:            (0.9) mg/l
5.dilution
A137:              8.1 mg/l
E138:            (0.2) mg/l
E139:            (0.3) mg/l
```

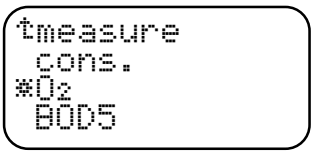
Determination of oxygen consumption rate acc. to DIN 38414 part 6

- Storage of the single test data in intervals of 10 seconds.
- Selection of the range with linear oxygen reduction ≥ 1 minute.
- Regular termination when linearity is reached.
- Termination after 10 minutes at the latest.
- Termination in case of measured values < 1 mg/L



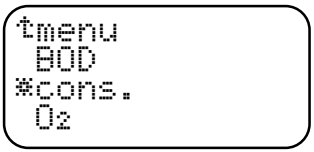
Menu oxygen measurement.





Method change.



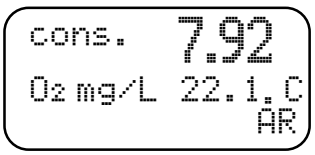


Select ***oxygen consumption rate***



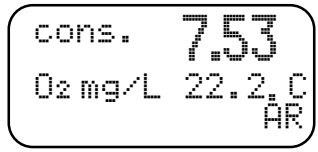
Immerse probe into sample solution!



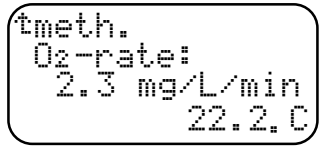


Start ***measurement of the consumption rate***.

Wait for result.



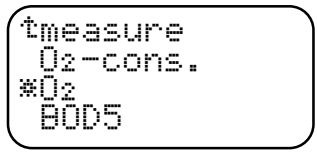
Display of the ***current oxygen concentration*** and the measured ***temperature***.



Display of the calculated ***oxygen consumption rate*** and the measured temperature.

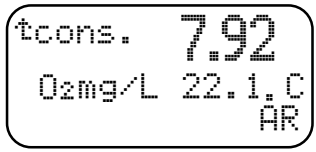
Re-measurement:





Method change.





Start measurement.

Documentation: refer to chapter documentation.

Test values can be documented in different ways:

- Storage in test value memory
- Printout (serial interface)
- Transmission of test values to a computer

Characterization of documentations in the display

During measurement the different documentations are displayed **down left**:



↲Dok: ***Printing on keypressing.***



Dok: ***Automatic printing*** selected.



↲998: ***Storage on keypressing.***
Example: 998 values <u>available</u>
(max. 1000 test values).



998: ***Automatic storage***.
Example: 998 values <u>available</u>
(max. 1000 test values).



D059s: ***Time controlled automatic printing.***
Time runs backwards.



S059s: ***Time controlled automatic storage.***
Time runs backwards.

Call-up of menu "Documentation"

pH measurement:



then





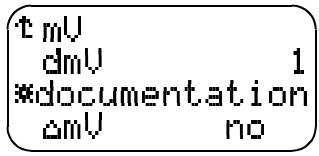
Select documentation **pH**.

mV measurement:



then





Select documentation **mV**.

ISE measurement:





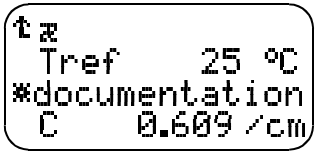
Select documentation **ISE**.

Conductivity measurement:



then





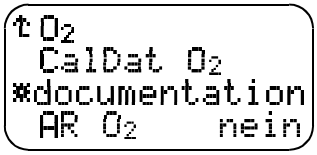
Select documentation **Conductivity** (or **Salinity**).

Oxygen measurement:



then





Select documentation **O_2**.

Printing

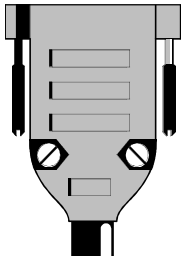
The following presettings are possible:

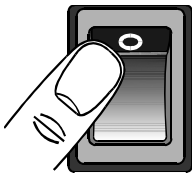
- 80 or 27 characters per line
- Printout with or without date and time
- Mode of test value numbering
- Automatic printing after measurement or on keypressing only





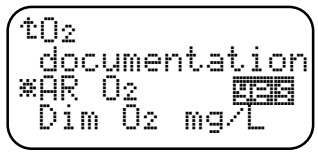
Connect **printer cable**.
Use cable AK 3000.





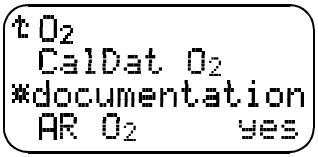
1. Switch on **printer**.
2. Switch on **MultiLab P4**.





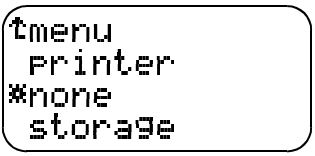
※ Function "***AR O_2 yes***" selected.





※ Select function ***documentation***.

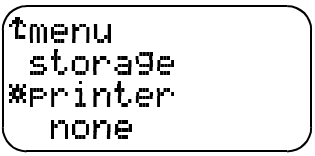




Entry to menu documentation.

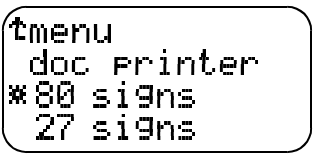
※ Preset: "***no***" documentation.





※ Select function documentation "***Printer***".

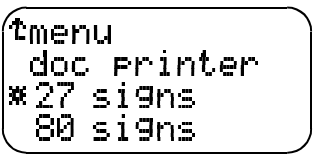




Confirm selection.

※ ***80 characters per line*** are set.





※ Select ***number of characters per line***.





Confirm selection.

※ Printout ***with date and time*** is set.





※ Select ***representation form***.









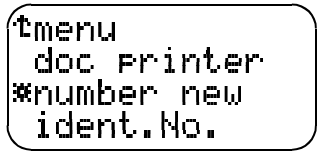
Confirm selection.

※ Function "***No. to 001***" is set.
Test values are ***continuously*** numbered from 001 to 999.

001*: No current test value*
e.g. after RESET or erasure of test value numbers (s.b.).

112*: Next documented test value (e.g. no. 112)*
after already performed measurements with switched on documentation.

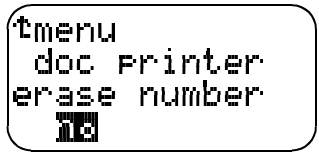




※ Set function "***Number new***".

At function "***Number new***" selected and confirmed:
Step to selection menu ***"Erase number"***

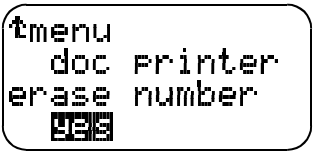




Confirm selection.

※ Function "Erase number: ***no***" is set.
Test value numbering ***continues*** after the last documented test value.





※ Set function "Erase number : ***yes***".
Test value numbering ***starts again*** with 001.





Confirm input and exit selection menu "Erase number".
Further procedure s.b.

Function "***Number new***" not selected:





※ Set function "***ident. No.***".
Input of any ***3-digit number*** before each measurement (e.g. customer number, sample location).

Note: To switch off the function "Ident. No." select function "no. cont.".





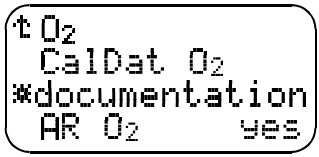
※ Function "***automatically***" is set.
Print test values ***automatically***.





※ Set function "***press button***".
Print test values ***by keypressing***.





Back to menu "additional functions".

Time controlled printout





※ Function "***automatically***" is set.
Print test values ***automatically***.



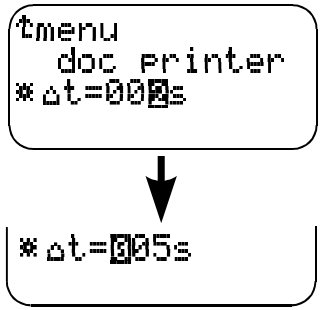


Time controlled automatic printout selected.
※ Time interval "Δt=060 s " is set.
Print of test values ***after 60 sec. automatically***.



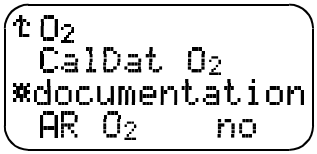


※ Set Interval, z.B. "Δt=010 s".
Print of test values ***after 10 sec. automatically***.



At time input < 5 s:
key ↵ or termination of input with ↑ effects the reset of the indication to Δt=005 s.
Readjustment (s.a.) is possible.





Back to menu "additional functions". (e.g. oxygen measurement).



During the continuous measurement with time controlled printout **do not depress or keep a key** which is not displayed (e.g. ↵ or arrow keys) Pressing a key which is not allowed stops the integrated clock during key operation.

Printing of calibration data (pH, ISE N, ISE F, ISE, Oxygen)



Printer must be **connected** and **switched on !**

For documentation the **printer** must be set to **automatical print !**

```
tmenu
 doc printer
*automatic.
 press button
```

※ Function "***automatically***" is set.
Print test values ***automatically***.

After succeeded calibration:
automatic printout of calibration data
(example pH)

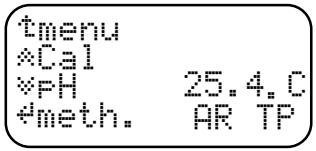
```
AutoCalDIN *
S=-60.9mV/pH
Uasy=-4mV
Cd1=6.865
Cd2=1.679
11.03.94 09:34
```

in case of missing calibration data or wrong calibration the following appears:
(example pH)

```
AutoCalDIN
Cal Error
11.03.94 09:34
```

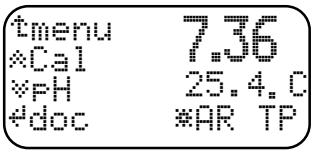
Printing of results





Back to menu "Measurement", e.g. pH measurement.





Display of test value.

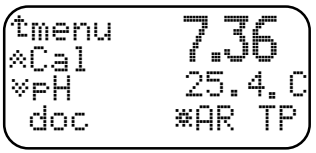
↲ Dok : Send data with requested presettings to the ***printer by keypressing.***



Printing of test value.

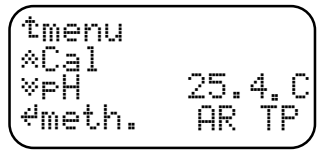
or

at selected function "***automatic***" printing:



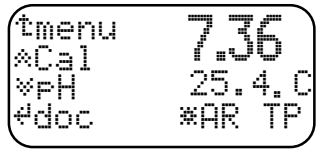
Dok : Send data with the requested presettings ***automatically*** to the ***printer***.

Printing of results, function "Ident. no." switched on



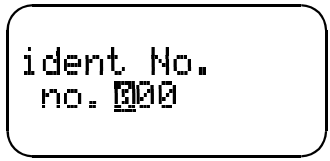
e.g. pH measurement.





Measurement runs until a stable value is reached.
Display of the test value.





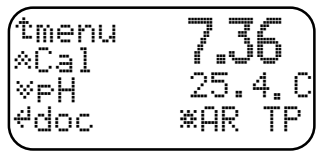
↲ Dok : After key depression menu ***"set Ident. no"*** is displayed.





Set the ***Ident. no.***
e.g. no. 184.
The instrument assigns the set sample code to the last measured sample.





Display of the test value.
Transmission of data in the requested settings to the printer.

e.g. printout of 80 characters per line:
(Sequence: *Sample number - Method - Date - Time - Special signs - Test value - Dimension - Indic. form*)

```
001 O2    30.04.93 17:46:32     8.3   mg/L          20.5
°C
002 O2    03.05.93 09:03:02     15.0  mg/L          20.5
°C
003 O2    04.05.93 09:33:00 !F  1.46  mg/L          21.0
°C
004 pH    03.05.93 09:07:11     10.75                25.3
°C
005 Cond  03.05.93 11:25:23     273.0 mS/cm         23.2
°C
006 O2    03.05.93 13:25:25     80.0  mg/L          17.1
°C
007 pH    04.05.93 09:25:01     4.83                 27.2
°C
008 pH    04.05.93 09:30:00     4.75                 27.3
°C
009 pH    04.05.93 09:40:00     5.82                 15.2
°C
010 mV    04.05.93 11:11:09     1250  mV             18.2
°C
```

e.g. printout of 27 characters per line:
(Sequence: *Sample number - Method - Date - Time - Special signs - Test value - Dimension - Indic. form*)

```
001 pH    03.05.93 09:07:11
     10.75
                    25.3 °C
002 Cond  03.05.93 11:25:23
     273.0 mS/cm
003 O2    03.05.93 13:25:25
     80.0  mg/l
004 pH    04.05.93 09:25:01
     4.83
                    27.2 °C
005 pH    04.05.93 09:30:00
     4.75
                    27.3 °C
006 pH    04.05.93 09:40:00
     5.82
                    15.2 °C
007 mV    04.05.93 11:11:09
     1250  mV
                    18.2 °C
```

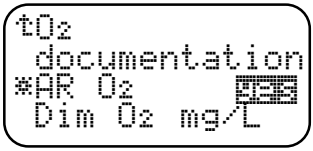
Storage

To store results in memory for later documentation.

Example: Storage of data at site in the MultiLab P4 and output to a printer or PC in the office.

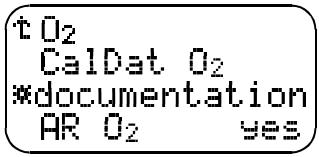
- **Max. 1000** results can be stored, in case of a higher quantity of measured values the **last** 1000 values remain in the memory.
- **Free storage locations are displayed** in a **descending** sequence (1000, 999, 998.. 2, 1), after 1000 stored values the numbering starts again from the beginning (..2, 1, 1000, 999, 998 ..).
- The **numbering of documented test values** (Number, Sample location) e.g. for the printout runs in **ascending** sequence 1 to 999, for controlling there are the functions "no. cont." or "Number new".





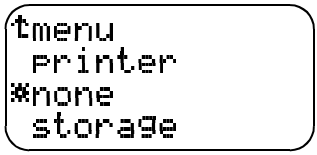
※ Function "***AR O_2 yes***" selected.





※ Select function ***Documentation***.





※ Preset: "***no***" documentation.



```
tmenu
 none
*storage
 printer
```

※ Select function documentation "***storage***" .



```
tmenu
 doc storage
*numbers
 output
```

※ Function "***Numbers***" selected.
Storage of test values.



```
tmenu
 doc storage
*no.cont.001
 number new
```



```
tmenu
 doc storage
*no.cont.112
```

※ Function "***No. new 001***" set.
Test values ***continuously*** numbered from 001 to 999.

001*: No current test value*
e.g. after RESET or erasure of test value numbers (s.b.).

112*: Next documented test value (e.g. Nr. 112)*
after already performed measurements with set documentation



In the **test value memory** always the **last 1000** test values are available, not depending on the current number of the documented test values.

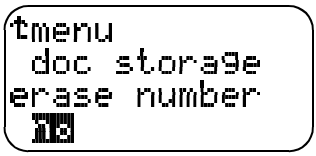


```
tmenu
 doc storage
*number new
 ident.No.
```

※ Set function "***Number new***" .

Function "***Number new***" selected and confirmed :
Step to selection menu ***"Erase Number"***





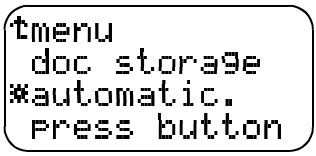
※ Function"Erase number : ***no***" set.
Test value numbering is ***continued*** after the last documented test value.





※ Set function "Erase number: ***yes***".
Test value numbering ***starts again*** with 001.





Confirm input and quit the menu "Erase number".

Further action s.b.

Function "***Number new***" not selected:





※ Set function "***Ident. no.***" Before each measurement input of any ***3-digit no*** (e.g. customer's code, sample location, river kilometer).

Note: To **switch off** the function "ident. No.", select function "**no. cont.**".





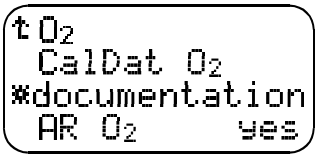
※ Function "***automatic***" set.
Store test values ***automatically***.





※ Set function "***press button***" .
Store test values after ***press button***.





Back to menu "Additional functions".

Time controlled storage



```
↑menu
 doc storage
*automatic.
 press button
```

※ Function "***automatic***" set.
Store test values ***automatically*** .



```
↑menu
 doc storage
*Δt=060s
```

Time controlled automatic storage selected.
※ Time interval "Δt=060 s " is set.
Store test value ***after 60 s automatically***.



```
↑menu
 doc storage
*Δt=010s
```

※ Set interval, z.B. "Δt=010s".
Store test value ***after 10 s automatically***.

```
↑menu
 doc storage
*Δt=005s
```

At time input < 5 s:
Button ↵ or termination of input with ↑ effects reset of indication to Δt=005s.
Resetting (s.a.) is possible.



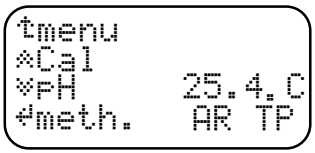
```
↑O2
 CalDat O2
*documentation
 AR O2    no
```

Back to menu "Additional functions".
(e.g. Oxygen measurem.).

During the continuous measurement with time controlled storage **do not press a button or hold it depressed** which is not displayed as a selection (e.g. ↵ or arrow keys).
Pressing a key which is not allowed stops the built-in clock during key operation.

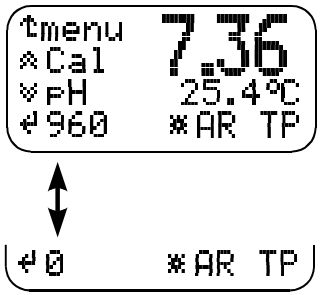
Storage of results





Back to menu "Measurement", e.g. pH measurement.

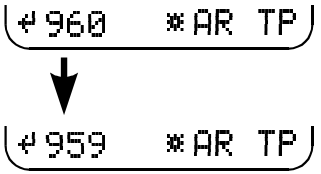




Display of test value.
↵960: ***By keypressing store*** the data in the desired presettings.
960*: Number of next test value storage location*

Full memory:
Always ***0*** *is displayed*.

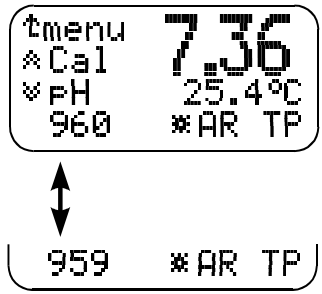




Storage of test value.
Number of test value storage location is reduced by 1.

or

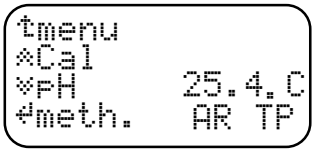
at selected function "***automatic***" storage:



960: ***Automatic storage*** in the desired presettings.

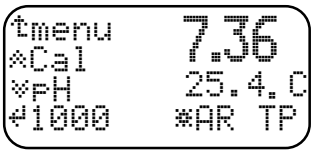
Test value counter follows on automatically.

Storage of results, function "Ident. no" switched on



e.g. pH measurement.





Measurement runs until stable value is reached.
Display of test value.





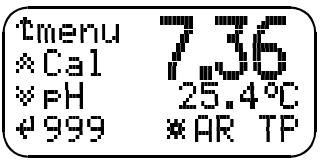
↲ 1000: After key-pressing menu "set ***Ident. No.*** " is displayed.





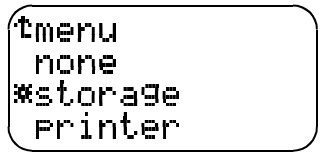
Set ***Ident. No.***,
e.g. no. 184.
The instrument assigns the entered sample code of the last measured sample





Display of the test value.
Transmission of the data in the desired settings to the test value memory.
(Memory counter follows on).

Printing of stored results



※ Function documentation "***Storage***" selected.





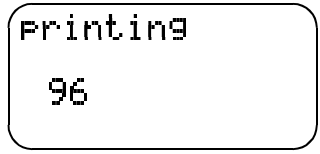
※ Function "***Numbers***" preset.





※ Selection of function "***output***"



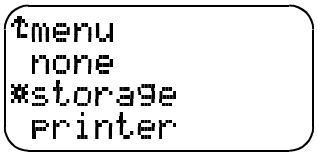


Confirm input.
Printing of test values (Memory counter follows on).



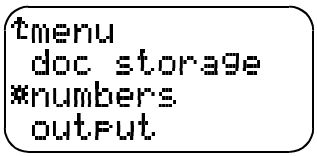
Printing has been finished.

Erasure of test values stored in memory



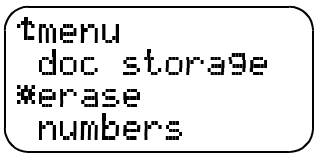
※ Function documentation "***Storage***".





※ Function "***Numbers***" preset.





※ Select function "***erase***".



No security inquiry!
In case of confirmation the instrument **immediately** erases the stored results in the memory!

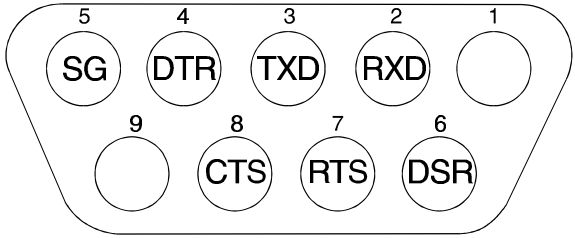




Confirm erasure.
All data in the test value memory ***are erased***.

RS 232 C interface

Pin connections



MultiLab P4	Computer		Printer
9-pin plug	9-pin socket	25-pin plug	with RS 232 C-interface
1	4	20	-
2	3	2	TXD
3	2	3	RXD
4	1 and 6	6	-
5	5	7	SG
6	4	20	-
7	8	5	-
8	7	4	DTR (if not available: short circuit CTS and RTS)
9	-	-	-

Commands

Command	Function
↵	Start of communication with each first CR Instrument characteristic MLP4 > Display shows Remote LOGON MLP4 >
CLOC	Switches back to normal operation MLP4> Display switches from Remote to actual method

pH

Command	Function

CPHC pH-test value transmission. Resolution as set in the instrument.

```
pH    22.02.94 13:45:09     7.82   pH            20.7.°C
MLP4 >
```

`INVALID COMMAND` when temp. probe is disconnected

CMVC mV-test value transmission. Resolution as set in the instrument.

```
mV    23.02.94 12:36:21     -48    mV            23.8 °C
MLP4 >
```

`INVALID COMMAND` when temp. probe is disconnected

CISF Fluoride-test value transmission (if calibration values available, otherwise INVALID COMMAND)

```
ISEF  24.02.94 08:02:00     16.3   mg/L    F-    23.9 °C
MLP4 >
```

`INVALID COMMAND` when temp. probe is disconnected

CISN Ammonium-test value transmission (if calibration values available, otherwise INVALID COMMAND)

```
ISEN  24.02.94 13:45:00     146    mg/L    NH4-N  24.2°C
MLP4 >
```

`INVALID COMMAND` when temp. probe is disconnected

CISE Ionsensitive test value transmission (if calibration values available, otherwise INVALID COMMAND)

```
ISE   24.02.94 13:45:00     146                   24.2°C
MLP4 >
```

`INVALID COMMAND` when temp. probe is disconnected

RCPH Read-out of pH-calibration values
(characteristic AutoCalTEC, AutoCalDIN or ConCal,
⁘ when AutoRead performed)

```
AutoCalDIN *
S=-60.9mV/pH
Uasy=-4mV
Cd1=6.865
Cd2=1.679
11.03.94 09:34
MLP4 >
```

in case of missing calibration values appears:

```
AutoCalDIN
Cal Error
11.03.94 09:34
MLP4 >
```

RCF Read-out of Fluoride-calibration values (if available)

```
S=59.2mV/D
U0=0.0mV
C1=1.00mg/L
C2=0.00mg/L
F-
11.03.94 09:34
MLP4 >
```

in case of missing calibration values appears:

```
ISE F
Cal Error
11.03.94 09:34
MLP4 >
```

RCN Read-out of Ammonium-calibration values (if available)

```
S=59.2mV/D
U0=0.0mV
C1=1.00mg/L
C2=0.00mg/L
NH4-N
11.03.94 09:34
MLP4 >
```

in case of missing calibration values appears:

```
ISE N
Cal Error
11.03.94 09:34
MLP4 >
```

RCI Read-out of ionsensitive calibration values (if available)

```
S=59.2mV/D      U0=0.0mV
C1=1.00mg/L   C2=0.00mg/L
11.03.94 09:34
MLP4 >
```

in case of missing calibration values appears:

```
ISE
Cal Error
11.03.94 09:34
MLP4 >
```

Conductivity

Command	Function

CLF1A Switch on AutoRange, call up conductivity and temperature meas. value

```
Cond  22.02.94 09:00:28     0.0   uS/cm          21.9 °C
MLP4 >
```

CLF12 Meas. range 0.000...3.000 µS (only when C<0.15/cm)

```
Cond  22.02.94 09:00:28     0.000 uS/cm          21.9 °C
MLP4 >
```

`INVALID COMMAND` when C > 0.15/cm

CLF13 Meas. range 0.00...30.00 µS

```
Cond  22.02.94 09:00:28     0.00  uS/cm          21.9 °C
MLP4 >
```

CLF14 Meas. range 0.0...300.0 µS

```
Cond  22.02.94 09:00:28     0.0   uS/cm          21.9 °C
MLP4 >
```

CLF15 Meas. range 0...3000 µS

```
Cond  22.02.94 09:00:28     0     uS/cm          21.9 °C
MLP4 >
```

CLF16 Meas. range 0.00...30.00 mS

```
Cond  22.02.94 09:00:28     0.00  mS/cm          21.9 °C
MLP4 >
```

CLF17 Meas. range 0.0...300.0 mS

```
Cond  22.02.94 09:00:28     0.0   mS/cm          21.9 °C
MLP4 >
```

CSAL Meas. range 0.0...70.0

```
Sal   22.02.94 09:00:28     0.0                  21.9 °C
MLP4 >
```

RC Read-out of cell constant

```
0.690/cm
MLP4 >
```

RTC Read-out of temperature coefficient

```
nlF
MLP4 >
```

RREF Read-out of reference temperature

```
25°C
MLP4 >
```

Oxygen

Command	Function

CCON Measure the oxygen concentration

```
O2    22.02.94 09:19:40  *  8.6    mg/L          21.9 °C
MLP4 >
```

CPO2 Measurement of oxygen partial pressure

```
O2    22.02.94 09:19:40  *  168    mbar          21.9 °C
MLP4 >
```

CSAT Measurement of saturation

```
O2    22.02.94 09:19:40  *  107    %             21   °C
MLP4 >
```

RCAL Read out the calibration data

```
OxiCal 01.01.00 00:00:00 1.000 Srel 20.0 °C
MLP4 >
```

RBNR Read-out of the BOD5 samples

```
22.02.94/01
MLP4 >
```

RBPR Read-out of BOD5 analysis for sample. Format see
Probe BOD5 measurement.

Error message

INVALID COMMAND Wrong or not interpretable command

Print format test values

Printer 80 characters per line or interface command format

3 characters **serial number or identification no.**
(is dropped in case of interface command)
1 space
(is dropped in case of interface command)
5 characters **method indication**
1 space
17 characters **date and time**
1 space

3 characters **special characters:**
- ! (for offset correction),
- F (for slope correction),
- * (for measurements out of the meas. range)

1 space
9 **character**s **test value**
1 space
8 **character**s **unit**
1 space
5 **character**s **indication form**
1 space
4 **character**s **temperature**
1 space
2 **character**s **°C**

Data transmission

Baud rate	1200
Data bits	8
Stop bits	1
Parity	none
Handshake	Hardware
max. cable length	15 m
Font	IBM, separation by blanks

Software Multi/ACHAT for Windows

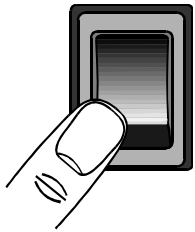
The software Multi/ACHAT (WTW product) backs all interface commands of the MultiLab P4.

Windows is required.

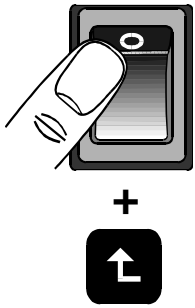
Some infrequently used functions are summarized in this chapter .

- Setting the **language**
- Setting **date and time**
- Information conc. **software status**
- Recovery of default settings (**RESET**)

Call-up of menu "Configuration"



Switch off the instrument.

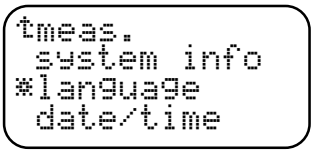


Switch on instrument and **simultaneously** depress ↑
Release ↑ after sound.

Language

The following languages are stored:

1 **German**
2 **English**
3 **French**
4 **Spanish**
5 **Italian**
6 **Dutch**
7 **Swedish**
8 **Danish**
9 **Portuguese**
10 **Indonesian**
11 **Hungarian**



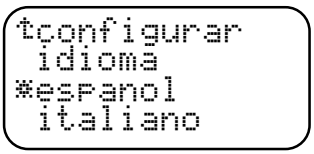
※ Menu ***"Configuration"***.
Select "***language***".





※ Enter menu ***language.***





※ Select language,
e.g. ***spanish***.



```
↑medic.
 info sistem
*idioma
 fecha/hora
```

※ Confirm input.
Display of all menus in Spanish.



```
↑configurar
 idioma
*espanol
 italiano
```

Return to German display: Call up function "***idioma espanol***" again.



```
↑Konfigurieren
 Sprache
*deutsch
 english
```

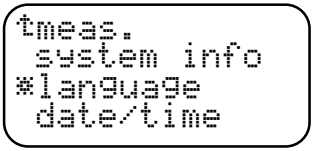
※ Select ***deutsch***.



```
↑Messen
 System Info
*Sprache
 Datum/Uhrzeit
```

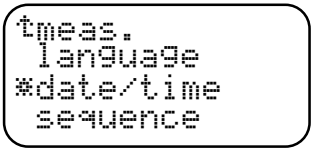
※ Confirm input.
Displays of all menus in German.

Date and time



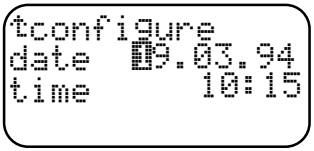
Menu "Configuration".





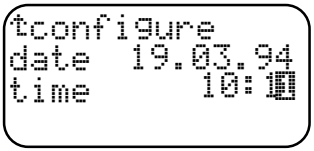
※ Select function ***"Date/time"***





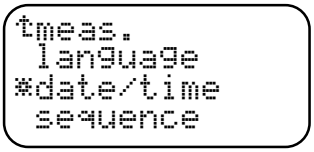
Display of the current data. The first number of the day is marked.





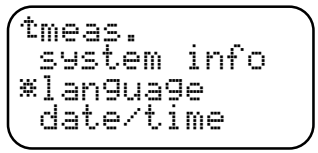
Update data.





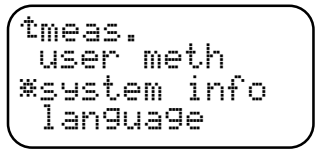
Back to main menu "Configuration".

System Info (Software status)



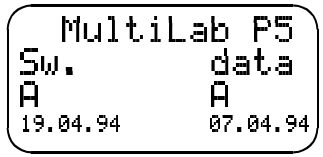
Menu "Configuration".





* Select function "***System Info***".

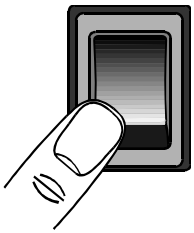




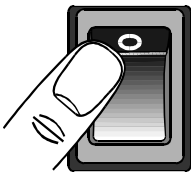
Date and version number can be different from the example.

Reset

Reset to default settings is possible in single steps. "Reset all" is the sum of all single steps.
Below all possibilities are listed. ↵ starts the selected Reset.



Switch off instrument.





tMenü
↵Reset

Switch on instrument and **simultaneously** depress ↵. After acoustic signal release ↵.



tMessen
Photo/Foto
※pH

※ Reset ***pH/mV/ISE***-measurement.



tMessen
pH
※
O2

※ Reset ***conductivity measurement***.



```
↑Messen
 ▓
*O2
 BSB5/BOD
```

※ Reset ***oxygen measurement***.



```
↑Messen
 O2
*BSB5/BOD
 DOK/DOC
```

※ Reset ***BSB5/BOD***.



```
↑Messen
 BSB5/BOD
*DOK/DOC
 Reset all
```

※ Reset ***Documentation / Sequence / Configuration menu***.



```
↑Messen
 DOK/DOC
*Reset all
 Photo/Foto
```

※ Reset ***all.***



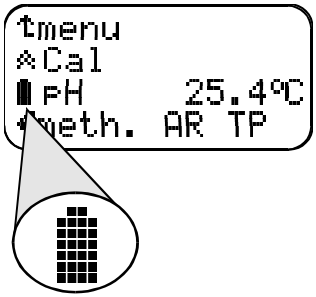
Perform Reset.



```
↑Menü

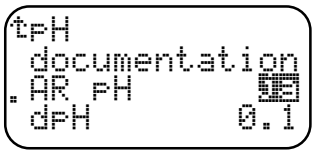

↵Reset
```

Accu



Symbol for state of charge *illuminates:*
Charge accumulator.

Charging the accu*:* ***disappears approx 3 min. after connection of line adaptor.***

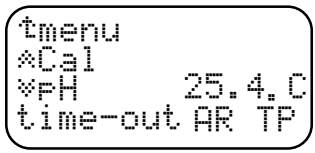


The symbol for state of charge replaces the marking sign ※ in the selected menus.



Display is dark*.*
Instrument should function again after connection of the line adaptor.
If not send instrument to WTW for repair.

pH



Measurement: Measured value not stable.
Possible cause / Action:
- Junction of the electrode contaminated / Clean junction
- Unsuitable electrode / Change electrode
- Sample solution not stable / Depends on aim of the measurement and the characteristics of the sample solution
- Electrode too old / Change electrode
- Temperatures of sample solutions too different / Wait for temperature adjustment



Calibration: Measured value not stable.
Possible cause / Action:
- Junction of the electrode contaminated / Clean junction
- Cable broken / Change cable or electrode
- Electrode too old / Change electrode

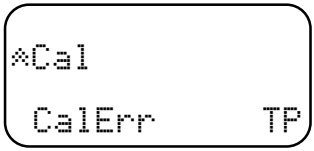


Calibration: Calibration data outside of admissible ranges.

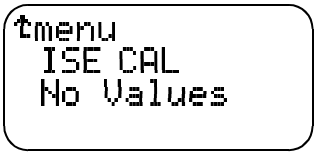
Admissible slope range:
-62 mV ... -50 mV
Possible cause / Action:
- Wrong buffer solutions
  / Change buffer solutions, see set buffer combination
- Old buffer solutions / Change buffer solution, see preservability date
- Old electrode / Change electrode
- Short circuit / Change electrode or repair meter
- Wrong temperature value (only with measurements without temperature probe)
  / Set correct temperature value

Admissible asymmetry range:
-30 mV ... +30 mV
Possible cause / Action:
- Wrong buffer solutions
  / Change buffer solutions, see set buffer combination
- Old buffer solutions / Change buffer solution, see preservability date
- Old electrode / Change electrode
- Contaminated junction
  / Clean junction
- Wrong temperature value (only with measurements without temperature probe)
  / Set correct temperature value

ISE N, ISE F and ISE

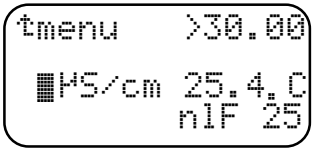


Calibration: Slope outside of admissible range.
Admissible range: -62 ... +62 mV
Possible cause / Action:
- Cable broken
  / Change measuring or reference electrode or repair meter
- Unsuitable standard solutions
  / Change standard solutions
- Defective or missing reference electrode
  /Change reference electrode
- Wrong or missing preparation of standard solutions

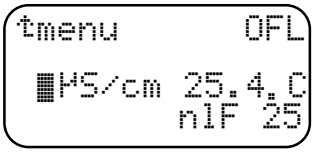


Measurement: Missing calibration data.
Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

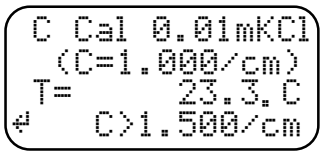
Conductivity



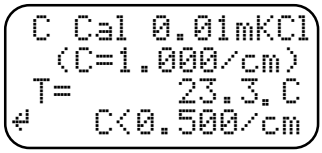
Measurement: The measured value is outside the selected measuring range.
Possible cause / Action:
- Measuring range too small
  / Select bigger measuring range or automatic selection of measuring range



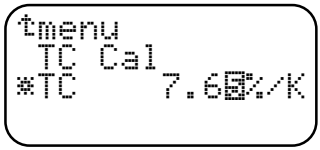
Measurement: The measured value is above the biggest measuring range.
Possible cause / Action:
- The conductivity of the sample solution is above 500 µS/cm
  / Use meter with a bigger measuring range



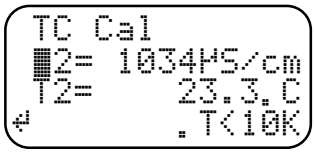
Determine cell constant: The cell constant is above 1.500/cm. With confirmation the old value remains.
Possible cause / Action:
- Wrong measuring cell / Use a measuring cell recommended for the meter
- Contaminated or old electrodes
  / Clean electrodes
- Wrong or destroyed control solution (use potassium chloride solution c=0.01 mol/l only once)
  / Change control solution



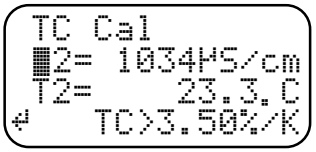
Determine cell constant: The cell constant is below 0.500/cm. With confirmation the old value remains.
Possible cause / Action:
- Measuring cell with cell constant below 0.500/cm / The control of cells with a cell constant below 0.5/cm is not useful and, therefore, not contained in the program.
- Wrong or destroyed control solution (use potassium chloride solution c=0.01 mol/l only once) / Change control solution



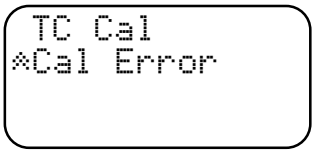
Input temperature coefficient: The input value is above 3.50%/K.
Action:
- Check whether the value is correct (coefficients above 3.50%/K are very rare)
- For measurement in pure water from ion exchange facilities use the nLF function.



Determine temperature coefficient. The temperature difference to first measurement is lower than 10 K. Action: Increase or decrease sample temperature.

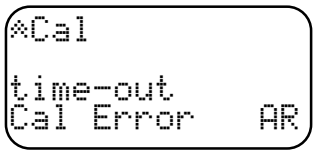


Determined temperature coefficient higher than 3.50 %/K.
Possible cause:
- The temperature coefficient of the sample solution is above 3.50%/K
  / Set temperature coefficient to 0 %/K and perform the compensation manually.
  Note: Temperature coefficients above 3.5 %/K are very rare.
- The sample solution has chemically changed during the measurement, e. g. carbon dioxide has been absorbed or lime has precipitated.
  / Depending on the aim of the measurement and the characteristics of the sample solution.
- Unusable or defective measuring cell
  / Change measuring cell.



There is no valid value for the temperature coefficient stored in the meter.
Action: Determine or enter temperature coefficient.

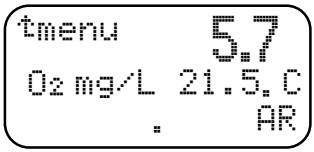
Dissolved oxygen



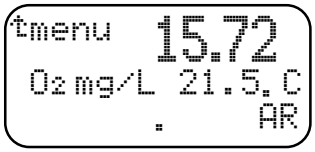
Calibration: Measured value not stable.
Possible cause / Action:
- Membrane contaminated / Clean membrane or regenerate probe
- Membrane moist / Dab membrane dry
- Temperature probe moist / Dab temperature probe dry
- Temperature difference between probe and calibration vessel too high / Wait for temperature adjustment
- Reference electrode contaminated / regenerate probe
- Too much water in calibration vessel / Remove superfluous water from calibration vessel. At vessels with sponge only moisten the sponge
- Probe defective / Change probe



Measurement: Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate



Measurement and calibration: Probe is leaky.
- Possible cause / Action:
- Membrane damaged / Change membrane
- Membrane head was not screwed on tight enough / Tighten membrane head with a paper towel



Measurement and calibration:
Electrolyte solution used up.
Action: Regenerate probe.

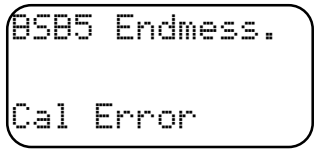


Calibration: Slope outside of admissible range.
Admissible range: 0.6 up to 1.25
Possible cause / Action:
- Membrane contaminated / Clean membrane or change membrane head
- Membrane moist / Dab membrane dry
- Gold electrode contaminated / Regenerate probe
- Silver electrode contaminated / Regenerate probe
- Too much water in calibration vessel / Remove superfluous water from calibration vessel. At vessels with sponge only moisten the sponge
- Probe defective / Change probe

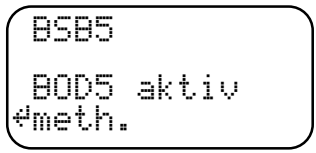
BSB5



Initial measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

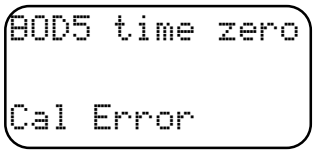


Final measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

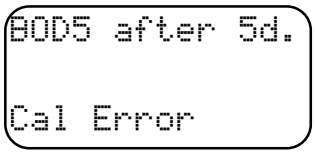


Procedure BSB5 measurement:
Databank set up for measurements according to the ISO standard.
Action: Erase databank.
ATTENTION, all data of BOD5 measurements will be lost!

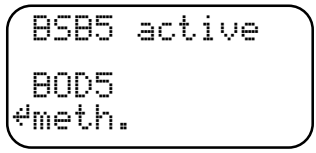
BOD



Initial measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

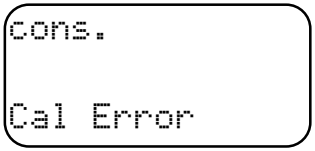


Final measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

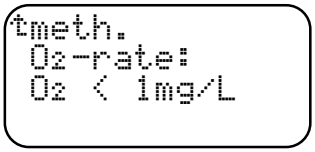


Procedure BOD5 measurement:
Databank set up for measurements according to the DIN standard.
Action: Erase databank.
ATTENTION, all data of BSB5 measurements will be lost!

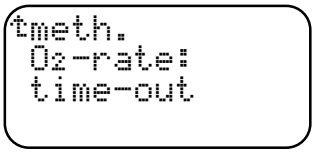
Consumption rate



Measurement: Missing calibration data.
Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate



Measurement: Initial value below 1 mg/l.
Cause / Action:
- Sample solution not sufficiently aired / Air sampe solution and measure once again

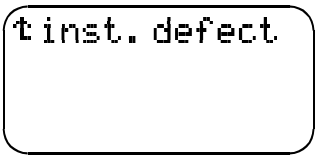


Measurement: There is no data usable for evaluation.
Action: Air sample solution and measured once again.

Maintenance



Error in the course of the program
- Switch meter off and then on again
- Perform RESET



Meter is defective.
Action: Send it back to WTW for repair!

Default settings

We deliver the MultiLab P4 with the default settings mentioned below. Results can be stored for a later **documentation** (refer to the corresponding chapters).

Language		**German**
Dimension		
	Conductivity	**µS/cm** or **mS/cm** (AutoRange)
	Dissolved oxygen	**mg/L**
Resolution		
	pH	**0.1**
	mV	**1 mV**
	Conductivity	**dependent on the meas. range**
	Dissolved oxygen	**0.1 mg/L**
mV-measurement		**mV absolute**
pH-functions		**AutoRead yes**
ISE-functions		**C1=10 mg/l, C2=100 mg/l**
Conductivity		**Tref=25°C,** **Cell constant 0.609 /cm** **Temperature compensation nlF**
O_2-functions		**AutoRead no**

Documentation	**none**
Printer:	**80 characters/line** **with date/time** **No. to 001** **automatically time controlled** **Δt = 60s**
Storage:	**No. to 001** **automatically time controlled** **Δt = 60s**

Calibration data

pH:	**Uasy = 0** **S = 59.2 mV/pH**
ISE N:	**no values**
ISE F:	**no values**
ISE:	**no values**
O_2:	**S = 1.000** **T = 20.0 °C**

How to restore the default settings: see chapter "Reset"

Instrument

Test value documentation with date and time	internal memory for 1000 test values

Display	Graphic display with 84*32 points

Error messages	via Display

Control elements for the user	
Switch	ON/OFF switch
Keys	Foil keyboard with 6 keys and cyclic acknowledge

Analog inputs	
pH and temperature of pH	Socket acc. to DIN 19262, 2 banana sockets 4mm,
LF and temperature of LF	7-pin DIN socket
O_2 and temperatures of O_2	8-pin DIN socket

Connections	
Power supply	Power supply socket

Digital interface	RS 232 C socket, 9-pin, galvanic separation. Printer connection via RS 232 C interface. Computer connection via RS 232 C interface.

Instrument security / environm. conditions	
Protection class	3 IEC 1010
Fire protection housing	UL 94 V2
Protection system	IP 42 DIN 40050
Line adaptor	EN 60742

Electromagnetic compatibility EMV (Test severity levels see test certificate)	
Interference transmission	EN 50081-1 FCC Class A
Resistance to jamming	EN 50082-2 Namur recommandations, general requirements
Climate class	2, VDI/VDE 3540
Ambient temperature	Storage: -25°C up to +65°C Operation: +5°C up to 40°C
Relative humidity	Yearly mean ≤ 75 % 30 days/year: 95 % remaining days: 85 % light dew: yes

Test certificate	GS/GE-approved

Energy supply	
Mains connection via line adaptor	Input: 205 V .. 255 V~ , 50..60 Hz Output: 12 V .. 15.5 V~ Variant: Line adaptor for input 105V .. 130 V~, 50..60 Hz, output as above.
Accumulator operation	Built-in accumulator: 5 NiCad-accum. 1.2V each, 2200 mAh 8 hours continuous operation with fully charged accumulator, charging time 16 hours
Current consumption / instrument	max. 550 mA
Instrument behaviour at/after power failure total discharge	Accumulator buffering after mains connection immediately ready to measure with the last selected operation mode.

Housing	
Dimensions	112 mm x 265 mm x 185 mm
Weight	approx. 2.5 kg

pH and mV

Parameters	pH, mV, temperature continuously, pH with AutoRead
Meas. ranges pH mV	 0.00 ≤ pH ≤ 14.00 ± 1250 mV
Resolution pH mV	 0.1, 0.01, adjustable 1 mV, 0.1 mV, adjustable
Accuracy pH mV	at 15°C .. 35°C ambient temperature 0.01 ± 1 digit 0.1 mV ± 1 digit
Temperature Meas. range Resolution Accuracy	 -5.0°C .. 110.0°C 0.1K 1K at manual temperature input ±0.1K ± 1 digit, at15°C .. 35°C Ambient temperature
Temperature compensation of the electrode slope	automatically or manually in the range -5°C to 100°C
Adjustment ranges	Temperature: -10.0°C to 120.0°C
Electrode data	Admissible ranges Slope-62mV/pH..-50mV/pH Asymmetry voltage -30mV..30mV
Input resistance	> 5 TΩ

ISE

Meas. range Ammonia (Two-point calibration)	0.14.. 1400 mg/L NH_4-N Given values for calibration: 10 mg/L and 100 mg/L +62 mV/D > S > -62 mV/D Calibration range 0.01 .. 999.99
Meas. range Fluoride (Two-point calibration)	0.19.. 1900 mg/L F- Given values for calibration: 10 mg/L and 100 mg/L +62 mV/D > S > -62 mV/D Calibration range 0.01 .. 999.99
Meas. range ionsensitive measurement (Two-point calibration)	0.01.. 9999 Given values for calibration: 10 and 100 +62 mV/D < S < -62 mV/D Calibration range 0.01 .. 999.99
Functions	AutoRead
Calibration	
ConCal	any buffers One or two-point calibration with neutral buffers (Uasy) and possibly second buffer (slope). Manual interruption.
AutoCalDIN	DIN/NIST buffer: 1.679, 4.006, 6.865, 9.180, 1.2454 (25°C) All buffers are temperature corrected in the range of 0°C to 90°C. Test value indication after stability or manual interruption. Charactarization of reaching the stability with ⁂.

AutoCalTEC	WTW-Technical buffers 2.00, 4.01, 7.00,10.00 (25°C). Test value indication after stability or manual interruption Charactarization of reaching the stability with ⁜.

Conductivity

Parameters	Conductivity, temperature,continuously
Meas. principle	2+4-electrode-meas. technique
Meas. frequence(s)	80 Hz, 100 Hz, 400 Hz, 1000 Hz
Meas. ranges conductivity (resolution)	**Cell constant 0.01 cm^{-1}:** 0.000µS/cm..3.000µS/cm (0.001µS/cm) 0.00µS/cm..30.00µS/cm (0.01µS/cm) **Cell constant 0.1 cm^{-1}:** 0.00µS/cm..30.00µS/cm (0.01µS/cm) 0.0µS/cm..300.0µS/cm (0.1µS/cm) **Cell const. 0.500 cm^{-1}..1.500 cm^{-1}:** 0.0µS/cm..300.0µS/cm (0.1µS/cm) 0µS/cm..3000µS/cm (1µS/cm) 0.00mS/cm..30.00mS/cm (0.01mS/cm) 0.0mS/cm..300.0mS/cm (0.1mS/cm)
Meas. accuracy	±0.5% ± 1 digit of meas. value
Temp. compensation	-5°C bis 90°C, automatically
Temperature coefficient	0.00%/K bis 3.50 %/K adjustable, additionally non-linear function of natural water acc. to DIN 38404 and ultrapurewater function for neutral water
Cell constants	0.01 cm^{-1} , 0.1 cm^{-1} and 0.609 cm^{-1} fest 0.500 cm^{-1} .. 1.500 cm^{-1} adjustable, Pre-adjustment 0.609 cm^{-1}
Salinity Meas. range (resolution) Accuracy	 0.0..70.0 (0.1) IOT-table: ±0.1 Literature: "UNESCO Technical Papers in marine sciences 36".
Reference temperature	20°C or 25°C fixed, and one free adjustable ref. temp.

Temperature	
Meas. range	-5.0°C..90°C
Resolution	0.1K
Accuracy temperature (at 15°C..35°C ambient temperature)	±0.1K ± 1 digit
Probe exchange error	<0.2 K at -5.0°C .. 60.0°C <0.4 K at 60.0°C .. 110.0°C
Temperature range TetraCon 96	0°C..90°C
Check	with 0.01 m KCl and adjustment of the cell constant

Dissolved oxygen O_2

Parameters	mg/L O_2, mbar pO_2, % saturation, temperature continuously
Meas. principle	potentiostatic 3-electrode system
Meas. ranges (resolution)	0.0 to 300.0 mg/L (0.1 mg/l) 0%..999 % (1%) saturation. In the range 0.0 mg/L..30.0 mg/L the resolution is selectable between 0.1 mg/L and 0.01 mg/L. In the range 0.0%..100.0% the resolution is selectable between 0.1% and 1%.
Accuracy	0.5 % of meas. value (0.01 mg/L resolution)
Temp. compensation only slow NTC with OxiCal®	automatically with double thermistor system
Air pressure correction AutoBar	automatically of 850 to 1080 mbar
Salinity correction	0..99, manually adjustable
Temperature Meas. range Resolution Accuracy temperature (at 15°C..35°C ambient temperature) Sensor exchange error Temperature range TriOxmatic® 300	 -5.0°C..60°C 0.1K ±0.1K ± 1 digit <0.2K at -5.0°C .. 60.0°C <0.4K at 60.0°C .. 110.0°C 0°C..50°C
Functions	AutoReg, membrane control, AutoBar, AutoRead, OxiCal, H_2O-Cal, BSB5/BOD
Calibration DIN EN 25814	OxiCal® with OxiCal® P or OxiCal® SL H_2O-Cal with air-saturated water.

Test certificate EMC

(EMC-similar to MultiLab P5)

SENTON
▪ EMV-Prüfzentrum ▪ EMI/EMC-Testcenter ▪

CERTIFICATE
of
EXPERT OPINION

(Radio Frequency Interference Test)

for

Kind of product	:	**Filterphotometer + LF, + OXI, + pH**
Type	:	**MultiLab P5**
Manufacturer	:	**WTW GmbH**
Applicant	:	**WTW GmbH**
Date effected	:	**06.06. - 22.06.93**
		04.08. - 10.08.93

uniform EMC-design

Kind of product	:	**Mehrparametergerät LF, OXI, pH**
Type	:	**MultiLab P4**

We hereby certify, that the above mentioned model has been tested and found to be in compliance with the following regulation(s):

EN 50081-1:1992
prEN 50082-2:1992
NAMUR Recommendation NE21/12.90, Standard Requirements
FCC Part 15 Subpart B Limit Class A

Senton GmbH

Johann Roidt

SENTON GmbH · EMI-Laboratories · Äußere Frühlingsstraße 45 · 94315 Straubing · Tel. 09421/42081

Manufacturer's certification

Hereby it is confirmed that the

Multiparameter- MultiLab P4

has Radio Frequency Emmissions in accordance with BMPT-AmtsblVfg 243/1991.

This instrument has passed the tests set by the authoroties for telecommunication. WTW have been authorized to carry out the testing for the instrument in this range.

WTW Wissenschaftlich-Technische Werkstätten GmbH
D-82362 Weilheim, Dr.-Karl-Slevogt-Straße 1